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Remedial Action Work Plan

Ringwood Mines/Landfill Superfund Site
Operable Unit Two

Ringwood, Passaic County, NJ

Prepared for:

FORD MOTOR COMPANY

December 2020

620277

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Appendix C - Vibration Monitoring Plan
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Appendix E - Quality Assurance Project Plan (QAPP)

Appendix F - Field Sampling Plan

Appendix G – Paint Waste, Drum, and Drum Carcass Excavation and Removal Plan

Appendix H - Transportation & Disposal Plan

Appendix I - Technical Specifications

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Acronyms/Abbreviations	Definition
AOC	Administrative Order on Consent
AOS	Apparent Opening Size
ARAR	Applicable or Relevant and Appropriate Requirement
ARRCS	Administrative Requirements for the Remediation of Contaminated Sites
bgs	Below Ground Surface
BMP	Best Management Practice
CAMP	Community Air Monitoring Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIP	Community Involvement Plan
CMP	Cannon Mine Pit
COPC	Chemical of Potential Concern
CQA/QCP	Construction Quality Assurance/ Quality Control Plan
DOT	US Department of Transportation
E2	E2 Project Management, LLC
Emilcott	Emilcott Technologies
ESD	Explanation of Significant Differences
FRDR	Final Remedial Design Report
GAC	Granular Activated Carbon
GPS	Global Positioning System
GWQS	Groundwater Quality Standards
HASP	Health and Safety Plan
HSSE	Health, Safety, Security and Environment
IQAT	Independent Quality Assurance Team
JSAP	Job Safety Analysis Program
LOD	Limits of Disturbance
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MSW	Municipal Solid Waste
NIOSH	National Institute for Occupational Safety and Health
NJDEP	New Jersey Department of Environmental Protection
OCDA	O'Connor Disposal Area
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit Two
Owner	Ford Motor Company
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PDI	Pre-Design Investigation
PDSP	Pre-Design Sampling Plan
PE	Project Engineer
PLS	Professional Land Surveyor
PMP	Peters Mine Pit
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan

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Acronyms/Abbreviations	Definition
QC	Quality Control
RA	Remedial Action
RAC	Remedial Action Contractor
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDCSRS	New Jersey Residential Direct Contact Soil Remediation Standards
RDWP	Remedial Design Work Plan
RECON	Remedial Construction Services, L.P.
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision
RPM	Remedial Project Manager
SESC	Soil Erosion and Sediment Control
Site	Ringwood Mines/Landfill Superfund Site
SOW	Statement of Work
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WTS	Water Treatment System

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1.0 Introduction

On June 30, 2014, the US Environmental Protection Agency (USEPA) issued the Record of Decision (ROD) for the Ringwood Mines/Landfill Superfund Site (Site), Operable Unit Two (OU2), located in the Borough of Ringwood, Passaic County, New Jersey. A Site Location Plan is provided as Figure 1. for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area. The ROD (**Appendix A** of the Consent Decree) defines the components of the remedial action (RA) selected by USEPA for each of these land ACs.

An Administrative Order on Consent (AOC) was entered with an effective date of October 1, 2014 and governs the implementation of the remedial design (RD) for the Site. The scope and components of the implementation of the RD are specified in the Statement of Work (SOW) attached to the Consent Decree as **Appendix B**.

Pursuant to Section VI of the SOW, a Remedial Design Work Plan (RDWP) was prepared and submitted to the USEPA for approval on June 4, 2015. Based on agency comments, the RDWP was revised August 7, 2015. The RDWP provided a plan and schedule for development of the remedial design for each of the three land ACs at the Site, as identified above. The RDWP was approved by the USEPA in a letter dated August 26, 2015.

This Remedial Action Work Plan (RAWP) has been prepared by Remedial Construction Services, L.P. (RECON) on behalf of Ford Motor Company (Owner), The remedial activities described herein include the remedy as outlined in the USEPA-approved Final Remedial Design Report (FRDR), dated February 2017, and are consistent with the Consent Decree for the OU2 Remedial Action, signed March 2019. The construction of the Recycling Center at the O'Conner Disposal Area is included in this RA and is described in Section 6.2. Following the issuance of the final construction documents for the Recycling Center, all applicable changes to the RAWP and appendices will be amended to reflect the RAC construction of the facility.

As further described in the following sections of this RAWP, the appendices to this document include the CQA/QCP (Appendix A), Site-Specific HASP (Appendix B), Vibration Monitoring Plan (Appendix C), CAMP (Appendix D), Quality Assurance Project Plan (QAPP; Appendix E), Field Sampling Plan (Appendix F), the Paint Waste, Drum, and Drum Carcass Excavation and Removal Plan (Appendix G) and Transportation & Disposal Plan (Appendix H).

1.1 Overall Performance Standards

The performance standards as defined in the SOW are the Remedial Action Objectives (RAOs) as defined in the ROD and compliance with Applicable or Relevant and Appropriate Requirements (ARARs) as defined in various regulations pertaining to the OU2 remedy implementation. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Section 121(e)(l) provides that Federal, State, or local permits are not required for remedial actions conducted on-site, however, the substantive requirements of such ARARs must be met. In addition,

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in the State of New Jersey, meeting the substantive requirements of regulations is assessed by the New Jersey Department of Environmental Protection (NJDEP) through a permit equivalent process.

The RAOs defined in the ROD are as follows:

- Limit direct exposure to soil or fill material containing hazardous substances at levels exceeding those set forth in the New Jersey Residential Direct Contact Soil Remediation Standards (RDCSRS);
- Limit or reduce exposures by residents, recreationists, hunters, and/or hikers to an additional lifetime cancer risk range of between 1×10^{-4} and 1×10^{-6}, and a lifetime non-carcinogenic hazard index (HI) less than 1.0 associated with chemicals of potential concern (COPCs) in fill in the three land ACs; and
- Reduce the potential for COPCs in soil or fill materials to migrate into groundwater and surface water (a groundwater remedial action is being addressed under a separate operable unit, OU3).

The RD for the CMP Area, OCDA, and PMP Area land ACs address the RAOs through the following principal components:

- Management of fill/waste and soil so that materials are characterized and either appropriately managed/reused on site or properly disposed of off-site;
  - For the CMP Area and OCDA land ACs, consistent with the ROD, management of previously characterized fill/waste and soil is limited to excavation for consolidation of these materials beneath the cap (see Section 7.4 for additional discussion).
  - For the PMP Area land AC, fill/waste will be excavated to the water table, staged, characterized, and based on analytical characterization, either reused under the cap or disposed of off-site. Consistent with the ROD, segregated and suitable non-hazardous fill and soil will be reused above the water table for grading. The procedures for establishing reuse are discussed in Section 7.4.2.
- Use of Engineered Caps to limit the potential for direct contact exposures. Each AC has a soil cap with a geotextile component as discussed further in Section 7.5.2;
- Use of Institutional and Engineering Controls in addition to Engineered Caps (*e.g.,* fencing, signs, etc.) to limit the potential for direct contact exposures.
  - Engineering Controls include security fencing, signs, and in the case of the CMP and PMP Areas, the addition of boulders to discourage access to the Engineered Caps by all-terrain recreational vehicles common to the area.
  - The Institutional Control will be a NJDEP deed notice in accordance with NJAC 7:26C, Administrative Requirements for the Remediation of Contaminated Sites (ARRCS).

The ARARs applicable to implementation of the remedy at each land AC, as they relate to permit equivalents that will need to be obtained or provisions applicable during implementation, are as follows:

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- The Technical Requirements for Site Remediation, NJAC 7:26E, particularly as relates to quality assurance (QA) requirements for sampling and definition of remediation standards;
- Remediation Standards, NJAC 7:26D, which form the basis for the cleanup levels in the ROD;
- Pollutant Discharge Elimination System, NJAC 7:14A, relating to the potential for a discharge of dewatering waters during implementation of the remedies;
- Surface Water Quality Standards, NJAC 7:9B, which would govern a discharge to surface water;
- Groundwater Quality Standards, NJAC 7:9C, which would govern a discharge to groundwater;
- Freshwater Wetlands Protection Act Rules, NJAC 7:7A, governing the disturbance, restoration, and mitigation of wetlands and transition areas, which regulations also cover the Federal wetlands program requirements for the delegable wetlands at the Site, under Section 404 of the Clean Water Act;
- Flood Hazard Area Control Act Rules, NJAC 7:13, governing work in the riparian zone or flood plain of Park Brook. Park Brook is the only surface water body within the remediation areas;
- Stormwater Management, NJAC 7:8, governing management of stormwater, particularly as it relates to post-remediation conditions and best management practices during the remedial action;
- Soil Erosion and Sediment Control Act, Chapter 251, P.L. 1975, which is administered by the Hudson-Essex-Passaic Soil Conservation District and governs disturbance of lands for sediment control and management of construction stormwater;
- Water Lowering, NJAC 7:25-6.25, to partially or completely lower a body of water, which applies to the filling of the PMP Area pond.

Other regulations may also be applicable to the OU2 RA. For instance, if wastes are transported off site, the New Jersey Solid Waste and the Resource Conservation and Recovery Act (RCRA) rules would apply for disposal and transportation. These rules would apply to the contractors and transporters, etc., and the requirements are covered in the Technical Specifications (Appendix I) for remedy implementation.

The RAOs for OU2 will be met through the implementation of the scope of work outlined in the FRDR and this RAWP.

1.2 Relevant Project Documents

The relevant project documents outlined below are referenced throughout this RAWP and are considered companion documents to the RAWP as they include relevant information for the RA

- *Final Remedial Design Report*, Ringwood Mines/Landfill Superfund Site, Operable Unit Two, prepared by Cornerstone Engineering Group, LLC, dated October 2017

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- *Final Remedial Design Drawings*, Ringwood Mines/Landfill Superfund Site, Operable Unit Two, prepared by Cornerstone Engineering Group, LLC, dated October 2017; referred to herein as "Design Drawings"
- *Final OU2 Remedial Design Addendum*, prepared by Cornerstone Engineering Group, LLC, October 18, 2018
- *Technical Specifications*, Ringwood Mines/Landfill Superfund Site, Operable Unit Two Remedial Design, prepared by Cornerstone Engineering Group, LLC, dated August 2020 (Appendix I of this RAWP)
- *Plan for O'Connor Disposal Area,* Ringwood Recycling Center, prepared by Engineering & Land Planning Associates, Inc, dated July 2, 2018
- *Consent Decree for Remedial Action for Operable Unit 2, Ringwood Mines/Landfill Superfund Site,* signed March 2019. Including Appendices

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2.0 RAWP Document Organization

The organization of the RAWP is outlined in Table 2-1 below. Additional information on the organization of this plan and can be found in the Table of Contents.

Table 2-1: RAWP Organization

Appendices		
Appendix A	Construction Quality Assurance/ Quality Control Plan (CQA/QCP)	
	Attachment A	CQA/QCP Forms
Appendix B	Site-Specific Health and Safety Plan (HASP)	
	Attachment A	Chemical Contaminants Data Sheets
	Attachment B	Safety Data Sheets
	Attachment C	Safety Procedures
	Attachment D	Site Specific Hazard Communication Program
	Attachment E	Instructions for Reporting Near Miss Accidents and Incidents
	Attachment F	Site Visitor Orientation Breifing Form
	Attachment G	HASP Comprehensive Quiz
	Attachment H	Journey Management Plan
	Attachment I	Decontamination Plan
	Attachment J	Environmental Compliance Considerations
	Attachment K	Equipment Inspections
	Attachment L	Site Specific HSE Document Retention Guidelines
	Attachment M	Site Safety Officer's Project Safety Workbook
	Attachment N	Safety Incentives
	Attachment O	Communicating HSE Information
	Attachment P	Onsite Interactive Communication
	Attachment Q	Audits and Inspections
Appendix C	Vibration Monitoring Plan	
	Attachment A	Vibra-Tech Qualifications
	Attachment B	Vibration Monitor Manufacturers Data Sheet
	Attachment C	Weekly Vibration Monitoring Report
Appendix D	Community Air Monitoring Plan (CAMP)	
	Attachment A	Action Level Tables
	Attachment B	Example Perimeter Air Monitoring Station Location Drawings
Appendix E	Quality Assurance Project Plan (QAPP)	
	Attachment A	Groundwater Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
	Attachment S-1	Stockpile and Drum Sampling
	Attachment S-2	Groundwater/Effluent Sampling
	Attachment S-3	Decontamination
	Attachment S-4	Field Instrument and Equipment Maintenance and Calibration
	Attachment S-5	Water Level Meter: Operating Instructions

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	Attachment S-6	Sample Handling and Custody
	Attachment L-1	Trace Metals Analysis by Inductively Couple Plasma Emission Spectrometry
	Attachment L-2	Digestion of Water and Wastewater Samples
	Attachment L-3	TCLP Leach Extraction Procedure
	Attachment L-4	Mercury Analysis for Water and Wastewater
	Attachment L-5	Ignitability
	Attachment L-6	Cyanide Reactivity
	Attachment L-7	Sulfide Reactivity
	Attachment L-8	Analysis of pH for Soils
	Attachment L-9	Volatile Organic Compounds by GC/MS
	Attachment L-10	Semivolatile Organic Compounds by GC/MS
	Attachment L-11	Maintaining Sample Chain of Custody
	Attachment L-12	Quality Assurance Manual
Appendix F	Field Sampling Plan	
	Attachment A	Individual Sampling Plan, Stockpile and Drum Sampling
	Attachment B	Individual Sampling Plan, Monitoring Well Sampling
Appendix G	Drum Handling and Removal Plan	
Appendix H	Transportation & Disposal Plan	
	Attachment A	Regulatory Transporter Permits
	Attachment B	Routes to Disposal Facilities
Appendix I	Technical Specifications	

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3.0 Existing Site Conditions

3.1 General Site Description and Location

The overall Site is an approximately 500-acre parcel of land located in the Borough of Ringwood, Passaic County, New Jersey. The location of the overall Site and the three OU2 land ACs requiring RA that are covered by this RAWP are shown in the enclosed Figure 1.

The Site is located in an area of historic mining operations dating back to the 1700s. Current uses of the Site include parklands (Ringwood State Park), Borough of Ringwood facilities (an existing recycling center and public works yard), open space (Borough of Ringwood property), privately owned residential properties, and utility corridors. The majority of the 500-acre Site is forested or otherwise overgrown with vegetation.

The three land ACs that are the subject of this OU2 RAWP are contained within the overall Site and are described further below.

3.2 PMP Area, OCDA, and CMP Area Land ACs

Background information on each of the three land ACs is presented in the sections that follow. This background information includes an overview description of each land AC, a description of the remedy selected in the ROD, and a summary of prior investigations and information.

3.2.1 CMP Area

The CMP Area is located in the southwestern portion of the Site and encompasses an area of approximately two acres. This land AC is situated adjacent to the Van Dunk Lane cul-de-sac. The CMP Area is mostly an open field surrounded by a chain-link fence and includes areas such as access roads and rock piles and outcroppings.

The remedy for the CMP Area as defined in the OU2 ROD is briefly summarized as follows:

- Excavation and consolidation of shallow fill/waste for placement under the cap areas;
- Excavation of drums of waste, if any, and proper offsite disposal;
- Placement of compacted fill to promote proper drainage of the area;
- Installation of an Engineered Geotextile/Soil Cap as an Engineering Control and restoration with vegetation;
- Additional Engineering Controls (*e.g.*, fence, boulders, signs, etc.) to control access; and
- Institutional Controls and long-term monitoring, maintenance, and reporting.

A number of prior investigations have been performed in the CMP Area to complete the Remedial Investigation (RI) and as a part of prior waste removal actions. This previously completed work included:

- A topographic site map;
- Test pits used to characterize soil/fill (*e.g.*, soil classification, material types) and define lateral and vertical extent of fill and waste;

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- Rotosonic borings to characterize the deeper fill material within the CMP Area;
- Geophysical testing within borings to investigate the potential for subsurface voids, and to characterize bedrock (*e.g.*, fracture orientation, transmissive zones);
- Soil classification and descriptions of subsurface materials;
- Laboratory analysis of soil/fill/waste materials, both total constituents and Toxicity Characteristic Leaching Procedure (TCLP) analysis of waste samples; and
- Baseline human health and baseline ecological risk assessments.

In addition to the above, the prior RI activities included characterization of groundwater and surface water. However, groundwater is being addressed under a separate operable unit, Site-Related Groundwater, referred to as OU3.

3.2.2 OCDA

The OCDA is located in the north-central portion of the Site, just south of the PMP Area, and encompasses approximately 12 acres. The OCDA is adjacent to and extends along Peters Mine Road, and slopes to the east toward Park Brook. Wetlands have been delineated within the OCDA and generally adjacent to Park Brook. This area's historic use was as a settling pond for mine tailings from the wet ore processing operations. This area is also currently wooded and mostly overgrown with vegetation.

The ROD for the OCDA defined both a Selected Remedy and a Contingency Remedy. On April 16, 2015, the USEPA issued an Explanation of Significant Differences (ESD) approving the Contingency Remedy for the OCDA; therefore, this RAWP addresses the Contingency Remedy as the final Selected Remedy for the OCDA.

The final Selected Remedy components for the OCDA are as follows:

- Excavation of fringe area fill and consolidation within the OCDA;
- Placement of compacted fill to promote proper drainage of the area;
- Installation of an Engineered Geotextile and Soil Cap followed by redevelopment of the area above the Engineered Cap as a Recycling Center for the Borough of Ringwood;
- Construction of the Recycling Center above the Engineered Cap once installed which would also function as a protective feature above the cap (*e.g.*, asphalt pavement, etc.);
- Additional Engineering Controls (*e.g.*, fencing, signs, etc.) to control access;
- Restoration of vegetation in areas outside of the Engineered Cap;
- Restoration/mitigation of wetlands disturbed by the remedy implementation; and
- Institutional Controls and long-term monitoring, maintenance, and reporting.

A number of prior investigations have been performed in the OCDA to complete the RI and as a part of prior waste removal actions. This previously completed work included:

- A topographic site map;
- Wetland delineation and mapping;

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- Test pits and test trenches used to characterize soil/fill (*e.g.*, soil classification, material types) and define lateral and vertical extent of fill and waste;
- Soil classification and descriptions of subsurface conditions;
- Laboratory analytical testing of soil/fill/waste materials; and
- Baseline human health and baseline ecological risk assessments.

As with the CMP Area, the prior RI activities in the OCDA included characterization of groundwater and surface water. However, as previously noted, Site-Related Groundwater is being addressed separately under OU3.

3.2.3 PMP Area

The PMP Area is also located in the north central portion of the Site. This area encompasses approximately three acres and is located such that the majority of the area is within Ringwood State Park with the remaining area located on Borough of Ringwood property. An approximately one-half acre pond, an expression of the groundwater table, is located within the approximate center of the PMP Area where a former soil cap has subsided thus enabling the pond to form. The PMP Area is otherwise forested and overgrown with vegetation.

The remedy for the PMP Area as defined by USEPA in the ROD is briefly summarized as follows:

- Excavation of soil and fill to the water table, unless drums and paint waste are found to extend below the water table and can be removed, in which case, excavation will also include such materials;
- Segregation of excavated materials for re-use under the cap or off-site disposal based on the nature of the materials and the results of laboratory analyses, as applicable;
- Placement of compacted fill to achieve grades above the water table and provide overall grading of the area to achieve proper drainage;
- Installation of an Engineered Geotextile/Soil Cap as an Engineering Control and restoration with indigenous vegetation consistent with Ringwood State Park; and
- Institutional Controls and long-term monitoring, maintenance, and reporting.

A number of prior investigations have been performed in the PMP Area to complete the RI and as a part of prior waste removal actions. This previously completed work included:

- A topographic site map;
- Topographic mapping of the pond within the PMP Area;
- Wetland delineation and mapping;
- Test pits and test trenches used to characterize soil/fill (*e.g.*, soil classification, material types) and define lateral and vertical extent of fill and waste;
- Directional borings to characterize the PMP Area (*e.g.*, pit depth) and provide information regarding pit dimensions and bedrock characteristics;
- Geophysical testing within borings (*e.g.*, fracture orientation, transmissive zones);
- Soil classification and descriptions of subsurface conditions;

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- Laboratory analytical testing of soil/fill/waste materials, both total and TCLP analysis of waste samples;
- Analytical and physical characterization of the sediments in the PMP pond; and
- Baseline human health risk assessment and a screening level ecological risk assessment.

As with the CMP Area and OCDA, the prior RI activities in the PMP Area included characterization of groundwater and surface water. However, as previously noted, Site-Related Groundwater is being addressed separately under OU3.

3.3 Site Geology and Groundwater

The Site geology and groundwater conditions are summarized below. Additional details may be found in the Revised Draft Site-Related Groundwater Remedial Investigation Report (RIR), Ringwood Mines/ Landfill Superfund Site, Ringwood, New Jersey (ARCADIS, January 2015) and the Site-Related Groundwater Remedial Investigation Report Addendum, Ringwood Mines/Landfill Superfund Site, Ringwood, New Jersey (Cornerstone, October 2018).

3.3.1 Geology

The Site is located in the southeastern extension of the New England Highlands Physiographic Province. The portion located in New Jersey is known as the New Jersey Highlands, and the topography of the site within the New Jersey Highlands consists of northeast-southwest trending parallel ridges, created by well foliated gneiss. The more common, less foliated gneiss forms rounded or broad-topped topographic highs. Granite gneiss and pegmatite form sharp ridges separated by narrow troughs underlain by less resistant gneiss. Major cross faults are visible as trench-like features that interrupt drainage. These faults generally strike approximately east-west across the predominant northeast strike of the major ridges and valleys (Hotz, 1953).

Unconsolidated soil and sediment deposits in the area are primarily confined to the stream valleys and corridors and are thickest in the eastern and southern parts of the Site. The overburden ranges from approximately 25 to 50 feet thick. Glacial deposits blanket the lower slopes of ridges and hills and consist of heterogeneous mixtures of silt, sand, and gravel with boulders, typical of a ground moraine. The stream deposits are observed within the floodplains of the creeks and swamps and consist of clay and silt with some sand and gravel. These stream deposits are thought to be primarily derived from reworking of the glacial sediments.

The overburden consists of the Rahway Till dating from the Pleistocene age, which is reddish-brown, light reddish-brown, reddish-yellow silty sand to sandy silt containing some to many sub-round and sub-angular pebbles and few sub-rounded boulders. The matrix is compact, non-plastic to slightly plastic with coarse sub-horizontal fissile structures, and the clasts are composed of red and gray sandstone and siltstone, gray gneiss, and white to gray quartz and quartzite gravel. Boulders are mainly gneiss, and a few are quartzite or gray and red sandstone (Stanford 2002).

Bedrock in the valleys and other topographic low areas is generally covered by overburden, which consists of unconsolidated and reworked glacial deposits and weathered bedrock. In some areas,

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the overburden is overlain by excavated rock, mine tailings, fill soil, and refuse from historical mining activities and historical fill/waste placement.

Bedrock is encountered at approximately 25 to 50 feet below ground surface (bgs) and consists of Mesoproterozoic age metasedimentary rocks of the Vernon Supersuite and gneisses of the Losee Metamorphic Suite, approximately 1.3 billion years old. The rock primarily consists of calc-alkaline and plagioclase gneisses. There are occurrences of pegmatite, pyroxene-amphibolites, biotite-quartz feldspar gneiss, and magnetite iron ore. The structural nature of bedrock at the Site is complex. The gneisses are moderately to well foliated, have mineral lineation, and display evidence of three distinct folding events. Joints are prevalent in the bedrock and are characteristically moderate to well developed, planar, typically unmineralized, and moderately to steeply dipping with spacing from one foot to several tens of feet (Volkert 2008).

The iron ore found in Ringwood is thought to be associated with hydrothermal deposits consisting primarily of magnetite that replaced pyroxene amphibolites and skarn rocks. The iron ore formed around the same time as emplacement of granite and pegmatite, approximately 950 million years ago.

3.3.2 Groundwater

Groundwater at the Site occurs in both overburden and bedrock, but only in overburden where it is sufficiently thick to be continually saturated, usually a thickness observed to be greater than 8 feet. Where saturated, the overburden defines an upper aquifer and fractured bedrock a lower, or deeper, aquifer. The transition from the overburden aquifer, where it is present, to the bedrock aquifer is marked by a weathered bedrock zone of variable thickness (ranging from 0 feet to approximately 20 feet). There is limited hydraulic communication between the overburden and bedrock aquifers beyond the immediate vicinity of the underground mine workings because of the poor vertical permeability and transmissivity of the basal boulder till as well as the crystalline bedrock.

Groundwater occurs in the overburden under unconfined water table conditions in the PMP Area and the OCDA. Although saturated overburden has not been encountered in the CMP Area because of insufficient overburden thickness. Groundwater occurs in the bedrock aquifer beneath the entire Site. The overburden aquifer is monitored in two zones, the upper water table and the lower, or deeper, overburden. The bedrock aquifer is monitored in multiple zones ranging from tens of feet in depth to approximately 500 feet bgs. Based on observed monitoring well yields during the more than 25 years of groundwater sampling at the Site, the hydraulic conductivity of the overburden aquifer is low to moderate and is low to very low in the bedrock aquifer. The depth to groundwater in the overburden fluctuates seasonally and is typically deeper during dryer summer months with some wells being dry, or nearly dry, when conditions are sufficiently dry.

In the PMP and CMP Areas, the abandoned underground mine workings have filled with groundwater and, therefore, represent significant storage of groundwater. The volumes of stored water are estimated at 213,000,000 gallons and 49,000,000 gallons, respectively (Getz 1965). Based on the very low historical mine dewatering rates (less than 54 and 33 gallons per minute, for

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the PMP and CMP Areas, respectively) and low to very low monitoring well yields during purging and sampling, the significant storage of groundwater within the abandoned mine workings does not appear to contribute to or increase the overall local hydraulic transmissivity, or groundwater movement, within the massive crystalline bedrock. Moreover, this large volume of groundwater storage and lack of yield from the area-specific monitoring wells indicate that fractures within the crystalline bedrock have very limited transmissivity and/or connectivity.

The direction of groundwater flow in both the overburden and bedrock aquifers is generally to the southeast. Groundwater ultimately discharges to streams, creating base flow in the perennial streams. Surface water within the streams ultimately discharges into the Wanaque Reservoir, located approximately one mile from the confluence of Park Brook, North Brook, Mine Brook, and Ringwood Creek (WCC 1988).

Although groundwater at the Site is classified as Class IIA, a potential potable water source, as classified by NJDEP, groundwater at the Site is not used as a potable water source. The majority of drinking water for residents near the Site is provided by production wells maintained by the Borough of Ringwood. The Borough production wells are located more than a mile from the Site in a different sub-watershed. In addition to the Borough's production wells, there is a limited amount of potable water provided to Borough residents from the Wanaque Reservoir.

3.3.3 Conceptual Site Model

The Groundwater Remedial Investigation (RI) Report presents a detailed description of the Conceptual Site Model (CSM) that includes the inter-relationship between the geology, the overburden and bedrock groundwater, the mine workings, and surface water. The CSM is summarized here and the reader is referred to the Site-Related Groundwater RI Report for additional detail.

CMP Area

The CMP Area is a former mine pit located on a bedrock ridge in the southwestern portion of the Site, adjacent to the cul-de-sac at the end of Van Dunk Lane. The CMP Area has underground mine workings and a mine pit that was closed by blasting in the sides. The pit was filled to ground surface after it was initially closed, when it was used as a permitted landfill.

Because the CMP is located on a bedrock ridge, the overburden soil is thin to non-existent and there has been no confirmation of a water table in the overburden soil. Therefore, groundwater occurs only in the shallow and deeper bedrock and within the mine pit, but the overburden, where it occurs, is too thin to sustain a water-bearing zone and is unsaturated. The bedrock aquifer is monitored in multiple zones ranging from tens of feet in depth to approximately 500 feet below ground surface (bgs). Based on observed monitoring well yields, the hydraulic conductivity of the bedrock aquifer is low to very low. The bedrock is interconnected with the mine workings, albeit this interconnection is controlled by the low hydraulic conductivity of the aquifer.

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Groundwater in the shallow and deeper bedrock flows radially away from the bedrock ridge toward Mine Brook to both the east and west. The center of the ridge represents an approximate location of a groundwater divide and the CMP is located at this divide.

OCDA

The OCDA is a former aboveground mine process waste disposal area. There are no mines or underground workings associated with the OCDA. Fill materials were historically deposited on top of the mine tailings. Consequently, investigation of the OCDA focused on characterization of the fill material, underlying mine tailings, and native soil.

Overburden soils at the OCDA are typically on the order of 40 feet thick and are underlain by the regional bedrock. Groundwater occurs in the overburden at a depth between two and ten feet bgs and flows through the native overburden soil up gradient of the OCDA then through OCDA fill materials and mine tailings prior to discharging to Park Brook and wetlands on the eastern, downgradient OCDA boundary. Groundwater flow also occurs in the bedrock below the fill, mine tailings, and native soils. Groundwater flow in the shallow bedrock also exhibits upward gradients with eventual discharge to the Park Brook.

PMP Area

The PMP Area is located at the head of a valley in the northern portion of the Site at the end of Peters Mine Road. The terrain consists of a relatively flat area where the PMP mine pit is located. Groundwater in the PMP Area occurs in the overburden, shallow bedrock, and deeper bedrock. The overburden is up to 60 feet thick, and the depth to groundwater in the overburden ranges from 12 to 17 feet bgs. Similar to the CMP Area, the bedrock aquifer is monitored in multiple zones ranging from tens of feet in depth to approximately 500 feet bgs. Based on observed monitoring well yields, the hydraulic conductivity of the bedrock aquifer is low to very low. The bedrock is interconnected with the mine workings, albeit this interconnection is controlled by the low hydraulic conductivity of the aquifer. Groundwater flow in the overburden and bedrock is generally to the south-southeast.

The results of the Site-Related Groundwater RI, including the geochemical and environmental tracer studies, show that groundwater in bedrock exhibits an upward vertical gradient. Because of this upward gradient from the deeper bedrock aquifer to the shallow bedrock to the overburden, groundwater in the bedrock is mixing with the overburden groundwater prior to discharge to the adjacent Park Brook. There are also groundwater seeps in other topographically low-lying areas identified as SR-3 Seeps 1 and 2, where groundwater discharges to the ground surface.

Surface water within Park Brook discharges into Sally's Pond which receives flow from other small tributaries from the north and east. Surface water in Sally's Pond ultimately discharges to Ringwood Creek approximately one mile upstream of its confluence with the Wanaque Reservoir. The reservoir is located approximately 1.5 miles downstream of the PMP Area.

The Air Shaft groundwater flow study, conducted during the Site-Related Groundwater RI, documents an upward gradient in the PMP Air Shaft, with reducing conditions at depth and

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increasing oxygen levels in the groundwater moving upwards in the PMP Air Shaft. The investigation results indicate the presence of a thermal and geochemical stratification of the water in the Air Shaft at approximately 170 to 180 feet bgs. Referred to as a thermocline and a chemocline, these are common phenomena in flooded mine workings where stratified conditions exist as a result of isolated mine areas that have no drainage or flow pathway at depth. The presence of a thermocline creates conditions that limit the physical mixing between the water above and below the depth of stratification as confirmed by the mine water analytical results for samples collected from the PMP Air Shaft.

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4.0 Remedial Action Field Team

The primary firms that are involved in the OU2 RA implementation are outlined in Figure 4-1. Section 9.1 provides further detail on the lines of communication and reporting for all parties, including de maximis, Ford Motor Company, USEPA, and NJDEP.

4.1 Roles and Responsibilities

The roles and responsibilities of the key members of the OU2 RA project team are described below.

de maximis, inc., **Project Coordinator – Craig Coslett**
Assistant Project Coordinator – Danielle Ondic

The Project Coordinator and Assistant Project Coordinator will be the primary liaisons between regulatory agency representatives and Owner's Representative; will coordinate the activities of the Principal Engineer and in-field contractors including RECON, the Remedial Action Contractor (RAC), the Construction Manager, and the IQAT Official; and will serve as the Owner's Representative with owners of properties on and adjacent to the Site and other stakeholders.

***de maximis, inc.,* Construction Manager – Tom Perkins**

The Construction Manager will provide day-to-day in-field management of the RAC activities and the RAWP Implementation. The Construction Manager will act as the primary on-site contact for regulatory agencies.

Tetra Tech, Inc., Principal Engineer – Brian Sielski, PhD, PE

The Principal Engineer is responsible for providing technical direction, appropriate technical input, and reviews for design-related deliverables. The Principal Engineer will attend periodic progress meetings, address design clarifications or revisions, if/ when needed, depending on conditions encountered, evaluate sampling results pertaining to remediation design requirements, and otherwise assist project team members upon request.

Tetra Tech, Inc., Construction Quality Assurance Manager – Tim Roeper, P.G.

The Construction Quality Assurance (CQA) Manager will coordinate the CQA/CQP activities throughout all aspects of the remedial construction activities. His responsibilities include training and staffing for the Independent Quality Assurance Team (IQAT), providing field inspections on an as-needed basis, and assisting the Project Coordinator as needed.

Tetra Tech, Inc., Independent Quality Assurance Team Official – Robert Schellberg

The IQAT Official will provide day-to-day in-field quality assurance of the RAC and other subcontractors and coordinate the activities of the IQAT in the field. The IQAT Official is responsible for providing field inspections, assisting the Principal Engineer with design decisions, informing the Construction Manager and Principal Engineer of deficiencies, attending project meetings, and keeping the project team updated with daily field reports. The IQAT Official will oversee and implement the RAWP.

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RECON, Project Manager –– Larry Endicott

For the implementation of OU2 RECON has been selected as the RAC. RECON's Project Manager will be the primary point of contact on the project. He has the authority to represent RECON in business dealings involving the project. He also has overall responsibility for the quality of the end product delivered to the Owner's Representative as well as RECON's adherence to its project schedule. The Project Manager will attend all progress meetings and other meetings requested by the Owner's Representative.

RECON, Program Health and Safety Manager – Brad Lockhart

RECON's Program Health and Safety Manager will be responsible for the implementation of the RECON Site Health, Safety, Security and Environment (HSSE) Program and the Site-Specific HASP provided in **Appendix B** of this RAWP. He will also modify this plan if/as conditions change, confirm personnel are fit for duty, monitor onsite hazards and conditions, coordinate emergency medical care, and investigate any incidents that occur on site. He will routinely conduct safety inspections to ensure compliance with the HASP and Occupational Safety and Health Administration (OSHA) procedures and requirements. He reports to RECON's Vice President of Safety.

RECON, Site Manager – Douglas Jumper

RECON's Site Manager will be responsible for the implementation of the day-to-day construction activities on the Site and will direct the overall flow of construction activities following the project schedule while assessing various working conditions and incorporating guidance from the RECON Project Manager. To perform this task effectively, the Site Manager will coordinate on-site activities with the RECON Quality Control (QC) Manager/Project Engineer (PE). On-Site Superintendents and the Site Safety Officer to ensure that the work is adequately inspected and performed safely. The Site Manager will assist the Project Manager with schedule updates, resource planning, and budgeting efforts. The Site Manager will attend all progress meetings on site.

RECON, On-Site Superintendents – Scott Sutton and Carl Walker

RECON's On-Site Superintendents will be responsible for the implementation of the day-to-day construction activities on the project site and will direct the overall flow of construction activities following the project schedule while assessing various working conditions and incorporating guidance from the RECON Site Manager. To perform this task effectively, the Superintendents will coordinate site activities with both the Tetra Tech QC Manager/PE and the RECON Site Safety Officer (SSO) to ensure that the work is adequately inspected and performed safely. The on-site Superintendents will assist the RECON Project Manager with schedule updates, resource planning, and budgeting efforts and attend all progress meetings on site.

RECON, Quality Control Manager/Project Engineer –– Brad Houston

RECON's QC Manager/PE will facilitate all quality control activities and inspections on site in accordance with the CQA/QCP provided in Appendix A of this RAWP. He will also be a primary liaison with RECON's licensed surveyor for the project. The QC Manager/PE will prepare and

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maintain the site CQA/QCP and be responsible for preparation of the site Submittal Register. The QC Manager/PE will also review and approve all submittals, prepare appropriate transmittals, and submit them to the Owner's Representative. Responses from the Owner's Representative will be noted in the Submittal Register, which will be updated as necessary.

RECON, Site Safety Officer –– Rodney Cockerel

RECON's SSO will assist the Project Manager, Site Manager, and Superintendents with on-site implementation of the RECON HASP provided in **Appendix B**. Safety is a core value at RECON, and the development of a good safety culture on site is essential. The SSO will perform any required monitoring, ensure that proper personal protective equipment (PPE) is available to and worn by field personnel, and is an essential management team member for assessing any changes to Site conditions that may potentially affect the well-being of field personnel. The site safety management team will provide timely information regarding changes or new conditions on site and instruct the crew as to how these changes will be managed.

RECON, Permit Manager – Douglas Jumper

RECON's Permit Manager will be responsible to identify all permits required for the performance of work on site. He will also work with the project team to generate all permit applications, coordinate with appropriate agencies for the acceptance of applications, associated fees and approvals, schedule the required inspections during construction, and work jointly with subcontractors if permits are required for their services.

4.2 Remedial Action Subcontractors

Subcontractors to the RAC assisting with the RA include but are not limited to the following:

E2 Project Management, LLC (E2), Wildlife Herpetologist - Michael Muller

E2 has previous experience on several paint sludge remediation sites in New Jersey and New York and has a comprehensive understanding of all listed endangered species and protective measures, specific to the OU2 land ACs. The protective measures are to be employed to ensure the endangered species identified within the land ACs are not impacted by the RA implementation. E2 will generate a Habitat Best Management Practices Manual that will include photographs of all endangered species documented in the land ACs, their typical habitats, and actions to be implemented should one or more of the species be encountered during RA implementation. E2 will also provide training sessions for all employees on-site to educate the individuals on all species, protective measures and actions to be taken. E2's herpetologist will perform site inspections prior to the initiation of intrusive activities and daily during the field work implementation to assure controls are properly installed and to remove any targeted animal species from within the protected area prior to work initiation.

Vibratech, Vibration Monitoring/Technical Assistance - Mark Edwards

Vibratech, a qualified and experienced subcontractor specializing in vibration monitoring, will implement the Vibration Monitoring Plan provided in **Appendix C** of this RAWP during the RA implementation.

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The monitors for use at the Site include a seismograph, triaxial geophone, and cellular modem that will be placed in pre-determined locations and programmed for wireless telemetry functions. The instrumentation will be solar powered and equipped with a battery backup system. The Vibration Monitoring Plan includes the seismograph locations, warning/threshold values, and method of detection and notification. Should there be a detection at warning level, the monitors will immediately send an email notification to the Construction Manager and the Project Manager and mitigative action will be taken.

Emilcott Technologies (Emilcott), Community Air Monitoring Plan (CAMP) Implementation/ Technical Assistance - Dave Tomsey

Emilcott, a highly qualified and experienced air monitoring specialty firm, will provide support in the implementation of the On-site and Community Air Monitoring Programs (CAMP; Appendix D of this RAWP). Emilcott will provide air monitoring equipment and support to administer the CAMP, including the following services:

- Installation and maintenance of a meteorological station that will log wind speed/direction, temperature, and humidity.
- Real-time air monitoring equipment for volatile organic compounds (VOCs) and particulates (PM10) using telemetry based automated monitoring systems with audible alarms at the upwind and downwind work zone perimeter locations.
- Training of a RAC technician to perform inspections of the air monitoring instruments at a minimum of once per hour. The technician will also be trained to operate and maintain the air monitoring system on a daily basis, position stations on a daily basis based on current wind direction and respond to notifications from the system indicating elevated levels of VOCs or particulates.
- Preparation of a Daily Field Report.

Pennoni, Site Surveyor - Justin Brown, Professional Land Surveyor (PLS)

The Site Surveyor, Pennoni, a New Jersey-licensed land surveyor, will establish all initial lines, elevations, and reference points as well as assist in loading the Global Positioning System (GPS) excavation models into a Base Station/Rover GPS system that will be utilized daily by the RAC's survey technician.

Survey data will be collected and further verified by Pennoni on an as needed basis.

All subcontractors will abide by the requirements of this RAWP. The Project Coordinator will maintain pertinent documentation such as OSHA training certificates, licenses, certificates of insurance, and emergency numbers. All subcontractors will be provided with plans that are applicable to their work, including but not limited to the Site-Specific HASP provided in Appendix B of this RAWP.

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5.0 Remedial Action Pre-Mobilization Tasks

Prior to the mobilization to the Site, there are several field activities that will be completed. The activities are described in the following sections which outline the scope of work, the attached appendices which provide additional details, as well as within permits required for the performance of the OU2 RA.

5.1 Remedial Action Contractor Submittals

Figure 5-1 contains the RAC Submittal Register, which lists the submittals outlined in the OU2 Technical Specifications provided in **Appendix I** of this RAWP for reference. The submittal register will document when items are to be submitted, when approval is required, and when a specific material is needed. The QC Manager/PE will follow standard procedures concerning submittals, including the use of the submittal register, transmittal form, cross-indexing the register and transmittals, etc. Each transmittal may contain more than one (1) submittal specific to that specification section.

Submittal transmittals shall be numbered sequentially in the following manner:

New Transmittal:	Specification Section – Transmittal Number
Example:	31.05.19-1
Revised Transmittal:	Specification Section – Transmittal Revision Number
Example:	31.05.19-1.1

The RAC will be responsible for the preparation, review, and approval of submittals prior to their submission to the Principal Engineer, Project Coordinator, and Construction Manager. This includes review of materials and suppliers' catalog cuts, as well as subcontractor submittals. The QC Manager will review the submittal for completeness and compliance with the Technical Specifications (Appendix I). Variations to a submittal will be noted on the transmittal form. The QC Manager will actively participate during procurement activities to ensure purchase orders and subcontractors comply with the contract.

A hard-copy of the submittals will be maintained on-site by the Construction Manager and the IQAT Official. A copy of the completed Submittal Register and the individual submittals will be included as an appendix of the Remedial Action Report.

5.2 Permits

A list of state and local permits/permit equivalencies that are required for the RA are outlined below. The required permits, or permit equivalencies, will be addressed prior to commencement of the RA. The following permits/permit equivalencies have been issued by the appropriate entity to maintain compliance with the ARARs:

- NJDEP, Freshwater Wetlands General Permits 5 and 11, dated October 2017;
- NJDEP, Individual Flood Hazard Area Permit, dated October 2017;
- Hudson-Essex-Passaic Soil Conservation District, Soil Erosion and Sediment Control Permit, dated February 5, 2018;

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- NJDEP, Division of Fish and Wildlife, Water Lowering Permit, dated March 15, 2017;
- NJDEP, Stormwater Permit Equivalency, dated September 5, 2017;
- NJDEP, Groundwater Discharge Permit-by-Rule Equivalent, dated January 19, 2018;
- Highlands Act Exemption, dated January 7, 2019; and
- NJDEP, Division of Parks & Forestry, Right of Entry Agreement.

In addition to the permits and permit equivalencies outlined above that have already been issued, the RAC has identified and will apply for local permits or permit equivalencies, pursuant to USEPA's permit equivalency policy prior to commencement of the RA. The permits and approvals that may be included are outlined below:

- General Construction Permit; and
- Permits associated with Recycling Center Construction (to be determined upon final design).

Open lines of communication will be maintained with the local authorities and agencies to address any questions or comments that may arise during the RA implementation activities to ensure compliance with all permit or permit equivalency requirements.

5.3 Construction Layout Inspections and Surveys

The Site Surveyor, Pennoni, will establish all initial lines, elevations, and reference points and will assist in loading the GPS excavation models into a Base Station/Rover GPS system that will be utilized daily by a survey technician. The site control grid and associated documentation will identify the following:

- Temporary benchmarks and control points;
- Locations for optical survey monitoring points on structures;
- Land AC boundaries;
- Wetland and Riparian area limits, transition areas and habitat protective measure limits;
- Areas of work (marked by four-foot high wooden stakes or paint marks)-Limits of Attainment and Limits of Disturbance (LOD);
- Monitoring wells, utilities alignment, etc.; and
- Grade, excavation, and fill limits.

Appropriate documentation will be presented for the control grid and prior to initiating construction activities. The RAC will verify the locations of the site reference and survey control points established via the use of a GPS rover/base system. Survey control will be maintained by the RAC's PE throughout the project to provide location-based data to calculate accurate fill and cut volumes and ensure proper grade control as the work progresses. Survey data will be collected and further verified by the independent New Jersey-licensed land surveyor on an as needed basis. The survey data collected throughout the project will be compiled and used to develop a set of as-built drawings.

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5.4 Utility Locations

The following applies to all subsurface disturbance work conducted at the Site. Underground and above-ground utilities that could affect, or be affected by, construction activities will be identified prior to the initiation of any intrusive subsurface activities. New Jersey One Call will be notified at least three (3) days before the scheduled start of intrusive activities to locate and mark out subsurface utilities. In conjunction with the Owner's Representative, the RAC will also perform a utility location review within each of the three land AC work areas to assist in the identification of any utilities. If any utility conflicts are identified, the appropriate utility company will be contacted to discuss what actions need to be taken.

In addition, caution will be exercised for the protection of existing monitoring wells, fencing, benchmarks, and other structures to remain throughout the RA construction. Well locations, protection methods, and modifications are outlined in the October 2017 OU2 Remedial Design Drawings, available under separate cover.

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6.0 Mobilization and Site Preparation

6.1 Site Mobilization

The mobilization to the Site will occur in Spring 2021 following approval of this RAWP by the USEPA. Upon arrival at the Site, the following activities will be performed:

- Hold a site mobilization/pre-construction meeting to review the scope of work, procedures, expectations, and requirements;
- Perform pre-construction inspections and surveys of the Site and surrounding areas;
- Establish contractor areas (office trailer, equipment staging, materials lay down, etc.) and temporary facilities; and
- Install soil erosion and sediment control (SESC) measures and habitat protection devices following all applicable permit conditions prior to starting work.

6.2 Site Preparation

Site preparation for implementation of the remedies at the three land ACs has common elements and land AC-specific elements. The common elements are as follows:

Site Security and Access

For each land AC, site security will consist of fencing during construction, which will be a combination of new and existing fencing. Where existing fencing is sufficiently outside the limit of work for construction, the fence may remain. However, the limits of remediation activities in some instances will occur outside of an existing fence line. Where this is the case, fencing will be extended to secure the area, control access, and enable construction. Temporary fencing (*i.e.,* portable) will be used in areas where the extended fencing is not in its permanent, post-remediation, location at the conclusion of the remedy construction. As applicable, permanent fence will be constructed at the conclusion of the work.

Each of the land ACs can be accessed from a public roadway; however, in each case, some improvements within the ACs will be necessary for access. First, because of the earthwork nature of the remedial activities, a stabilized construction entrance will be installed inside the entrance gate of each land AC security fence. The stabilized construction entrance will be built in accordance with the approved Soil Erosion and Sediment Control Permit and applicable provisions of The Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition, January 2014.

In addition, once off of the public roads, some improvements to stone access roads within the ACs will be necessary for equipment and vehicle access and movement. These improvements will include the addition of crushed stone for surface stabilization of off-road access and widening of entrance ways for large construction vehicles.

Staging Areas

A staging area will be used for construction support within each of the three land ACs. The staging areas will be used for material lay down, temporary stockpiling, and support infrastructure such as a construction trailer. The ground surface within the staging areas will

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be stone covered. Staging areas will also provide supplemental area for queuing of vehicles entering and exiting the Site for transport of soils for the final cover, and other materials/transport (*e.g.*, waste destined for off-site disposal). The Technical Specifications provided in Appendix I) prohibit queuing of vehicles on public roads.

Sediment Barriers

In accordance with the approved SESCP for the OU2 RA, barriers will be installed during site preparation to control the potential for sediment transport during the initial periods of construction and will consist of silt fence and/or silt fence with hay bales as shown on the Design Drawings. Sediment barriers will be installed in accordance with The Standards for Soil Erosion and Sediment Control in New Jersey (2014), and where their use is consistent with design guidelines: (1) one-acre tributary drainage area, and (2) a length of contributing slope of 150 feet or less. Initial sediment barrier installation will be supplemented with additional sediment barriers as the work expands and with additional SESCs, as appropriate for each land AC.

Decontamination

Each of the three land ACs has an element of excavation that has the potential to put construction equipment into contact with fill and/or waste with concentrations of constituents potentially above soil remediation standards. Where such conditions exist, a decontamination pad will be constructed, as illustrated on the Design Drawings. The decontamination pad will be located such that potentially contaminated equipment will be decontaminated prior to exiting the work site or into an otherwise clean area. The decontamination pad will have a containment system, a location to collect decontamination fluids (e.g., sump), and containerization of decontamination fluids for treatment in the dewatering water treatment system or for waste characterization and proper off-site disposal.

The layout of the common site preparation items described above are shown in the Transportation & Disposal Plan, provided as Appendix H of this RAWP.

In addition to these site preparation elements that are common to the three land ACs, the following site preparation items are specific to individual land ACs as described in the following sections.

6.2.1 CMP Area

A portion of the work for the CMP remedy implementation will be performed in the Van Dunk Lane cul-de-sac. Based on the limit of attainment defined by the additional work performed for the Pre-Design Sampling Plan (PDSP), the work will extend into the cul-de-sac sufficiently that the driveway for the adjacent property owner to the north will be temporarily obstructed. Driveway access to the home will therefore be temporarily relocated for this resident as shown on Design Drawing CMP-2. The resident's property driveway will be restored upon completion of construction.

In addition, this resident has stored various items off of their residential property and within the boundaries of the CMP remediation area. These items will be relocated in coordination with the resident, and the fence line adjusted to reflect the surveyed property boundaries during RA

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construction. To maintain continued vehicle access at the end of Van Dunk Lane, a temporary, gravel cul-de-sac will be constructed to the south of the road, which will be removed, and the area restored, prior to completion of the RA implementation. At the conclusion of the work in the Van Dunk Lane cul-de-sac, the restored cul-de-sac will be paved as shown on Design Drawing CMP-3.

6.2.2 OCDA

The tributary drainage area and flow paths for the OCDA land AC exceed the criteria for use of sediment barriers alone for SESC. The eventual redevelopment of the Engineered Cap as the Borough of Ringwood's Recycling Center, which includes the construction of impervious surfaces, employs the use of an extended detention basin for water quality control. Grading of the OCDA, in preparation for the Recycling Center construction, includes the initial construction of the extended detention basin. Per the ROD, there are no impervious surfaces included in the OCDA remedy construction. Note, however, that the initial construction of the extended detention basin as part of the OCDA remedy (*e.g.*, waste consolidation and soil capping) will serve as a temporary sediment basin until such time that the new Borough Recycling Center construction occurs.

Basin sizing using a 25-year storm is typically applied to conditions where downstream damage may be severe. While that is not expected to occur along Park Brook, the 25-year storm was selected as a basin design criterion for added protection for the adjacent stream channel (a Category 1 waterway) and wetlands (designated as exceptional resource value).

The sediment basin dimensions required during remedy implementation would be 50 feet wide, 100 feet long, and a minimum of four feet effective depth. Following the New Jersey standards for volume requirements, the basin must be sized to accommodate the larger of either the volume necessary to obtain 70% trap efficiency or the volume of temporary stormwater runoff storage produced from a 2-year, 24-hour, Type III storm. The 2-year storm produced the largest total required volume of 0.830 acre-feet. Enlarging the base of the sediment basin to 50 feet wide by 240 feet long, creating a total surface area of 71 feet by 112 feet, provides a total storage volume of 0.831 acre-feet. The design of the sediment basin will provide a total sediment storage volume of approximately 0.046 acre-feet. These dimensions fit readily within the footprint of the future, permanent extended detention basin for the Recycling Center, which is approximately 50 feet wide by 540 feet long and four feet deep.

Discharge to the sediment basin will be from diversion swales lined with erosion control fabric. Discharge from the sediment basin will be regulated by a riser constructed from corrugated metal pipe. A trash rack and anti-vortex unit will be welded atop the metal riser to prevent any trash or other floatable debris from exiting the basin. An orifice will be installed on the side of the riser to allow accumulated water in the basin to drawdown while still providing adequate sediment storage for runoff from the disturbed area. An anti-seep collar, composed of similar metal, will be welded to the outlet pipe to prevent any unintended seepage from the sediment basin along the pipe conduit. The outlet pipe will discharge water to the newly established flat area (from pull back of waste/fill) adjacent to Park Brook. The outlet will be protected with a rip rap stone apron appropriately designed to reduce flow and prevent erosion.

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Work at the OCDA will also be adjacent to Park Brook. To limit potential impacts on Park Brook and clearly demarcate the work boundaries, a dual sediment barrier will be used along the limit of disturbance as detailed in the approved Site-specific SESCP. As shown in Drawing SE-1 of the SESCP, the dual sediment barrier is a silt fence first, followed by an immediately adjacent hay bale barrier. This type of sediment barrier provides additional structural support and sediment filtering.

6.2.3 PMP Area

Similar to the OCDA, work in the PMP Area occurs adjacent to Park Brook. Per the approved SESCP, the dual sediment barrier approach will be used for the PMP Area work as well, as described above for the OCDA.

The area adjacent to the PMP Area to the southeast is currently used for storage of equipment used in prior work at the Site. This equipment will be relocated and/or salvaged as part of the project, so that the restoration work may be completed. The trailer-mounted granular activated carbon (GAC) units will be available for use for treatment of dewatering waters prior to discharge to groundwater.

6.2.4 Recycling Center Construction

The new Ringwood Recycling Center will be constructed on the completed OCDA Engineered Cap in accordance with the complete design and construction plans, specifications, and applicable permit equivalents and certain permits that are to be provided upon completion at a later date. Based on the permit plan set for the Recycling Center dated July 2, 2018, the construction of the new Recycling Center will include the following:

- Approximately 113,000-square feet of asphalt pavement installed as per Drawing 10 detail;
- Approximately 21,600-square feet of pervious concrete pavement installed as per Drawing 12 detail;
- Approximately 8,500-square feet of 6-inch concrete pavement installed as per Drawing 10 detail;
- Approximately 3,100-square feet of 8-inch concrete pavement installed as per Drawing 10 detail;
- Construction of a Bioretention Basin and associated access road, drainage structures, inlets, outlets, headwalls, underground piping, stone filters, spillways, riprap, and stone storage structure;
- Approximately 1,400-linear feet of curbing installed as per Drawing 10 detail;
- Approximately 650-linear feet of moveable block wall;
- Approximately 417-linear feet of chain link fencing, 1,150-linear feet of post/rail fencing and 100-linear foot of railing including all required gates;
- 14-foot by 44-foot two story office building with stairs/railing and septic system/piping/cleanouts;

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- Eight concrete container storage bin walls including catwalks, canopy, cardboard compactor and 360-linear foot concrete retaining wall and associated footings;
- Lighting as defined on Drawing 7;
- Plantings/landscaping as defined on Drawing 7; and
- Signage.

Upon issuance of the final Recycling Center construction documents, changes to the Recycling Center plans, if any, will be outlined in a brief RAWP Addendum.

6.2.5 Existing Recycling Center Removal

The RAWP work scope includes decommissioning the existing Recycling Center after the new Recycling Center is constructed and operational. This will include the removal of material stored by the RAC and decommissioning of the existing components of the Recycling Center. All materials will either be moved to the new Recycling Center after it is constructed or transported to a disposal facility for proper disposal and/or recycling.

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7.0 Field Tasks

The following sections provide details on the main field activities for the RA.

7.1 Removal of Surficial Debris, and Vegetation

Prior to the start of any intrusive RA activities, a general surficial cleanup of the Site will be conducted. This will include the removal of any surficial debris, such as scrap metal, tires, etc., as well as vegetation. Any buried debris and/or waste will not be included in this activity. The cleanup activities include:

- Removal of vegetation (*e.g.*, woody vegetation);
- Sorting of large items for recycling (*e.g.*, tires and scrap metal); and
- Removal of remaining materials as solid waste.

Vegetation

The first step in vegetation removal will be the cutting of the trees and brush at the ground surface with a saw. The cut vegetation may be mulched or otherwise handled as outlined in the Technical Specifications (Appendix I). The removal of vegetation will occur as part of the clearing and grubbing.

Recycling of Metal and Tires

To a practical extent, tires and large metal objects will be removed for recycling, if present on-site. All recycling materials will be free of dirt before removal from the Site.

Municipal Solid Waste (MSW) Items

All remaining surficial debris located in any of the three land ACs will be collected and either recycled or transferred into water-tight containers (e.g., roll-off containers) for off-site disposal as MSW. All recycling materials and/or solid waste will be free of soil before removal from the Site.

7.2 Electrical Utility Power Drop to Site

Electrical power for trailers, pumps and other electrical equipment will be acquired using power drops from overhead lines adjacent to the Site. The Borough of Ringwood and Jersey Central Power and Light will be contacted to install the electrical drops. The drops will be located to maximize coverage of the Site whenever possible to limit the length of electrical cable from the source to the equipment.

7.3 Prepare Equipment Staging and Site Support Facility Locations

Equipment and material staging areas will be established during Site set up activities. The material staging areas will consist of clean construction materials as well as staging areas for any waste generated as a result of grading and/or excavation activities.

The excavation of material from the PMP Area will require the construction of several stockpile areas for the temporary storage of material. This temporary storage will facilitate the sampling of material for a determination of potential reuse as backfill material or offsite disposal. The stockpile storage areas will be limited to a volume of 500 cubic yards and separated sufficiently so they are

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distinct, and materials are not co-mingled between adjacent stockpiles. The RAC will maximize the use of available space to allow for the establishment of approximately 11 stockpiles.

In accordance with the FRDR, each stockpile will be lined with 12-mil reinforced polyethylene liner and a 12-inch layer of 1-inch stone and surrounded with staked haybales to contain material and prevent stormwater run-on. The stockpiles will be covered with polyethylene covers ballasted with sandbags when not in use. Upon completion of the RA, the stone layer will be consolidated and sampled similar to the excavation material to determine reuse as grading fill or the requirement for off-site disposal.

At each land AC, material stockpile areas will be constructed as necessary for the temporary storage of solid waste and/or paint waste that may be encountered during material excavation/grading. These stockpile areas will be constructed in identical fashion as those constructed for the PMP Area excavation work.

7.4 Soil Excavation

7.4.1 Excavation

Excavation for the three land ACs will be the first aspect of earthwork performed at the Site. Starting with the excavation, and for each aspect of the earthwork to be performed subsequently (*e.g.*, fill, grading, capping), vibration monitoring will be used to confirm that the earthwork does not have the potential to have an adverse impact on any adjacent structures or potentially result in subsidence in accordance with the Vibration Monitoring Plan **(Appendix C)**. All excavation activities will be performed in accordance with the Design Drawings and Technical Specifications **(Appendix I)**.

Excavation in the three land ACs will be performed as follows:

1. CMP Area
   Excavation will be limited in the CMP Area to the pull back of shallow waste areas in certain fringe areas of the CMP as shown on Design Drawing CMP-3.

2. OCDA:
   Excavation within the OCDA will be performed to consolidate fill and/or waste within the final boundaries of the Engineered Cap and Recycling Center to be constructed above the Engineered Cap, as shown on Design Drawing OCDA-3.
   - Consistent with the ROD, the fill and/or waste consolidation will extend to the top of the underlying, undisturbed mine tailings (*i.e.*, mine tailings commingled with waste will be treated as waste).
   - To the extent consolidation of this material includes non-hazardous mine tailings, the mine tailings may also be used as fill above the water table for the PMP Area site grading. For instance, to create grades conducive to wetlands restoration, some mine tailings are expected to be excavated and consolidated under the cap areas, as illustrated in the profiles on Design Drawing P-1.

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- In addition, to accommodate the construction of subsurface features (*e.g.*, utilities, retaining wall foundations, etc.) for the Recycling Center after the Engineered Cap is constructed, certain areas of the OCDA will be over-excavated and backfilled with certified clean soils. These additional excavation areas have limits corresponding to a minimum of two feet of clean soil below and along the sides of future excavations intended for construction of the Recycling Center.

3. PMP Area
   - Excavation within the PMP Area will involve removal of the fill and/or waste surrounding the PMP pond within the limits of attainment to the top of the water table, and characterization of this material for either on-site reuse under the cap or proper off-site disposal. Additional excavation may be conducted below the water table for removal of paint waste or drums for off-site disposal, if encountered and it is practical to proceed with removal.

The requirements for excavation work in all three land ACs will be consistent with applicable OSHA provisions. To the extent that excavation results in below grade slopes, the criteria for excavation will be as follows:

- The fill and/or waste within the excavation areas is considered Type C as defined in 29 CFR 1926, Subpart P, Appendix A. Type C soil is generally granular and cohesionless, may be layered, and has the most stringent slope requirements because of the limited strength assumptions. Given the uncontrolled nature of the fill and/or waste, Type C is considered the appropriate condition;
- The maximum allowable slope for Type C soil is 1.5 (horizontal) to 1 (vertical) per 29 CFR 1926, Subpart P, Appendix B, for excavations up to 20 feet deep. The planned excavations within each of the land ACs are less than 20 feet in depth;
- Excavation below the water table will be subject to the same maximum allowable slopes; however, in this event, excavation activities will be subject to further engineering evaluation. Below the water table, seepage into the excavation has the potential to cause piping of fines and instability/undermining of the excavation face. Because the fill and/or waste is uncontrolled material, a determination cannot be made regarding stability in advance of attempting such an excavation. Therefore, excavation below the water table, if attempted to remove paint waste and/or drums, will be on a case-by-case basis. This approach is consistent with the SOW which states:
  - Any excavation below the water table will be conducted provided that the area can be isolated and stabilized to support such a removal action, and that the work can be completed in a manner that does not compromise the structural integrity of the mine pit or mine workings or introduce unsafe geotechnical or worker conditions.

7.4.2 PMP Excavated Material Characterization

As described in the FRDR, the analytical data for the PMP Area fill and/or waste indicates that, with the exception of arsenic, which is also characteristic of the native bedrock and mine tailings, there were few locations where constituents were reported above the site-specific cleanup levels, which

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are the RDCSRS. More specifically, of the total of 49 samples at 20 locations, detections of constituents above the RDCSRS were as follows:

- Four locations and a total of five samples above the lead RDCSRS;
- Four locations and a total of five samples above the vanadium RDCSRS;
- One location and a total of two samples above the antimony RDCSRS;
- Two locations and a total of two samples above the polychlorinated biphenyls (PCBs) RDCSRS; and
- Three locations and a total of three samples above the polycyclic aromatic hydrocarbons (PAHs) RDCSRS.

The OU2 ROD states that "Segregated non-hazardous soil or fill from [the Peters Mine Pit excavation], if suitable, may be reused as fill for the excavated area…." There is no documentation indicating that listed hazardous wastes were disposed of in the PMP Area. Therefore, hazardous waste classification for excavated material would be based on a determination as a characteristic waste through testing for corrosivity, ignitability, reactivity, and toxicity using the TCLP. Based on the overall nature of the fill and/or waste, it is unlikely that the excavated material would be hazardous based on corrosivity, ignitability, or reactivity.

In addition, of the constituents reported in soil fill above the RDCSRS, only arsenic and lead have TCLP limits. Based on the TCLP analytical methodology which employs a 20:1 dilution, a constituent must be present at a concentration of at least 20 times the TCLP limit for the TCLP limit to be exceeded and the material classified as hazardous. The TCLP limit for arsenic is 5 milligrams per liter (mg/L) in the extract, and therefore, the concentration in the soil must be at least 100 milligrams per kilogram (mg/kg) to exceed the TCLP limit. The highest reported arsenic concentration from implementation of the PDSP was 79.8 mg/kg. The TCLP limit for lead is also 5 mg/L in the extract, and therefore, the concentration in the soil must be at least 100 mg/kg to exceed the TCLP limit. Lead concentrations in the samples above the RDCSRS ranged from 592 to 4240 mg/kg, indicating the potential for a TCLP extract result to be above the TCLP limit. However, as noted above, this occurred in only five samples out of a total of 49, approximately 10% of the samples collected.

The collective characterization data for the PMP Area fill and/or waste indicates a high potential for a majority of the material to be excavated as part of the PMP remedy to be reused, not only because the material is likely to meet the ROD requirement for reuse, but also because the data indicate that the majority of the material is likely to meet the site-specific cleanup levels.

Given the high potential for fill and/or waste reuse, excavation within the PMP Area will be performed as follows as documented in the Technical Specifications (Appendix I):

- As excavation proceeds, the excavated fill and/or waste will be segregated into approximately 500 cubic yard lots for sampling and analysis for the characteristics of hazardous waste. The NJDEP Fill Material Guidance for SRP Sites (Version 3.0, April 2015) includes a Recommended Sampling Frequency Guide for Alternative Fill. The excavation

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plan for the PMP Area results in approximately 28,000 cubic yards of material to be excavated. Based on the NJDEP Sampling Frequency Guide, this amount of material would require 41 samples for adequate characterization (without justification for reduced sampling), or approximately one sample per 680 cubic yards. The 500 cubic yard lots will exceed the minimum samples for characterization, and also provide a practicable quantity for stockpiling, testing, and determining reuse or disposal;

- During the process of segregating excavated material into 500 cubic yard lots, any observed waste materials that would interfere with reuse and compaction will be removed, and properly disposed of off-site. If paint waste or drums are encountered, these materials will be segregated and placed on, and subsequently covered with, plastic sheeting pending characterization for off-site disposal at a permitted facility. Fill and/or waste of any kind that cannot be reused, including paint waste and drums, will be staged separately, as illustrated on Design Drawing PMP-3;
- Because the characteristics of the material being excavated are not known in advance, there will be two possible procedures for stockpiling. Material may be temporarily stockpiled directly on material of like kind yet to be excavated and tested. Alternatively, if material is stockpiled outside of the limit of attainment, it will be stockpiled within a temporary lined cell. A typical detail for a temporary lined containment area is illustrated on Design Drawing D-4;
- Samples will be collected from the temporary stockpiles and sent to a New Jersey-certified laboratory for testing of ignitability, corrosivity, reactivity, and TCLP Metals under chain of custody and with rapid analytical turnaround time, typically 24-36 hours. To accomplish the sequence of stockpiling, sampling, testing, and final determination for reuse or off-site disposal, stockpiling will account for approximately three days of time, as follows:
  - Day one – stockpile and sample;
  - Day two/three – results received from the laboratory;
  - Day three and beyond – reuse in a sequential excavate and fill process or load out for off-site disposal.

A typical staging area layout using lined containment areas is illustrated on Design Drawing PMP-3.

- Discrete, representative samples will be collected for laboratory testing;
- Analysis will be for ignitability, corrosivity, reactivity, and TCLP metals based on the characterization results from the PDSP.

7.4.3 Groundwater Management

The ROD as further clarified in the SOW includes in the remedy for the PMP Area dewatering of the PMP pond or "…use of other water management technologies or methods approved by EPA…." In addition, dewatering may not only be necessary for the excavation to the water table within the PMP Area, but also for excavation below the water table to remove paint waste or drums, if encountered and practicable.

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The PMP Area, based on information generated during the RI and the Pre-Design Investigation (PDI) from the rotosonic angled borings and test pits, was filled with mine tailings, soil, and waste. The fill material, other than waste, is predominantly granular with particle sizes typically ranging from fine sand to cobbles. The waste material is typical of the plant trash reported to have been disposed such as cardboard, plastic, metal fragments, and wood debris. The flat hydraulic gradients downgradient of the PMP pond in both the overburden and bedrock, and at elevations similar to the pond water surface, indicate: (1) enhanced recharge through the pond depression within the PMP pit through the predominantly granular fill materials, and (2) effective hydraulic communication between the pit and the surrounding area. Further, the PMP RI Report (Arcadis, 2012) states:

> In a 2005 affidavit, Russ Kerestes, a former vice president of the O'Connor Trucking and Haulage Company, stated that the mine shaft at the base of the PMP was sealed prior to beginning waste disposal in 1967. Insufficient information is available to confirm the method used to seal the shaft or determine whether the seal is watertight.

In general, the above information indicates that if dewatering of the pond or dewatering of the PMP pit were used to stabilize the excavation subgrade for placement of the clean fill for final grading, there is a reasonable expectation that an interconnection would exist with the mine structures and a substantial amount of water management may be necessary. Consequently, consistent with the SOW, and recognizing that the general excavation plan for the areas surrounding the PMP pit as part of the PMP Area remedy is to the top of the water table, an alternative approach to water management is recommended, specifically the placement of certified clean angular, crushed stone.

Since there is standing water within the PMP pond at depths of between four and six feet deep depending on location and the time of year, it is anticipated that excavation of fill material to the top of the water table in areas surrounding the pond will lower the standing water level in the pond. This will facilitate placement of angular crushed stone directly onto the wet subgrade with minimal displacement of the ponded water beyond the limits of attainment for the PMP remedy. The result would be a suitable working surface upon which equipment can then distribute, grade, and compact the grading fill that will be used below the Engineered Cap. Typically, 12-24 inches of crushed stone is sufficient to stabilize the area for construction of the remedy.

If the excavation to the water table exposes granular materials (*e.g.*., mine tailings), the subgrade would be expected to be stable for placement of fill above, just as it would be for the crushed stone to be placed as an effective work platform. However, if finer grained materials are present or voids are evident, then geotextile will be placed at the excavation interface prior to the placement of the crushed stone. A detail of subgrade stabilization is provided on Design Drawing D-4, and the area to be stabilized for the PMP pond is shown on Design Drawing PMP-3.

Excavations within the CMP Area and OCDA are not anticipated to intersect the water table, and dewatering is not expected for the excavations in these areas. However, the pull-back of waste within the OCDA may result in excavation at or near the top of the water table. As such, certified clean angular crushed stone may also be used in these areas to provide a stable base for final

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grading and restoration of the excavated areas, to the extent the crushed stone would not interfere with the areas of planned wetland restoration.

As noted above, there is potentially a component of excavation below the water table in the PMP Area for removal of paint waste or drums, if encountered. While excavation below the water table can be accomplished without dewatering, particularly on a localized basis as would be anticipated for removal of paint waste or drums, if encountered, such removal may have practicable limitations without localized dewatering, and there is not an alternative such as placement of crushed stone.

In anticipation of the need for limited, localized dewatering for work below the water table within the PMP Area, the basis of design for such dewatering is premised on the permit-by-rule provisions within NJAC 7:14A-7.5. Specifically, NJAC 7:14A-7.5(b)3.vi authorizes discharge by permit by-rule for "Discharges to groundwater, not to exceed 180 calendar days, related to dewatering at a contaminated site…." Dewatering for the potential localized excavations within the PMP Area would meet these requirements, and those at NJAC 7:14A-7.5(b)3.vii and NJAC 7:26E-5.6(b) for a proposal supporting the permit-by-rule, for the following reasons:

- For localized excavations, the duration of pumping would be limited to a few days to a week, and would be well below the 180-day threshold;
- The dewatering and discharge, if needed, would be confined within the larger PMP Area excavation, and recharge would be to groundwater in a controlled manner (*e.g.*., localized stone-lined recharge pit) so that surface water runoff would not occur;
- Groundwater quality and flow direction within the PMP Area is well characterized, and has been the subject of multiple monitoring events providing an adequate database for development of a proposal for a permit-by-rule;
- Groundwater quality data within the PMP pit, for instance as documented from sampling of well SC-1 (the angled boring directly within the PMP fill and waste), is consistent, if not lower in constituent concentration, with groundwater quality downgradient of the PMP pit. A localized discharge of dewatering waters within the main excavation area would not, therefore, be expected to adversely affect groundwater quality downgradient of the PMP pit;
- Monitoring wells currently exist downgradient of the PMP fill excavation area that are available for groundwater quality monitoring during construction, if needed (see further discussion below);
- The limits of the work associated with localized dewatering and discharge are within a broader area of groundwater quality with certain parameters (*e.g.*., benzene, 1,4-dioxane, chloroethane) above NJDEP Groundwater Quality Standards (GWQS) and localized discharge on a limited basis would not be expected to adversely affect existing conditions;
- Because excavation below the water table, if performed, would involve movement of drums or paint waste, as an additional precaution, the dewatering waters will be treated through a temporary treatment system consisting of filters and GAC prior to discharge to groundwater. Trailer mounted filter and GAC units currently exist in the PMP Area, and the

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Technical Specifications provide for this equipment to be made available to the RAC for use during any such dewatering, should dewatering be necessary. A groundwater treatment flow diagram for the temporary treatment system is shown on Design Drawing D-3.

If paint waste and/or drums are encountered at the water table, and excavation continues below the water table, the excavation is expected to be localized. This is consistent with the ROD and SOW as the Selected Remedy for the PMP Area does not contemplate large-scale excavation below the water table, but accounts for the potential to remove paint waste or drums, if encountered and if practicable.

Dewatering would be accomplished by localized pumping by the RAC, within the excavation. A dewatering pump would be placed in a sump area of the excavation and would be extended as the excavation proceeds.

Dewatering at a scale described above (*i.e.*., 50' x 50' x 10') would involve the handling of approximately 1,000 cubic yards of material. Typical production rates for this type of excavation would be on the order of a couple of hundred cubic yards per day. Therefore, the duration of pumping would be approximately a week. Pumping would be expected to be intermittent within the larger excavation area of the PMP Area during this time but would typically have a duration of days up to one week for a pumping cycle.

The discharge will also be within the footprint of the excavation area. The discharge would be to the vadose zone and would percolate vertically downward to the groundwater table. Using the same hydraulic conductivity as noted above, and assuming a minimal head buildup of one foot in a recharge pit, the approximate size of a recharge area would be an estimated 60 feet by 60 feet.

7.5 Site Grading and Capping

Site grading will proceed in accordance with the Design Drawings and Technical Specifications (Appendix I). Grading will be comprised of placement of base grading material, cap subsoil, and cap topsoil. In addition, geotextile will be used for segregating of the fills placed for remedy construction from the underlying former mine and waste materials to control the potential for piping of fines and associated settlement. The basis of design for each of these site grading elements is discussed further below.

7.5.1 Base Grading

Base grading materials will include either reused material from excavations or imported materials. Imported materials may include either certified clean fill or alternative grading materials from off site. Certified clean fill will comply with the provisions of the NJDEP Fill Material Guidance for SRP Sites for clean fill. The specifications for alternative grading materials from off-site will require compliance with the "Like-on-Like" provisions of the NJDEP Fill Material Guidance for SRP Sites, with backup analytical documentation. The latter would only be used above the water table and not for subgrade backfill of any kind.

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Material reuse will be managed as previously described and may include non-hazardous soil/fill from the PMP fill excavation conducted as part of the PMP Area remedy and/or non-hazardous mine tailings from the OCDA remedy implementation.

Subgrade fill will be compacted with conventional earthmoving equipment, except as specified in the geotechnical design basis section relating to the structures that will be built for the Borough of Ringwood's Recycling Center. Further details of fill placement and compaction are provided in the Technical Specifications provided for reference in Appendix I.

Grades will be set at a minimum of five percent slope as shown on the grading plans for each of the land ACs (see Design Drawings CMP-3, OCDA-4 and PMP-4), except within the final top cap surface above which the Borough of Ringwood Recycling Center will be constructed. This five percent minimum slope on non-structural (*i.e.*, vegetated soil) surfaces accommodates the potential for settlement associated with waste that may remain in each of the land ACs while still maintaining positive drainage. Within the Recycling Center area where operations are a consideration, slope areas at paved and concrete surfaces will be less than five percent. These areas, however, contain structural features and stabilized subgrade that help maintain positive drainage and will also be subject to the routine maintenance associated with the recycling center.

CMP Area

Grading within the CMP Area is designed to maintain overland stormwater flow patterns consistent with current flow patterns. There are no defined channels or other stormwater control features included in the Remedial Design for the CMP Area.

OCDA

Grading within the OCDA is designed to support the new Borough Recycling Center design. The Recycling Center top surface elevation, however, may be modified to suit the final RA grading plan for the OCDA which is based on considerations of wetland restoration as well as cut/fill balance and material reuse (*i.e.*., removal of unsuitable bulky objects if found, for example, would reduce the volume of fill) for the waste consolidation. Any modifications to the Recycling Center final top elevation, however, will not affect its overall size or configuration, only the relative final elevation of the Recycling Center with respect to the areas surrounding it as previously discussed with the agencies.

Drainage from the Recycling Center will be predominantly conveyed to the extended detention basin, with a portion of stormwater flow from the previous site areas flowing overland to Park Brook. Other grading considerations, as shown on Design Drawings OCDA-3 and OCDA-4, include:

- Where structural features, such as retaining walls, pavement, and concrete pads, will be constructed for the Recycling Center after the waste consolidation and Engineered Cap construction is complete, the clean cover soils for the cap will be thickened in such areas so future excavation for this construction will not disturb underlying capped materials;
- Where utilities will be constructed for the Recycling Center after the waste consolidation and Engineered Cap construction is complete, corridors of clean soil will be included in the

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grading plan to accommodate future excavation within clean soils, and not underlying capped materials;

- Soil foundation improvements will be completed as a part of the waste consolidation and Engineered Cap construction to accommodate the structures required for the Recycling Center (*e.g.*, building, retaining walls); and
- Grades have been designed to allow for future construction of Recycling Center features, such as the retaining walls, by importing clean fill for backfill and not disturbing previously capped materials. The clean fill can also be taken from the thickened zones of final cover which will be excavated for various structural components of the Recycling Center.

PMP Area

The ROD for the PMP Area specifies that grades must be a minimum of two feet above the average surface water elevation of the existing pond, and a minimum of three feet above the perimeter elevations in the PMP Area. Grading within the PMP Area has been designed to meet these elevation constraints and maintain a minimum of a five percent slope, as shown on Design Drawing PMP-4. Overall grading within the PMP Area is designed to generally follow the contours of the surrounding land, with slopes trending from northwest to southeast. This will convey the majority of the stormwater runoff toward the wetlands adjacent to Park Brook. A smaller portion of the area is designed to slope to the northwest, and a wide, shallow grade will be established at the base of this sloped area to allow stormwater to flow overland, again toward the Park Brook, in a fashion similar to natural conditions.

During site preparation, either as surface vegetation is removed or excavation is performed, the ACs will be prepared to receive a geotextile separation layer below the subgrade grading fill and existing fill, waste, and mine tailings. The geotextile will provide a separation layer to minimize the potential for piping of fines into underlying materials and the associated potential for settlement. Per the Technical Specifications (Appendix I), the geotextile will be non-woven, and specifications provide the material properties including an apparent opening size (AOS) of US standard sieve size 70 or less for retention of fines.

7.5.2 Cap Grading and Construction

Following placement of the subgrade fill, the final Engineered Cap will be placed. Per the FRDR and Technical Specifications, the Engineered Cap materials will consist of imported clean soil fill per the previously referenced provisions of the NJDEP Fill Material Guidance for SRP Sites for clean fill, and will be graded to maintain the minimum five percent slope.

The Engineered Cap for each of the three land ACs will consist of geotextile and two feet of soil, as follows:

- A non-woven geotextile placed beneath the cap subsoil as a demarcation layer (see Technical Specifications, Appendix I);
- Eighteen (18) inches of subsoil which should be a loam texture (*i.e.*., mixture of sands, silts and clays, with less than 35 percent coarse rock fragments and less than 35% passing the 200 standard US sieve). The subsoil need not have a minimum organic content but would

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be suitable to provide moisture retention for vegetation (see Technical Specifications, Appendix I);

- Six inches of topsoil per the specifications in The Standards for Soil Erosion and Sediment Control in New Jersey;
- Final cover will be stabilized with vegetation. Where final cover is in an upland area and not part of the restoration for riparian zone or wetlands, it will be vegetated with a seed mix consistent with the permanent vegetation requirements of The Standards for Soil Erosion and Sediment Control in New Jersey.

PMP Area

The ROD for the PMP Area requires that it be restored with indigenous vegetation consistent with the fact that it is on State parklands. The majority of the area that will be disturbed for the PMP Area remediation is also within the riparian zone of Park Brook. As described in the application package for the NJDEP Division of Land Use Regulation, Freshwater Wetlands and Flood Hazard Area permit equivalents, the restoration plan for the PMP Area will be consistent with previous recommendations made by the NJDEP during consultations provided for prior work performed at the Site.

Conceptually, restoration will not only restore the wooded riparian zone and meet the intent of the ROD but create a more diverse ecological community structure. The proposed restoration plan incorporates general topography and hydrologic features (e.g.., isolated depressions) resulting from remedial activities into a restoration design for a diverse combination of wetland (which overlaps with the riparian zone) and upland communities (e.g.., deep/shallow emergent, wet meadow, wetland shrub/ scrub, forested wetland, upland forest).

The proposed restoration plan will use excavated areas to construct deep and shallow emergent plant communities that will provide habitat for vernal pool dependent species. Following final grading activities, which includes placement of top-soil and additional habitat structure (e.g., logs and boulders), planting and seeding activities will occur.

7.6 Materials Management

The RAC will perform the segregation of waste encountered during excavation and cut/fill operations in accordance with the Technical Specifications provided in Appendix I and the Transportation and Disposal Plan provided in Appendix H. Waste may consist of bulky debris, tires, cardboard, plastic, paint waste, drums, and potentially other deleterious objects. Waste streams will be staged in separate stockpiles on waste containment pads for further decontamination (metal and boulders) if necessary, and/or sampling and analysis for waste characterization in preparation for disposal. Expended PPE generated during the project will be properly containerized and ultimately consolidated to be disposed of with the proper waste stream.

The RAC will coordinate disposal with the Ford Motor Company approved disposal facilities identified in the Technical Specifications provided in Appendix I and as outlined in the Transportation and Disposal Plan, Samples will be taken of the excavated material at the required frequency

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defined by the disposal facility and analyzed for all required parameters by a third-party New Jersey-certified laboratory. Once approved profiles and acceptance criteria has been secured, the RAC will schedule for transportation and disposal of the waste streams. Disposal manifests will be provided with all information filled out for signature by the generator.

General trash and debris generated during the course of the OU2 RA implementation will be placed in metal dumpsters and disposed of at a general municipal trash disposal facility.

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8.0 Monitoring Activities

The OU2 RA monitoring requirements are outlined in the Vibration Monitoring Plan and CAMP, provided in Appendices C and D of this RAWP, respectively. These plans describe monitoring locations, frequency, types, and contingency and mitigation plans, as well as reporting requirements and data necessary to achieve project closeout.

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9.0 Site Management

This section describes how the Site will be managed during the RA. The roles and responsibilities of key project personnel are identified in Section 4.1 of this RAWP.

Intrusive activities will be performed five (5) days per week, from Monday to Friday. The workday will commence no earlier than 7:00 am and run until no later than 5:30 pm. In special circumstances, the Construction Manager may authorize the RAC to perform an activity outside of the regularly scheduled times. Regular union holidays will be non-working days, including: Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving, Christmas, and New Year's Day. The RAC will coordinate activities to minimize the impact of non-working holidays.

9.1 Project Coordination and Communication

The key project management personnel and their responsibilities for managing the Site activities include the following:

- USEPA

  The USEPA is responsible for regulatory oversight of the RA construction activities and the public participation program. The Remedial Project Manager (RPM) for the USEPA is Joseph A. Gowers.

- NJDEP

  The NJDEP is working in conjunction with the USEPA to provide regulatory oversight of the RA construction activities. The NJDEP Project Manager for OU2 is Ken Petrone.

- *de maximis, inc.*

  de maximis, inc. is the Project Coordinator and the Construction Manager for the Owner. They are responsible for the coordination and construction management of the RA. de maximis, inc. will act as the Owner's Representative, coordinate construction activities, and facilitate communication on behalf of the Owner between the RAC and regulatory agencies.

- RECON

  RECON is the RAC and will act as the Supervising Contractor for implementation of the OU2 RA work scope outlined herein. They are responsible for the coordination of subcontractors as well as their own work associated with the RA.

9.1.1 Lines of Communication

Figure 4-1 indicates primary lines of communication for project coordination. The Project Coordinator will be responsible for the communication of data and information (written or verbal) to the regulatory agencies. The primary means of communication will be via email, which provides documentation and a date stamp.

The Construction Manager will be the primary person to communicate with the on-site USEPA representative. All requests for information by the on-site USEPA representative will be made through the Construction Manager.

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Emergency communications involving injuries, police matters, or fire can be made by anyone on the Site to the Borough of Ringwood emergency services (911). Following communication with Borough of Ringwood emergency services, the party is required to immediately contact the Construction Manager.

Emergency communications involving affected property owners, theft, or damage to Site equipment will be made by the Construction Manager.

9.1.2 RA Contractor Management

The day-to-day management of the RA will be performed by the Construction Manager. Insurance certificates and contracts for all contractors and subcontractors are in place. Insurance certificates will be renewed on an annual basis and provided to the Owner's Representative.

The RAC will maintain an open line of communication with the Project Coordinator, the Construction Manager, the Principal Engineer, the Construction Quality Assurance Manager, and the IQAT Official during the course of the OU2 RA implementation to discuss technical issues and/or obtain feedback on and approvals of alternative approaches that may arise during the RA. Some of the issues that may be discussed are:

- Initiation, notification, and/or approval of real-time modifications;
- Notification of delays or changes to field work;
- Recommendations to stop work and initiate corrective action; and
- Reporting of issues related to analytical data quality, including, but not limited to, the ability to meet reporting limits.

9.2 Remedial Action Project Documentation

The Project Coordinator will generate a monthly progress reports for submission to the USEPA per Section 4 of the SOW (Appendix B of the CD.) The monthly progress report will cover all activities that took place during the prior reporting period, including:

- The actions that have been taken toward achieving compliance with the CD;
- A summary of all results of sampling, tests, and all other data received or generated, if not already include in another report;
- A description of all deliverables that submitted to the USEPA;
- A description of all activities related to the RA construction that are scheduled for the next six weeks;
- An updated Project Schedule for OU2, together with information regarding percentage of completion, delays encountered or anticipated that may affect the future schedule for implementation of the work, and a description of the efforts made to mitigate those delays or anticipated delays;
- A description of any proposed or USEPA-approved modifications to the work plans or schedules; and

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- A description of all activities undertaken in support of the Community Involvement Plan (CIP) during the reporting period and those to be undertaken in the next six weeks.

9.3 Coordination of Permit and Permit Equivalency Requirements

The permits and permit equivalencies required for the RA are discussed in Section 5.2. The RAC Permit Manager will be responsible for identification of needed permits, preparation of permit and permit equivalency applications, submittals to the agencies, follow up with the agencies, and for providing any required agency notification. The Construction Manager will be copied on all agency communications. The Construction Manager will perform a QC check to determine if the submittals have fulfilled the permit reporting requirements. The Permit Manager will maintain and provide to the Construction Manager a permit submittals checklist.

9.4 Project Meetings

Project meetings will be held throughout the implementation of the RA to review the progress of activities, planning of new activities, review of safety and health issues, and any changes to the schedule. The location and form of communication for these meetings may be modified to maintain the requirements outlined in the Site-Specific HASP (provided in Appendix B); Table 9-1 provides a summary of the scheduled meetings for the RA.

Table 9-1: RA Meeting Summary

Remedial Action Meeting	
Site Mobilization / Pre-Construction Meeting	Prior to the commencement of construction related activities at the Site.
Progress Meetings	Weekly progress meetings, includes Owner's Representatives and agencies as applicable.
Daily Construction/Safety Meetings	Daily work related meetings with field crews, includes safety breifings
Pre-Installation Meetings	Prior to installation of major construction items

The RAC will make the protection of the project site, employees, and the surrounding community a top priority throughout the duration of the project, including taking into account the recent COVID-19 health hazards. The following Best Management Practices (BMPs) have been developed by the RAC using guidance from the *CDC Guidance on Preparing Workplaces for COVID-19* and will be implemented throughout the project to achieve and maintain zero exposures:

Safety and Pre-Job Meetings

- Limiting tailgate safety meetings to a maximum of 10 individuals per group, unless space is available to maintain social distancing greater than six feet from one other.
- Splitting up business partners and crew members to limit attendance during meetings.
- Staggering safety meetings and locations to maximize social distancing.

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- In favorable weather conditions, discontinuing indoor safety meetings in the crew trailers or buildings performing meetings for groups greater than 10 individuals, and holding the meeting at an outdoor location.
- All meetings will include a daily topic related to the COVID-19 virus as well as reminding everyone of Stop Work Authority as part of ongoing training.
- Safety personnel to sign every person in to prevent multiple people from touching the same paper. This includes the RAC's daily sign in sheet, Safety Meeting Agenda, and Health Questionnaire.
- Supervisors are to designate one employee to complete RECON's daily task specific Job Safety Analysis Program (JSAP). This employee reviews the JSAP with the entire work crew and signs each employee's name to the form.

Facility Sanitation

- All office locations shall be cleaned twice per day.
- The RAC will clean all "high-touch" surfaces every day.
- The RAC will provide hand sanitizer, soap, and disinfectants for daily use.
- The RAC will place signs or other postings throughout the work areas to create good habits and reminders to avoid touching faces and covering coughs and sneezes.

PPE Requirements

- Utilize nitrile gloves for use in common areas to prevent cross-contamination.
- Utilize cloth masks in areas of potential social distancing accidental impact areas and prolonged contact scenarios.

Personnel Practices

- Crew members will disinfect their radios and use their own pens daily.
- Stop handshaking by using other noncontact methods or greetings.
- Discourage food sharing.
- Prior to opening an ice chest, all employees are required to use hand sanitizer.

Equipment Practices

- During equipment transitions at the end of the shift as well as prior to use, the current operator will sanitize equipment using a spray bottle with a 1:32 bleach to water solution, prior to departure and new operator will sanitize equipment prior to use.

Site Staff, Security, and Visitors Site Entry

- Advance Project Manager approval is required to allow a site visitor to enter any of the three land AC work areas.
- Routine vendors such as fuel deliveries will be established on a regular schedule, following all BMPs spelled out in the RAC's HASP plan prior to entering the work areas.
- Staff will avoid unnecessary travel. This includes off-site management to avoid travel to the project site if not necessary.

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- When possible, adjust or postpone large meetings or gatherings.
- All site visitors (subcontractor, vendor, or visitor) will be required to complete a site qualification health letter and associated questionnaire to evaluate potential exposure risks with COVID-19 prior to site entry. a health questionnaire will also be completed daily by everyone on-site.
- The RAC has instituted a medical digital infrared temporal thermometer measurement program. All project personnel and visitors will record a pre-shift and post-shift body temperature measurement. A temperature of 100.4 °F will be utilized as the threshold below which the individual is deemed fit for work at the Site. Daily temperatures will be collected and recorded by the Site Safety Officer.

Social Distancing and Fitness for Duty

- Crew members will wear cloth masks and maintain a social distance from one another of at least six feet during all onsite RA activities.
- Distribution of site personnel specific radios for onsite communication.
- Assign operators to the same equipment as much as possible to avoid cross-contamination.
- Advise staff to stop eating lunch together and to change clothes at home.
- Staff will be directed to stay home if they are ill, have anyone in their residence that is ill, or feel the beginning symptoms of an illness.
- Employees are discouraged from carpooling to the job site. Each employee is to drive their personal vehicle to a designated parking location on-site.

9.4.1 Site Mobilization/Pre-Construction Meeting

The site mobilization/pre-construction meeting will include the Owner's Representative, RAC, and major subcontractors. At a minimum, the meeting agenda will include the following items:

- Designation of personnel representing parties in the RA;
- Procedures and processing of field decisions, submittals, substitutions, applications for payment, proposal requests, Change Orders, and RA closeout procedures;
- Use of premises by RAC;
- Owner's requirements;
- Health and safety, including the CAMP program and discussion of any local resident concerns;
- Work restrictions;
- Construction facilities and controls provided by Owner;
- Temporary utilities;
- Site layout;
- Security and housekeeping procedures;
- Schedules;
- Progress meeting schedule;

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- Procedures for testing;
- QA/QC;
- Procedures for maintaining record documents;
- Requirements for inspections and acceptance of work; and
- Daily/weekly RAC reporting requirements, including photo documentation.

Regulatory agencies will be notified of the site mobilization/pre-construction meeting and may participate.

The Project Coordinator will record minutes and distribute copies within two (2) days after meeting to participants.

9.4.2 Progress Meetings

Weekly progress meetings will be held at the RAC Site trailer. The Construction Manager will coordinate the meeting. The meetings will include the following items at a minimum:

- Review minutes of previous meetings;
- Review of work progress;
- Field observations, problems, and decisions;
- Any resident/community concerns and corrective action(s);
- Identification of problems impeding planned progress;
- Review of monitoring activities and corrective actions, if any;
- Health and safety;
- Review of submittal schedule and status of submittals;
- Review of material or equipment delivery schedules;
- Maintenance of Project Schedule including 3-week look ahead (biweekly distribution at minimum);
- Corrective measures to regain projected schedules;
- Planned progress during succeeding work period;
- Coordination of projected progress;
- Maintenance of quality and work standards;
- Effect of proposed changes on Progress Schedule and coordination; and
- Other business relating to RA work.

The Project Coordinator will record minutes and distribute copies within two (2) days after meeting to participants. The weekly agendas will become attached as an appendix to the Remedial Action Report.

9.4.3 Daily Construction/Safety Meetings

The RAC will hold daily Construction/Safety meetings at the RAC Site trailer. The meeting will be held at the start of each morning before commencing the day's activities. The attendees will include

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the Construction Manager, the Site Manager, the QC Manager/PE, the IQAT Official, and all field staff in supervisor roles. The meetings will include the following items as necessary:

- The day's work activities and objectives;
- Supplies or equipment needs;
- Safety concerns associated with work or present at the Site;
- Review of daily monitoring results and corrective actions, if any;
- Any resident/community concerns and corrective action(s);
- Potential problems/issues, which may impede the planned activities;
- QC activities;
- Security issues; and
- Site housekeeping.

All meeting attendees will sign the Daily Meeting sign-in sheet. A copy of the sign-in sheet will be provided to the Construction Manager following the meeting.

9.4.4 Pre-Installation Meetings

The RAC will hold pre-installation meetings as required in the Technical Specifications or as otherwise necessary for major construction phases. The parties directly affecting, or affected by, the work of the specific section will be required to attend. At a minimum, the meetings will include the following items:

- Review construction/installation procedures;
- Review coordination with related work; and
- Discuss/address any issues related to local residents and/or the community.

The Project Coordinator will record minutes and distribute copies to participants within two (2) days after the meeting.

9.5 Site Security

The following Site security measures will be implemented throughout the OU2 RA:

- Perimeter fencing and gates;
- Site sign-in;
- Security lighting; and
- Motion sensitive cameras.

As further described in Section 6.2, the Site perimeter fencing and gates will be inspected and maintained throughout the project. The access gates will be generally closed during the day and locked at night. Common keys will be maintained with distribution to appropriate Site personnel and local agency emergency response personnel to allow access during off hours in case of an emergency.

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Lighting will be provided at strategic locations (*e.g.*, trailer entrances, equipment storage areas, and heavy equipment storage areas) in case of an emergency during night periods. The lights will be shielded and positioned to minimize any light pollution to nearby residences, where applicable. The lights may be motion activated or dusk to dawn, dependent upon target area and residential locations.

Cameras will be placed at select concealed locations focusing on areas of equipment and material storage. The cameras will be long lasting battery powered, capable of night vision and be activated by motion. The cameras will be inspected for any recorded data daily and information will be immediately communicated to the Site Manager and appropriate law enforcement agencies if deemed appropriate.

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10.0 Quality Assurance and Quality Control Program

10.1 Construction Quality Plan

Appendix A contains the CQA/QCP. The purpose of the CQA/QCP is twofold:

1. To establish the QC organization, describe procedures and plans to maintain an effective QC system in compliance with the FRDR and regulatory guidelines, and to produce a quality end product in compliance with the project; and
2. To describe the QA functions of the independent construction QA personnel (independent of the RAC that will be used to verify that the work is proceeding in accordance with relevant requirements and regulations.

The means and methods of construction QC are provided in the CQA/QCP. The CQA/QCP includes components addressing submittal control, deficiency tracking and conflict resolution procedures. In addition, QA and QC personnel are defined.

As described in the CQA/QCP, the independent construction QA personnel will coordinate routinely with the RAC's QC personnel, will perform independent inspections, will review test results, and will determine if additional testing is necessary. Results of CQA/CQC testing will be provided with weekly construction progress reports and will also be discussed as appropriate in construction progress meetings.

Forms provided in the CQA/QCP include: Daily Reports, Inspection Forms, Initial Inspection Checklist, Deficiency Logs, Transmittal Forms, and Transportation Logs.

10.2 Analytical Quality Plan

Appendix E contains the project-specific QAPP. The QAPP covers sampling, analysis, and data validation activities anticipated to be part of the OU2 RA implementation. All sampling performed will follow the procedures and frequencies in the QAPP. Additional information on sampling procedures are outlined in the Field Sampling Plan provided in Appendix F of this RAWP

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11.0 Remedial Action Health and Safety Program

The Site-Specific HASP, provided in Appendix B, identifies anticipated hazards and prescribes control measures to be implemented during the OU2 RA. The Site-Specific HASP applies to all Site activities by all parties. The procedures presented in the Site-Specific HASP are based on the best available information at the time of the plan's preparation and are intended only for the activities described in the HASP.

Applicability of the Site-Specific HASP extends to every individual on site, including visitors and RAC subcontractors. The plan must be reviewed by all personnel prior to entering an Exclusion Zone or Decontamination Zone. All personnel on site shall be informed of the Site emergency response procedures and any potential fire, explosion, health, or safety hazards of the project tasks/operations. The Site-Specific HASP summarizes those hazards and defines hazard control measures planned for the Site. Each individual working on the Site will be briefed on the contents of the Site-Specific HASP prior to visiting or working on the Site. A copy of the Site-Specific HASP will always be maintained in the RECON trailer at the project Site and available to any individual who wishes to review it at any time.

All visitors entering a Decontamination Zone or Exclusion Zone at the Site will be required to read and verify compliance with the provisions of the Site-Specific HASP. In addition, visitors will be expected to comply with relevant OSHA requirements. Visitors will be expected to provide their own PPE. If a visitor does not adhere to any provision of the Site-Specific HASP, he/she will be requested to comply or leave the work area.

The requirements and protocols cited in the Site-Specific HASP were developed in consideration of current safety standards as defined by USEPA, OSHA, and National Institute for Occupational Safety and Health (NIOSH) health effects and standards for known COPCs, and procedures designed to account for the potential exposure to unknown substances. The Site-Specific HASP will be updated during the project if additional hazards are encountered and/or if the scope of work changes.

11.1 Set Up of Site WORK Zones

As discussed further in the Site-Specific HASP provided in Appendix B, the following three zones will be clearly demarcated within each of the three land ACs:

- **Exclusion Zone** – This is the work zone where potentially impacted materials are located and will be handled.
- **Decontamination Zone** – This is the zone outside of the Exclusion Zone used for equipment and personnel decontamination activities.
- **Support Zone** – This is the zone outside of the Decontamination Zone with no potential for contact with any potentially impacted or contaminated materials.

Signs will be posted and each of the three areas will be delineated with flagging. Any changes to the work zones in any one of the three land ACs will be addressed during the Daily Construction/Safety Meeting. The RAC will be responsible for locating the perimeter of each of the zones and maintenance of the flagging. In accordance with the Paint Waste, Drum and Drum Carcass

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Excavation and Removal Plan, provided in Appendix G, in the event one or more buried drums or paint wastes are encountered during soil excavation in any of the three land ACs, the RAC will designate a separate Exclusion Zone as required for the RA implementation.

11.2 Decontamination Procedures Summary

All on-site personnel performing or supervising work within an Exclusion Zone or Decontamination Zone are required to follow the personal hygiene decontamination procedures as outline in the Site-Specific HASP provided in Appendix B. Personal decontamination consists of the following steps:

- Disposable PPE will be removed and discarded into 55-gallon US Department of Transportation (DOT)-approved drums;
- Water from the washing procedure will be stored in a tank intended for that purpose; and
- Decontaminated PPE will be stored in a secure area of the Support Zone.

Equipment decontamination will consist of the following steps:

- All equipment used in the Exclusion Zone will be assumed to be contaminated;
- All visible soil/waste, etc. will be removed using brushes and scraping to remove the bulk material in the Exclusion Zone;
- If brushing and hand scraping does not remove all contamination, high pressure water spray will be used;
- The decontamination wash water will be collected and stored in appropriate containers for treatment by the Temporary Wastewater Treatment System (WTS) or off-site disposal at a USEPA-approved facility; and
- Personnel engaged in decontamination shall use PPE in accordance with the Site-Specific HASP.

11.3 Final Equipment Decontamination

All equipment used during excavation and handling of contaminated material will be decontaminated prior to leaving the Site or prior to use in a non-contaminated area or another land AC, including, for example, movement of heavy equipment between the CMP Area and the OCDA/PMP Area. In this event, the RAC will use dry decontamination methods, such as brooms, shovels, and wire brushes, and depending on their effectiveness, may employ water and power washing, as/if necessary.

Any water generated by the equipment decontamination activities will be collected and stored in appropriate containers for treatment by the Temporary WTS or off-site disposal at a USEPA-approved facility, as appropriate. The final decontamination of equipment before leaving the Site or for use in non-contaminated areas will be performed in accordance with the procedures identified in Section 11.2 above and overseen by the RAC's Site Safety Officer or his/her designee. Following the decontamination process, all equipment will be visually inspected by the RAC for the presence of gross contamination prior to leaving the Exclusion Zone. If contamination is observed, it will be removed with additional decontamination efforts.

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12.0 Final Site Restoration and Demobilization Activities

The Site will be fully restored following completion of the OU2 RA activities. Site restoration measures for areas inside and outside of the Site perimeter will include, but are not limited to, the following;

- Removal of traffic control signage;
- Removal of any construction related trash and debris;
- Repair or replacement of fence/gate sections, as needed; and,
- Restoration and repaving of the driveway and cul-de-sac in the CMP Area as previously discussed in Section 6.2.1 of this RAWP.

Sweeping of dust and particulates from the Upper Ringwood roadways if/as necessary based on post-RA construction roadway conditions. Following the completion of all Site stabilization and restoration measures, all equipment, trailers, storage boxes, trash collection bins, and RA-related lighting will be removed from the Site.

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13.0 Remedial Action Project Schedule

The major components of the RA activities to be implemented at the Site are depicted in detail on the Project Schedule, which is provided as Figure 13-1 of this RAWP. The schedule is intended to be followed closely to complete the work by the completion date outlined on the schedule. During the implementation of the RA activities, the Project Schedule will be updated by the RAC every two (2) weeks and will be submitted to the Construction Manager and Project Coordinator for use in the monthly progress reports to the USEPA as previously described in Section 9.2.

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Figure 4-1

REMEDIAL FIELD ACTIVITIES TEAM ORGANIZATION

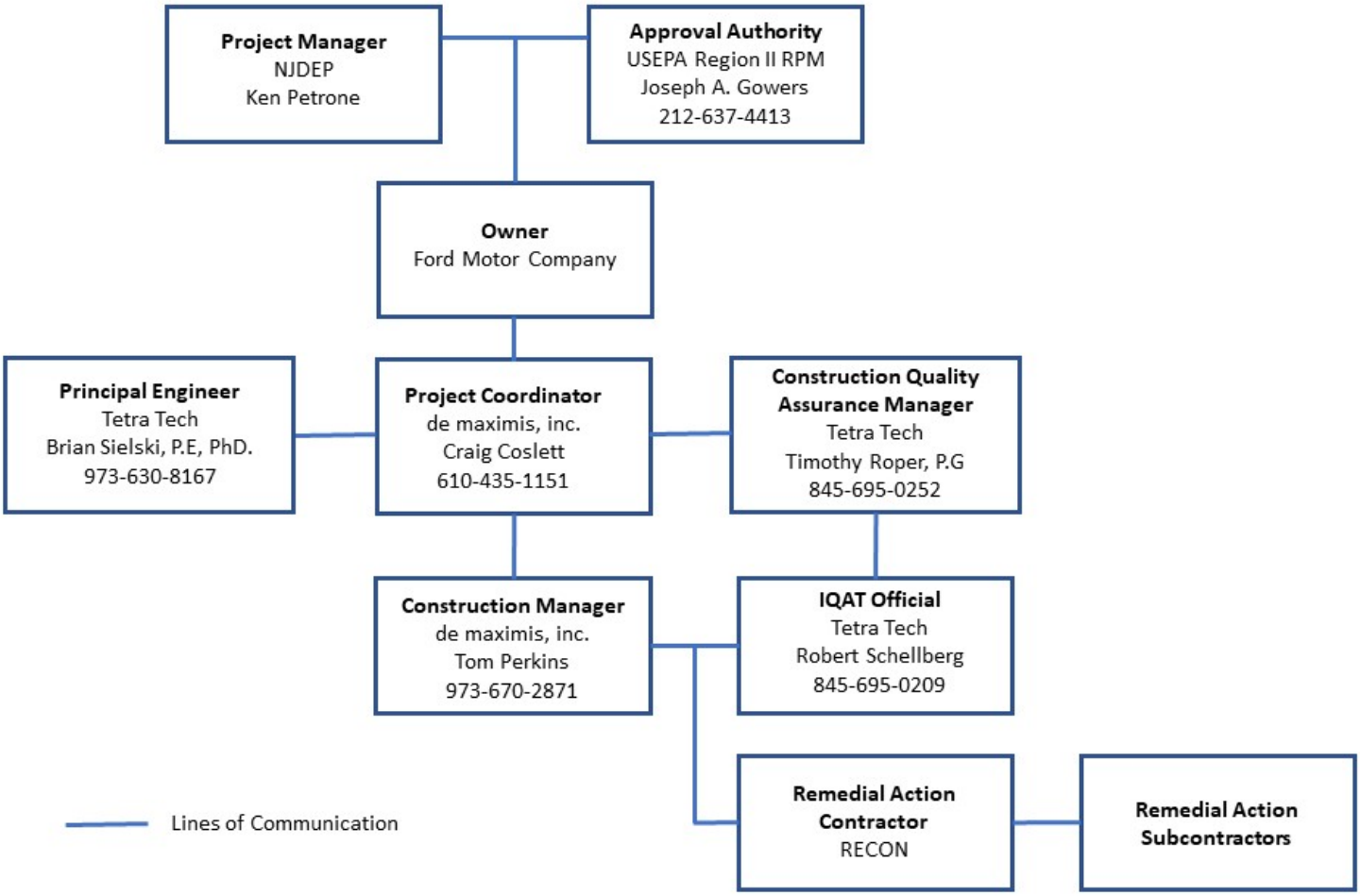


Figure 5-1

SUBMITTAL REGISTER

Ringwood Mines/Landfill Superfund Site
Operable Unit Two Remdial Action Construction
Submittal Reigister

Submittal Number	Description	Date Received	Status	Date Approved
	RAWP			
	HASP			
	Vibration Monitoring Plan			
	Air Monitoring Plan			
	Transportation and Off-Site Disposal Plan			
	NJDEP approved planting schedule			
	Habitat Best Management Practices Manual			
	Sustainable Materials Plan			
	Training Certificates			
	Medical Monitoring Documentation			
	Paint Waste and Drum Excavation Plan			
	Job Safety Analyses			
	Site Access and Layout Plans			
	Utilities Surveys			
	Project Schedule			
	Site Conditions Survey			
	Biodeisel Fuel Plan			
	Payment Schedule (Schedule of Values)			
	Substitution Requests			
	Work alteration Requests			
	Site Clearing & Handling Procedures			
	Soil Materials and Handling			
	Dewatering Shop Drawings/Plan			
	Rip-Rap			
	Excavation Support			
	Asphalt and Aggregate/Mix Design			
	Crushed Stone Paving			
	Fence and Gates			
	Seed, Plant Materials, Material sources			
	Gas Monitoring Wells/Permits			
	Ground Monitoring Wells			
	Pipe			
	Portable Axle Scale			
	Water Treatment Plan			
	Alternative Clean Fill			
	Waste Handling and Disposal Documentation			
	Waste Transporter Documentation			
	Geotextile Mill Certificates			
	Geogrid Certificates			
	Fill Material Source and Properties			
	Crushed Stone Source and Properties			
	Topsoil Source and Properties			
	Stormwater Gravity Pipe			
	Receiving and Inspection Reports			

Ringwood Mines/Landfill Superfund Site
Operable Unit Two Remdial Action Construction
Submittal Reigister

Submittal Number	Description	Date Received	Status	Date Approved
	Product List			
	Construction Cost Projection			
	Shop Drawings			
	Test Reports			
	Certificates			
	Manuafacturers Instructions			
	Manufactureres Field Reports			
	Construction Photographs			
	Disposal Manifests and Bills of Lading			
	Warranties			
	Survey/Record Documents			
	Closeout Submittals			

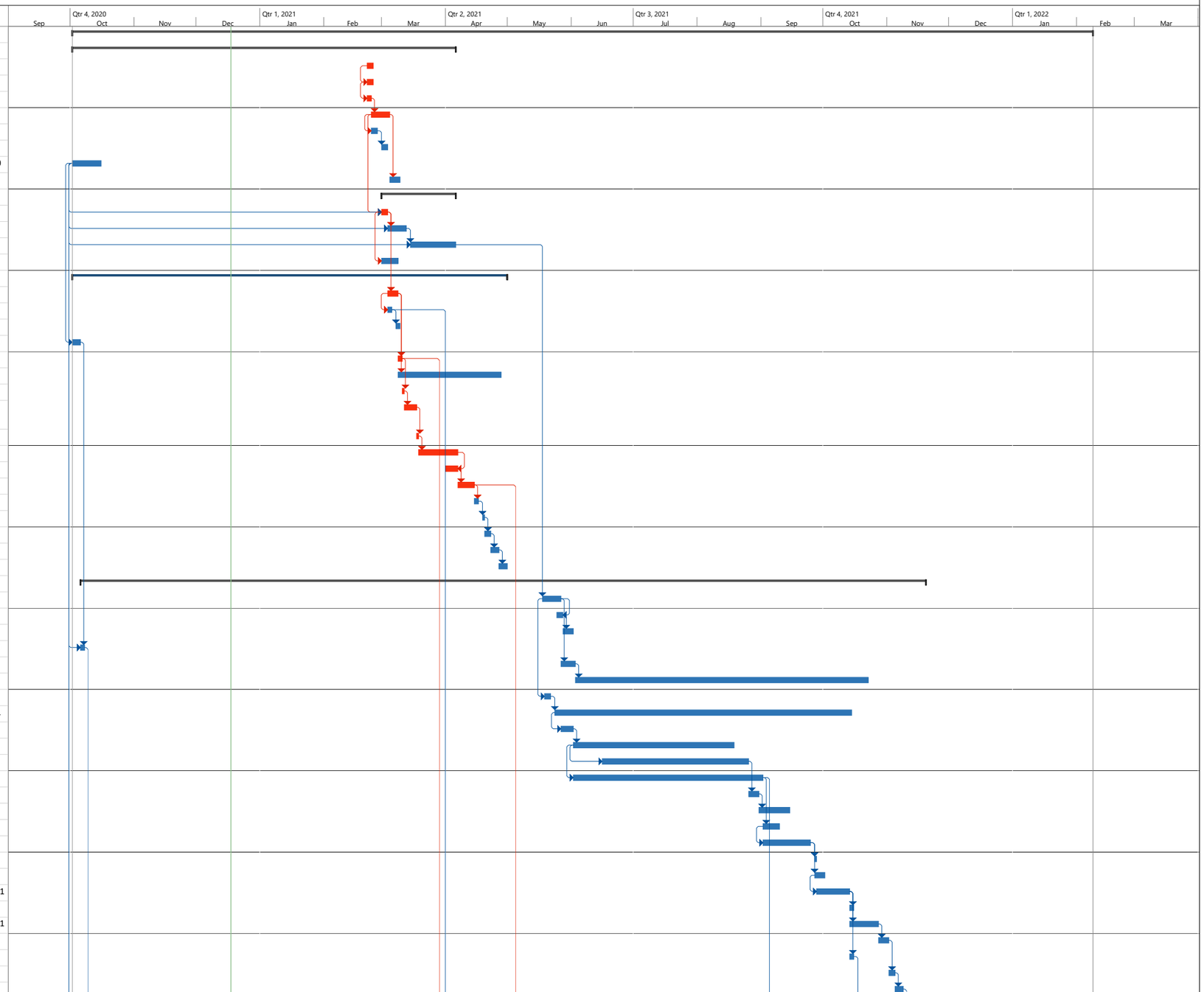
Figure 13-1

PROJECT SCHEDULE

RECON
Remedial Construction Services, L.P.

RINGWOOD MINES/LANDFILL SUPERFUND SITE
OPERABLE UNIT TWO
RINGWOOD NEW JERSEY

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Project Management**	**338 days**	**Fri 10/2/20**	**Tue 2/8/22**
2		**Mobilization / Demobilization**	**124 days**	**Fri 10/2/20**	**Mon 4/5/21**
3		Mobe Equipment	3 days	Mon 2/22/21	Wed 2/24/21
4		Mobe Labor	3 days	Mon 2/22/21	Wed 2/24/21
5		Set Up Tempoprary Facilities	2 days	Mon 2/22/21	Tue 2/23/21
6		Existing Topo Survey	7 days	Wed 2/24/21	Thu 3/4/21
7		Utility Clearance	3 days	Wed 2/24/21	Fri 2/26/21
8		Setup Vibration Monitoring	3 days	Mon 3/1/21	Wed 3/3/21
9		Endangered Species Controls, Inspections, & Management (all areas)	10 days	Fri 10/2/20	Thu 10/15/20
10		Protect Existing Structures	3 days	Fri 3/5/21	Tue 3/9/21
11		**Clearing and Grubbing**	**25 days**	**Mon 3/1/21**	**Mon 4/5/21**
12		Cannon Mine Pit	3 days	Mon 3/1/21	Wed 3/3/21
13		Peters Mine Pit	7 days	Thu 3/4/21	Fri 3/12/21
14		O'Connor Disposal Area	15 days	Mon 3/15/21	Mon 4/5/21
15		Soil Erosion and Sediment Controls	6 days	Mon 3/1/21	Mon 3/8/21
16		**Cannon Mine Pit**	**143 days**	**Fri 10/2/20**	**Fri 4/30/21**
17		Mobilization Earth Moving Equipment	3 days	Thu 3/4/21	Mon 3/8/21
18		Soil Erosion and Sediment Controls	2 days	Thu 3/4/21	Fri 3/5/21
19		Protect existing structures	2 days	Mon 3/8/21	Tue 3/9/21
20		Environmental Protection-Endangered Species Controls	2 days	Fri 10/2/20	Mon 10/5/20
21		Existing Topo Survey	2 days	Tue 3/9/21	Wed 3/10/21
22		Vibration Monitoring	35 days	Tue 3/9/21	Tue 4/27/21
23		Access Road and Laydown Area Improvements	1 day	Thu 3/11/21	Thu 3/11/21
24		Van Dunk Lane Cul-de-Sac Temporary Work and Private Resident Materials Cleanup	4 days	Fri 3/12/21	Wed 3/17/21
25		Waste Pull Back	1 day	Thu 3/18/21	Thu 3/18/21
26		Clean Fill for Grading	12 days	Fri 3/19/21	Tue 4/6/21
27		Geotextile (final cover)	3 days	Thu 4/1/21	Tue 4/6/21
28		18" Final Cover Subsoil	6 days	Wed 4/7/21	Wed 4/14/21
29		6" Final Cover Topsoil, and Disturbed Area Topsoil	2 days	Thu 4/15/21	Fri 4/16/21
30		Final Cover Seeding and Vegetation Maintenance	1 day	Mon 4/19/21	Mon 4/19/21
31		Van Dunk Lane Restoration - Complete	3 days	Tue 4/20/21	Thu 4/22/21
32		Boulders - Access Control and Rattlesnake Habitat	2 days	Fri 4/23/21	Mon 4/26/21
33		Permanent Fence and Gates	4 days	Tue 4/27/21	Fri 4/30/21
34		**Peters Mine Pit**	**282 days**	**Tue 10/6/20**	**Fri 11/19/21**
35		Mobilize Earth Moving Equipment	7 days	Tue 5/18/21	Wed 5/26/21
36		Soil Erosion and Sediment Controls	3 days	Tue 5/25/21	Thu 5/27/21
37		Protect existing structures	2 days	Fri 5/28/21	Tue 6/1/21
38		Environmental Protection-Endangered Species Controls	2 days	Tue 10/6/20	Wed 10/7/20
39		Setup Temporary Water Treatment Facilities	4 days	Thu 5/27/21	Wed 6/2/21
40		Dewatering, Treatment, and Recharge to Groundwater (allocation)8	100 days	Thu 6/3/21	Fri 10/22/21
41		Existing Topo Survey	3 days	Wed 5/19/21	Fri 5/21/21
42		Vibration Monitoring	101 days	Mon 5/24/21	Thu 10/14/21
43		Access Road and Laydown Area Improvements	3 days	Thu 5/27/21	Tue 6/1/21
44		Fill/Waste Excavation	55 days	Wed 6/2/21	Wed 8/18/21
45		Suitable Fill/Waste Reuse Replacement in PMP	50 days	Wed 6/16/21	Wed 8/25/21
46		Excavated Fill/Waste Staging for Testing Including Containment	65 days	Wed 6/2/21	Wed 9/1/21
47		Geotextile (subgrade stabilization allocation)	3 days	Thu 8/26/21	Mon 8/30/21
48		1" Crushed Stone (subgrade stabilization allocation)	10 days	Tue 8/31/21	Tue 9/14/21
49		Detention Basin Construction (complete including outlet)	5 days	Thu 9/2/21	Thu 9/9/21
50		Clean Fill for Grading (on-site from Detention Basin or Imported)	16 days	Thu 9/2/21	Fri 9/24/21
51		Erosion Control Fabric	1 day	Mon 9/27/21	Mon 9/27/21
52		Geotextile (final cover)	5 days	Mon 9/27/21	Fri 10/1/21
53		18" Final Cover Subsoil	12 days	Tue 9/28/21	Wed 10/13/21
54		Drainage Swales	2 days	Thu 10/14/21	Fri 10/15/21
55		6" Final Cover Topsoil, and Disturbed Area Topsoil	10 days	Thu 10/14/21	Wed 10/27/21
56		Final Cover, and Disturbed Area Seeding	3 days	Thu 10/28/21	Mon 11/1/21
57		Access Road and Culvert	2 days	Thu 10/14/21	Fri 10/15/21
58		Riparian Zone Mitigation Areas Final Grading	3 days	Tue 11/2/21	Thu 11/4/21
59		Riparian Zone Mitigation Areas Topsoil	2 days	Fri 11/5/21	Mon 11/8/21

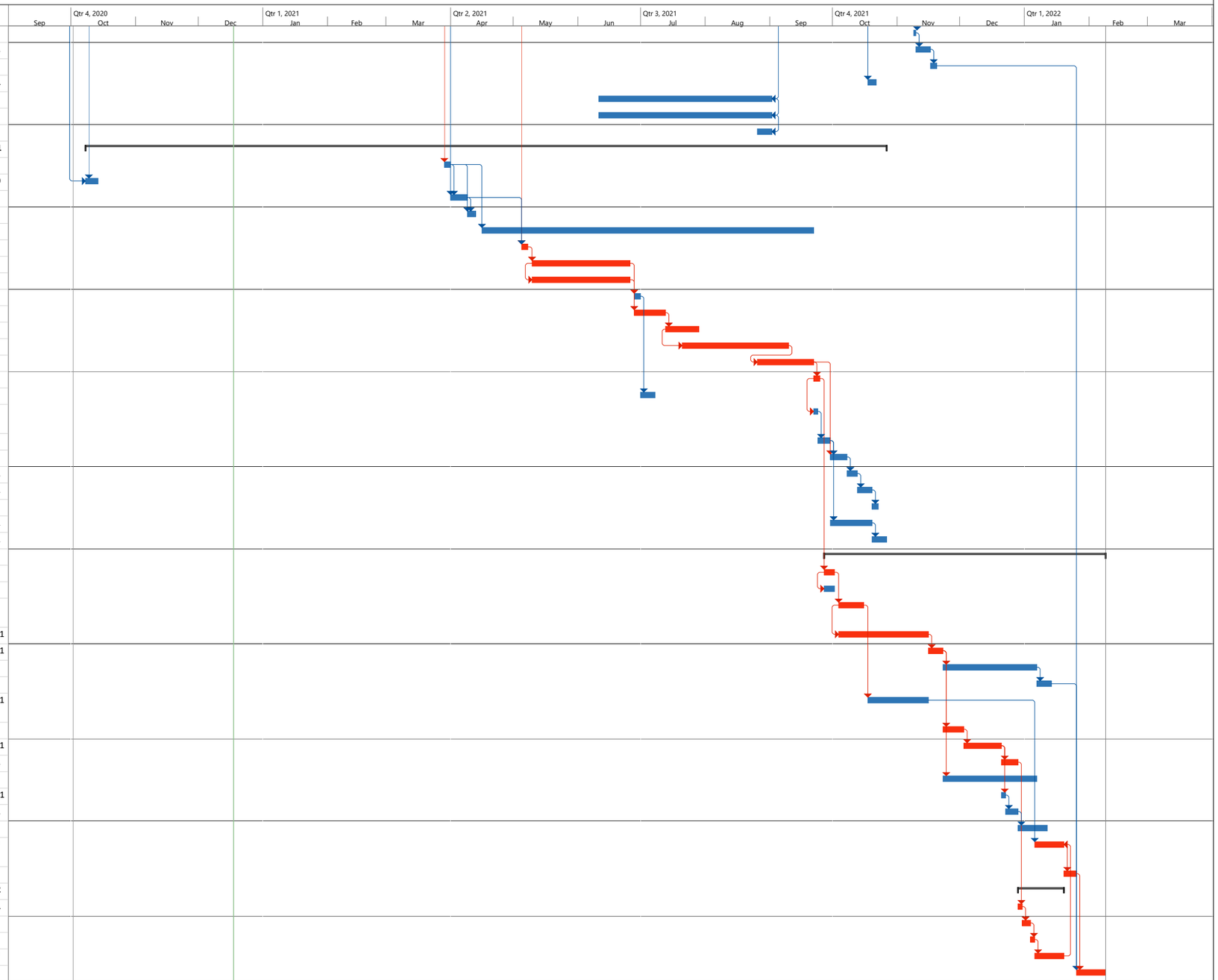


Project: Schedule RAWP
Date: Fri 12/18/20
Revision 11-10-20

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress

RINGWOOD MINES/LANDFILL SUPERFUND SITE
OPERABLE UNIT TWO
RINGWOOD NEW JERSEY

ID	Task Mode	Task Name	Duration	Start	Finish
60		Riparian Zone Mitigation Areas - Seeding	1 day	Tue 11/9/21	Tue 11/9/21
61		Riparian Zone Mitigation Areas Plantings - Shrubs	4 days	Wed 11/10/21	Tue 11/16/21
62		Riparian Zone Mitigation Areas Plantings - Trees	3 days	Wed 11/17/21	Fri 11/19/21
63		Boulders - Access Control and Rattlesnake Habitat	4 days	Mon 10/18/21	Thu 10/21/21
64		Transportation and Disposal of non-Hazardous Waste (allocation)	58 days	Fri 6/11/21	Wed 9/1/21
65		Transportation and Disposal of Hazardous Waste (allocation)	58 days	Fri 6/11/21	Wed 9/1/21
66		Transportation and Disposal of non-Reusable Bulky Waste (allocation)	5 days	Thu 8/26/21	Wed 9/1/21
67		**O' Connor Disposal Area**	**263 days**	**Thu 10/8/20**	**Tue 10/26/21**
68		Layout Survey	3 days	Mon 3/29/21	Wed 3/31/21
69		Environmental Protection-Endangered Species Controls	4 days	Thu 10/8/20	Tue 10/13/20
70		Soil Erosion and Sediment Controls	5 days	Thu 4/1/21	Thu 4/8/21
71		Protect existing structures	2 days	Fri 4/9/21	Mon 4/12/21
72		Vibration Monitoring	110 days	Fri 4/16/21	Tue 9/21/21
73		Access Road and Laydown Area Improvements	3 days	Wed 5/5/21	Fri 5/7/21
74		Fill/Waste Pull Back	34 days	Mon 5/10/21	Fri 6/25/21
75		Fill/Waste Consolidation back on OCDA	34 days	Mon 5/10/21	Fri 6/25/21
76		Sediment Basin (complete) and Temporary Drainage Swale	3 days	Mon 6/28/21	Wed 6/30/21
77		Clean Fill for Grading (allocation)	10 days	Mon 6/28/21	Mon 7/12/21
78		Geotextile (final cover)	12 days	Tue 7/13/21	Wed 7/28/21
79		18" Final Cover Subsoil	36 days	Wed 7/21/21	Thu 9/9/21
80		6" Final Cover Topsoil, and Disturbed Area Topsoil	18 days	Thu 8/26/21	Tue 9/21/21
81		Clean Fill Stone at Recycling Center Areas	3 days	Wed 9/22/21	Fri 9/24/21
82		Wetland Areas Grading, Ponds, Stumps, Boulders	4 days	Thu 7/1/21	Wed 7/7/21
83		Pavement Removal, Transportation, Disposal or Recycle (areas A, B, C, D)	2 days	Wed 9/22/21	Thu 9/23/21
84		Site Grading (area A)	4 days	Fri 9/24/21	Wed 9/29/21
85		6" Topsoil	6 days	Thu 9/30/21	Thu 10/7/21
86		Topsoil/Disturbed Area Seeding and Vegetation Maintenance	3 days	Fri 10/8/21	Tue 10/12/21
87		Riparian Zone Mitigation Areas Plantings - Shrubs	5 days	Wed 10/13/21	Tue 10/19/21
88		Riparian Zone Mitigation Areas Plantings - Trees	3 days	Wed 10/20/21	Fri 10/22/21
89		Existing Monitoring Well Alterations and Protection	14 days	Thu 9/30/21	Tue 10/19/21
90		Gas Monitoring Wells	5 days	Wed 10/20/21	Tue 10/26/21
91		**Ringwood Recycling Center**	**93 days**	**Mon 9/27/21**	**Tue 2/8/22**
92		Utilities - Water and Sewer Complete	5 days	Mon 9/27/21	Fri 10/1/21
93		Utilities - Electric Service all Areas including Lighting	5 days	Mon 9/27/21	Fri 10/1/21
94		Utilities - Stormwater Drainage including Swales, Manholes, Pipe, Headwalls, Riprap Complete	10 days	Mon 10/4/21	Fri 10/15/21
95		Concrete Retaining Walls	30 days	Mon 10/4/21	Mon 11/15/21
96		Reinforce Concrete Pads	5 days	Tue 11/16/21	Mon 11/22/21
97		Compactor/Dumpster Canopy	30 days	Tue 11/23/21	Thu 1/6/22
98		Catwalks/Handrail Complete	5 days	Fri 1/7/22	Thu 1/13/22
99		Stormwater Basin including Underdrain Storage Bed and Pipe, Topsoil, RECP, and Seeding Complete	20 days	Mon 10/18/21	Mon 11/15/21
100		Bituminous Concrete Subbase including Geogrid	6 days	Tue 11/23/21	Thu 12/2/21
101		Bituminous Concrete Base and Surface Courses	12 days	Fri 12/3/21	Mon 12/20/21
102		Porous Concrete Pavement	5 days	Tue 12/21/21	Tue 12/28/21
103		Recycling Center Building	30 days	Tue 11/23/21	Thu 1/6/22
104		Moveable Concrete Block Wall	2 days	Tue 12/21/21	Wed 12/22/21
105		Post and Rail Fence	3 days	Thu 12/23/21	Tue 12/28/21
106		4' and 8' Chain Link Fence and Gates	10 days	Wed 12/29/21	Tue 1/11/22
107		Miscellaneous - Soil Erosion and Sediment Controls, Concrete Curb, Signs, Striping	10 days	Thu 1/6/22	Wed 1/19/22
108		Landscaping including Topsoil, Seeding, Shrubs, Trees Complete	4 days	Thu 1/20/22	Tue 1/25/22
109		**Decommission Existing Recycling Center**	**16 days**	**Wed 12/29/21**	**Wed 1/19/22**
110		Impervious Surface Removal	2 days	Wed 12/29/21	Thu 12/30/21
111		Riparian Zone Mitigation Areas Final Grading	2 days	Fri 12/31/21	Mon 1/3/22
112		Topsoil/Disturbed Area Seeding and Vegetation Maintenance	2 days	Tue 1/4/22	Wed 1/5/22
113		Riparian Zone Mitigation Areas Plantings - Trees and Shrubs	10 days	Thu 1/6/22	Wed 1/19/22
114		Demobilization	10 days	Wed 1/26/22	Tue 2/8/22



Project: Schedule RAWP
Date: Fri 12/18/20
Revision 11-10-20

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split	
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress	
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress	

Appendix A

CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN (CQA/QCP) (PREPARE BY TETRA TECH)

Ringwood Mines/Landfill Superfund Site Operable Unit Two

Construction Quality Assurance/Quality Control Plan

DECEMBER, 2020

PRESENTED TO

Ford Motor Company

PREPARED BY

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ATTACHMENTS

Attachment A Sample CQA/QCP Forms

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AC	Area of Concern
CAMP	Community Air Monitoring Plan
CD	Consent Decree
Client	Ford Motor Company
CMP	Cannon Mine Pit
CQA/QC	Construction Quality Assurance/Quality Control
CQA/QCP	Construction Quality Assurance/Quality Control Plan
E&LP	Engineering & Land Planning Associates, Inc.
FRDR	Final Remedial Design Report
IQAT	Independent Quality Assurance Team
OCDA	O'Connor Disposal Area
OU2	Operable Unit 2
PMP	Peters Mine Pit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RAC	Remedial Action Contractor
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
Site	Ringwood Mines/Landfill Superfund Site
SOW	Statement of Work
USEPA	United States Environmental Protection Agency
VMP	Vibration Monitoring Plan

1.0 INTRODUCTION

This Construction Quality Assurance/Quality Control Plan (CQA/QCP) has been prepared by Tetra Tech, Inc. on behalf of Ford Motor Company (Client) for Operable Unit 2 (OU2) of the Ringwood Mines/Landfill Superfund Site (Site). OU2 for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area. Background information on each of the three land ACs is presented in the Remedial Action Work Plan (RAWP; December 2020) to which this CQA/QCP is appended.

This CQA/QCP has been prepared pursuant to the requirements presented in Section 5.7, Paragraph (e) of the Statement of Work (SOW), Appendix B to the Consent Decree (CD) for Remedial Action (RA). The quality assurance (QA) and quality control (QC) activities included in this CQA/QCP are associated with the OU2 Remedial Action as outlined in the RAWP.

1.1 PURPOSE

This CQA/QCP describes the construction quality assurance and quality control (CQA/QC) program that is designed to monitor and document that construction is completed in general accordance with the intent of the following documents:

- *Final Remedial Design Report*, Ringwood Mines/Landfill Superfund Site, Operable Unit Two, prepared by Cornerstone Engineering Group, LLC, dated October 2017.
- Record of Decision for Operable Unit 2, dated June 2014 (Appendix A of the CD).
- The SOW (Appendix B of the CD).
- The Administrative Order on Consent for Remedial Design, effective October 1, 2014.
- The Consent Decree for Remedial Action, dated August 2020.

In general, CQA/QC refers to measures taken to independently assess the quality, completeness, accuracy, and precision of the Remedial Action Contractor's (RAC) construction activities. This CQA/QCP provides:

- Responsibilities and authorities of the organizations and key personnel involved in the design and construction of the RA.
- Reporting and documentation requirements for the CQA/QC activities including daily summary reports, review process of submittals, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation (*e.g.*, Remedial Action Report (RAR), Record Drawings).

1.2 SCOPE

The CQA/QCP describes the CQA/QC requirements for construction of the following RA activities:

- Air monitoring.
- Water treatment and discharge.
- Site preparation.
- Vibration monitoring.
- Off-site transportation and disposal of impacted materials.
- Waste consolidation in the areas designated on the Design Drawings.

- Segregation, sampling, and testing of excavated materials from the PMP Area for acceptance as backfill on-site under the final cap, or disposal off-site.
- Importing of certified clean fill material.
- Backfilling and grading of excavated areas.
- Capping of the areas designated on the Design Drawings.

1.3 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The CQA/QC program is a planned system of activities that provides assurance that the project will be constructed in accordance with the intent of the Final Remedial Design Report (FRDR) and any revisions in the RAWP. It includes inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the RA.

The basic components of the CQA/QC program are;

- Preparation of this CQA/QCP.
- Review of the RAC conformance with the FRDR and the United States Environmental Protection Agency (USEPA)-approved RAWP, and submittals provided to the Principal Engineer prior to and during the RA.
- Collection and testing of excavated soil samples (in coordination with the RA Quality Assurance Project Plan [QAPP]).
- Conformance testing of imported soil and geosynthetic materials.
- Field monitoring and verification of survey control grades and excavation limits.
- Field monitoring of excavations to the limits defined by pre-excavation verification.
- Field monitoring of backfilling and grading activities.
- Monitoring of vibrations at sensitive excavation perimeter areas, and notifications for alert and action levels (in coordination with the RA Vibration Monitoring Plan [VMP]).
- Monitoring of air quality controls (in coordination with the RA Community Air Monitoring Plan [CAMP]).
- Final walk-over and review of the completed work.
- Preparation of Daily Summary Reports.
- Review of technical and laboratory data.
- Compilation and presentation of applicable data, logs, RAC record documents and certifications, photographs, and comments for inclusion in the RAR, which documents that the construction was completed in accordance with the FRDR or any modifications approved during the RA.

2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section describes the organization and responsibilities of the project team as related to CQA/QC during the RA. Additional details of project team roles and responsibilities, as well as an organizational chart, are provided in Section 4.0 of the RAWP.

2.1 FORD MOTOR COMPANY

Ford Motor Company (Client) is responsible for the overall coordination and management of activities as detailed in the CD.

By submission of CQA/QC documentation, the Client will demonstrate that the construction was performed in accordance with the FRDR.

2.2 REGULATORY AGENCIES

The USEPA is the lead regulatory agency overseeing the completion of the remedial activities under the Superfund program. USEPA and any oversight contractors assigned by them may provide third party oversight during construction. Such oversight activities are not within the scope of this document, other than USEPA's receipt of certain CQA/QC documentation as described in the following sections.

2.3 PROJECT COORDINATOR

The Project Coordinator will serve as the Owner's Representative and will coordinate the RA activities. General responsibilities of the Project Coordinator will include:

- Preside at, and record meeting minutes for, preconstruction and regular progress meetings, substantial completion, or other meetings, as necessary.
- Monitor the RAC's work in relation to the schedule and costs.
- Coordinate the activities of the Principal Engineer, Independent Quality Assurance Team (IQAT) Official, and RAC, with USEPA and the Client, and coordinate any proposed substantive changes among them.

2.4 CONSTRUCTION MANAGER

The Construction Manager will provide day-to-day in-field management of the RAC and the RAWP, including this CQA/QCP. The general responsibilities of the Construction Manager will include:

- Review construction schedule/progress with the Project Coordinator.
- Attend project status meetings.
- Identify and manage construction related issues and ensure corrective measures are implemented by the RAC.

The Construction Manager will report to the Project Coordinator and Principal Engineer and will be the primary on-site contact for regulatory agencies.

2.5 PRINCIPAL ENGINEER

The responsibilities of the Principal Engineer include the following;

- Provide clarifications to the design intent, excluding those components designed by the RAC, when requested or as necessary based on conditions encountered.
- Review submittals prepared by the RAC as required by the FRDR or otherwise requested by the Project Coordinator.
- Review alternate materials or substitutions proposed by the RAC.
- Review groundwater level and quality data collected by the RAC for compliance with the conditions of the permit equivalency for discharge to groundwater including any associated reporting requirements, if applicable.
- Review RAC-proposed changes to the design during construction, and coordinate with the Project Coordinator for approval by USEPA of significant changes to the FRDR or RAWP, as warranted.
- Participate in the pre-construction, substantial completion, and regular progress meetings, as necessary, to review construction activities and conformance with the intent of the FRDR and RAWP as requested by the Project Coordinator.
- Review the CQA/QC reports and communicate regularly with the IQAT Official.
- Certify that the construction was completed in general accordance with the FRDR, RAWP and any modifications to these documents approved during the RA in coordination with the USEPA, based on observations while on-site, IQAT Official documentation, and RAC Record Documents.

The Principal Engineer will periodically have on-site representation, as necessary to fulfill these responsibilities.

Tetra Tech, Inc. was retained by the Client as the Principal Engineer, with the exception of items designed by E&LP. Those items include the Recycling Center documents, permits and specifications. Tetra Tech, Inc. is the principal author of the USEPA-approved FRDR.

2.6 REMEDIAL ACTION CONTRACTOR

In accordance with Section 6.2 of the SOW, the Client is to notify the USEPA of the name, title and qualifications of the proposed construction contractors to be considered for performing the RA. The Client has identified Remedial Construction Services, L.P. (RECON) as the Remedial Action Contractor.

The RAC will assign a Project Manager as the responsible person-in-charge of all aspects of the RA project. The Project Manager will have sufficient relevant experience in construction and contract administration to manage the project. The RAC will be responsible for the overall implementation of the RA and will be performing internal construction QC on all components of the RA.

2.7 INDEPENDENT QUALITY ASSURANCE TEAM

The IQAT is responsible for overseeing and implementing the CQA/QC program. The IQAT Official will participate in project initiation and problem resolution meetings. The IQAT will be separate and independent from the RAC and will be responsible for reviewing each stage of construction and will have authority to reject workmanship provided by the RAC that is not in compliance with the FRDR, the RAWP and Technical

Specifications (Appendix I of the RAWP). The lines of communication for the IQAT function is included as an organizational chart in the RAWP. Responsibilities of the IQAT include the following:

- Review the general remediation/construction activities to verify compliance with the FRDR and RAWP, including Design Drawings, Technical Specifications, and related work plans and permit equivalencies/approvals.
- Review construction schedule/progress with the Project Coordinator.
- Coordinate CQA/QC sampling and testing, to include verification samples collected during the RA (in coordination with the RA QAPP).
- Verify removal of materials in accordance with the FRDR and the RAWP within the work area.
- Verify appropriate management of excavated materials including determination of their acceptable reuse.
- Verify that materials requiring off-site disposal have been appropriately segregated, contained, and designated for transportation to approved off-site, permitted facilities.
- Monitor that treated water is being tested and discharged, as necessary, in accordance with the design, permit equivalencies and approvals.
- Monitor that materials are backfilled into excavations within the specified requirements for material, segregation, and compaction.
- Monitor that work is being performed in accordance with the approved RAWP.
- Monitor that existing structures and utilities are being protected, and that vibration monitoring (as per the VMP) is being performed and appropriate notifications are made to the Principal Engineer and actions are taken to comply with the criteria.
- Review, in conjunction with the Principal Engineer and the Project Coordinator, corrective measures to be implemented during the RA when conditions are encountered requiring deviations from the FRDR or RAWP, including this CQA/QCP.
- Monitor that the RAC is maintaining a set of drawings showing adjustments/changes and record information.
- Monitor construction of the cap system and confirm compliance with the FRDR and Technical Specifications during placement.
- Attend project status meetings.
- Prepare Daily Summary Reports of RA work, including CQA/QC activities.
- Maintain photographic records.
- Review the accuracy of the certified record construction drawings provided by the RAC for incorporation in the RAR, with respect to CQA/QC records and observations.

The IQAT Official will report to the Project Coordinator and will interface with the Principal Engineer and RAC as required in execution of the RAWP including this CQA/QCP.

3.0 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

This section discusses the methodology that will be used to confirm the RA activities are being implemented in accordance with the FRDR and RAWP. The following sections present minimum requirements for monitoring and testing documentation to be performed by the IQAT as part of the CQA/QC program. This monitoring and testing program is intended to supplement and augment the QC requirements that will be performed by the RAC.

3.1 SITE PREPARATION

3.1.1 Construction Monitoring

Site preparation activities will be monitored by the IQAT to verify that the activities are in general accordance with the FRDR, RAWP, and other approvals. Visual observations of RA components will be performed and documented by the IQAT.

The Site preparation CQA/QC program consists of monitoring the following activities:

- Installation of temporary facilities.
- Filing by the RAC of appropriate permit and permit equivalency applications and other documents required on-site during the RA.
- Placement and maintenance of temporary erosion and sediment control materials.
- Installation of stabilized construction entrance(s), decontamination pads, and temporary roads and parking/staging areas.
- Site clearing and grubbing.
- Installation of air monitoring equipment and collection of background measurements (in accordance with CAMP).
- Installation of geotechnical monitoring points for vibration control and collection of baseline measurements prior to RA activities (in accordance with VMP).
- Installation of temporary signage and traffic control devices.
- RAC Site surveys.

3.2 EXCAVATION

The IQAT will monitor excavation activities of the on-site materials as outlined in the FRDR and RAWP. Monitoring will include a combination of visual observations for excavation to pre-defined and marked survey limits, and documenting continuation of excavation below the groundwater table for the removal of buried drums and/or paint wastes, if encountered. Within the PMP Area, the IQAT will monitor materials in accordance with the requirements of Section 31 20 00 of the Technical Specifications (Appendix I of the RAWP). The IQAT will either coordinate analytical testing or check that it is being coordinated by the RAC, in conformance with the RA QAPP.

3.3 DEWATERING AND WATER TREATMENT

3.3.1 Dewatering

The IQAT will monitor the dewatering activities, as applicable for the removal of drums and/or paint waste. This will include visually determining appropriate control of groundwater by pumping for excavations below the water table. The IQAT will also observe piping and hoses for evidence of leaks, and that any leaks are repaired. The IQAT Official will immediately notify the Project Coordinator of any deficiencies observed and will monitor corrective actions performed by the RAC to remedy deficiencies.

3.3.2 Water Treatment System

The IQAT will observe the start-up of the water treatment system and will verify, via review of analytical test data provided by the RAC, that the approved discharge limits have been achieved. During operation of the system, the IQAT will visually observe the system once per day to identify that the RAC's QC program is being implemented and monitor for any visual evidence of potential water leaks and spillage or other system malfunction. The IQAT will immediately notify the RAC and the Project Coordinator of any concerns regarding deficiencies.

The IQAT may obtain treated water samples periodically for independent analysis of water chemistry in coordination with the Project Coordinator. Independent test results will be compared to the permit requirements and to the RAC-provided analytical data. The IQAT Official will immediately notify the Project Coordinator and the Principal Engineer if approved limits have been exceeded or if a discrepancy is noted between independent analysis and that of the RAC.

3.3.3 Water Discharge

The IQAT will also observe the discharge of treated water from the water treatment system on a daily basis, to verify that the water is being directed to the appropriate discharge location. The IQAT will visually monitor the discharge location to verify compliance with the FRDR, RAWP, and applicable permit requirements. The IQAT Official will immediately notify the Project Coordinator of any deficiencies observed and will monitor corrective actions performed by the RAC to remedy deficiencies.

3.4 GROUNDWATER LEVELS

In the event treated groundwater from dewatering activities is discharged to the stormwater basin outside the capped area, the RAC will monitor the groundwater levels in the groundwater wells identified in the discharge to groundwater permit-by-rule. Monitoring will begin prior to the initiation of any dewatering activities with the installation of water level transducers. The RAC will begin bi-weekly monitoring within 60 days of the beginning of discharge and will last 6 months after the last discharge, as required by the discharge to groundwater permit. The RAC will report the water levels to the Principal Engineer for verification of the permit equivalency requirements. The Principal Engineer will communicate any changes to dewatering or discharge to groundwater requirements to the RAC and the Project Coordinator based on the water level measurements reported by the RAC.

3.5 BACKFILL

3.5.1 Construction Monitoring

The IQAT will monitor the stockpiling of backfill material (either imported or stockpiled excavated materials for reuse) to verify that they are not intermixed with other materials and that appropriate erosion and sediment controls are in place. The IQAT will monitor backfilling activities to verify materials are placed in accordance with Section 31 20 00 of the Technical Specification (Appendix I of the RAWP). The IQAT will visually monitor lift thickness and will verify the required compaction effort is provided by the RAC. If soft or unstable areas are observed, the IQAT will notify the Project Coordinator. The IQAT will observe the RAC's work to identify deficiencies and will verify that an acceptable, stable condition has been achieved prior to permitting the RAC to place the next lift of material. Other activities will include:

- Visual inspection of imported backfill – continuous during delivery and placement.
- Visual verification of loose lift thickness as outlined in the Technical Specifications – continuous during placement.
- Visual verification of removal of deleterious materials from excavated fill reused as backfill.
- Visual verification and documentation of compaction effort where a percent compaction is not specified to be measured by testing.

3.5.2 Imported Material Evaluation

Testing of imported backfill material will be performed in accordance with Section 31 20 00 of the Technical Specifications by the RAC. The Principal Engineer will review data submitted by the RAC to verify conformance with the requirements of the Technical Specifications. The IQAT will verify that backfill material delivered to the Site is from a source accepted by the Principal Engineer by reviewing delivery tickets. The IQAT will observe delivered materials to verify conformance with the physical requirements of the Technical Specifications. The IQAT will notify the Project Coordinator if unacceptable material is observed and will not permit the use of unacceptable materials as backfill.

3.6 GEOTEXTILE

The CQA/QC program for geotextile consists of the Principal Engineer reviewing the manufacturer's product data, the manufacturer's certification, and shop drawings submitted by the RAC to verify conformance with the requirements of Section 31 05 19 of the Technical Specifications (Appendix I of the RAWP). The IQAT will perform the following monitoring activities for the geotextile demarcation layer:

- Verify geotextile rolls delivered to the Site have been accepted for use at the Site by cross referencing packaging information with information accepted through the approval process by the Principal Engineer.
- Observe rolls upon delivery and periodically monitor the storage of materials to document that the materials are stored in accordance with the Technical Specifications and manufacturer's recommendations. Any damaged rolls will be rejected by the IQAT and repaired or replaced by the RAC.
- Verify that the subgrade is suitable for placement of the geotextile.
- Verify sufficient overlap during placement of the geotextile and that seams are appropriately constructed.

3.7 COVER SOIL

CQA/QC monitoring during the placement of the cover soil will include:

- Visually monitor the quality of the cover soil for the presence of over-sized particles and deleterious inclusions.
- Verify the material supplied by the RAC is coming from an approved location/source by periodically reviewing delivery tickets.
- Visually monitor placement to confirm that the underlying geotextile is not damaged during soil placement.
- Verify and document placement thickness and number of passes for compaction.
- Verify compaction at a frequency of 1 test per 5,000 cubic yards in accordance with ASTM D1557.
- Verify field density and moisture along a 100-foot grid or every 50 feet along linear alignments, per lift, in accordance with ASTM D6938.
- Verify the RAC completes compaction testing and achieves compaction requirements in accordance with the requirements of Section 31 20 00 of the Technical Specifications.

Geotechnical and analytical testing of cover soil will be performed in accordance with Section 31 20 00 of the Technical Specifications by the RAC. The Principal Engineer will review submittals to verify conformance with the requirements of the Technical Specifications. The IQAT, in coordination with the Project Coordinator, may obtain soil samples and complete independent testing to verify conformance of the delivered materials with the requirements of the Technical Specifications.

3.8 CONSTRUCTION-INDUCED VIBRATION

The IQAT will verify that the RAC installs, operates, and maintains the vibration monitoring system in conformance with the VMP. The IQAT will visually observe that the required vibration monitoring stations are installed and active in accordance with the VMP. The IQAT will verify that the vibration measurements (integrated and real-time) are collected and analyzed by the RAC and will weekly review the data provided by the RAC for conformance with the VMP and allowable levels. The IQAT will verify that appropriate actions were taken to control vibrations if action levels were exceeded. The IQAT will notify the Project Coordinator of any deficiencies observed in the operation of the system or in the reported data.

3.9 COMMUNITY AIR MONITORING

The IQAT will verify that the RAC installs, operates, and maintains the perimeter air monitoring system in conformance with the CAMP. The IQAT will visually observe that the required air monitoring stations are installed and active and that the portable stations are appropriately located in accordance with the CAMP. The IQAT will verify that the air quality samples (integrated and real-time) are collected and analyzed by the RAC and will weekly review the data provided by the RAC for conformance with the CAMP and allowable emission levels. The IQAT will verify that appropriate actions were taken to control air emissions if action levels were exceeded. The IQAT will notify the Project Coordinator of any deficiencies observed in the operation of the system or in the reported data.

3.10 SEEDING, PLANTING, AND STABILIZATION

CQA/QC monitoring during placement of the vegetative support layer will include:

- Visually monitor the quality of the vegetative support layer.
- Visually monitor the placement and preparation of the vegetative support layer to receive seed.

- Verify the specified seed mix is being used by the RAC.
- Verify seeding and stabilization is in conformance with the certified Soil Erosion and Sediment Control Plan and the requirements of the Technical Specifications.

Seeding and stabilization will be completed in accordance with Sections 31 20 00, 31 25 13, and 32 92 19 of the Technical Specifications (Appendix I of the RAWP) by the RAC. The IQAT will verify that the seed mix and fertilizer used by the RAC conforms to the seed mix and fertilizer specified through the submittal process by viewing labels provided on packaging. The IQAT will monitor the Site to verify vegetative cover is established within the specified timeframe included in the Technical Specifications.

4.0 RECORDS AND REPORTING

4.1 CONTRACT DOCUMENTS

The Contract Documents include the Technical Specifications, Design Drawings, FRDR, and contractual documents. The RAC, Construction Manager, and IQAT Official will each maintain on the Site one unaltered (*i.e.*, with no additional markings) set of the original Contract Documents. The RAC and Construction Manager shall also maintain a record of all proposed, pending, and approved changes and clarifications to the Contract Documents. The Construction Manager will provide a copy of all changes to the IQAT Official and Principal Engineer.

4.2 CONTRACT SUBMITTALS

Submittals required by the RAWP, including this CQA/QCP and the Technical Specifications (Appendix I of the RAWP), will be logged in at the time of receipt. A Submittal Register is included as part of the RAWP, Figure 5-1. A copy of the Submittal Register will be kept on file by the Project Coordinator and Principal Engineer. A form indicating review of the submittal will be prepared by the Project Coordinator or Principal Engineer. A copy of the review form indicating the status of the submittal will be returned to the IQAT Official for their files. Hard copies or electronic copies of submittals and review forms may be utilized at the discretion of the Project Coordinator.

4.3 DAILY SUMMARY RECORDS

The IQAT Official will keep records of construction and testing activities. Attachment A includes sample IQAT forms which will be used in the field and included in the daily summary records, as appropriate. Daily Summary Reports will be numbered sequentially and will include the following:

- Date and project name.
- Weather conditions, including daily high and low temperatures, wind conditions, and precipitation.
- General description of work activities performed at the Site.
- Description of work completed for the day, referencing locations, stationing and grid coordinates as appropriate.
- Identification of areas worked.
- Reduced-scale drawings or sketches showing work completed, as required.
- Summary of test samples taken.
- Summary of test results compared with the Technical Specification requirements and indication of pass or fail status for the samples.
- Observations related to the operation of the water treatment system, as applicable.
- Test equipment calibrations, unless recorded in other field notebooks/records.
- Description of materials taken off-site including designated disposal facility.
- List of imported materials received including sources.
- Summary of CQA/QC procedures used for the day and list of CQA/QC personnel on-site.
- List of inspections completed by Agencies and summary of findings.
- Problems encountered and resolutions reached.
- Security issues and resolutions reached.

4.4 CONSTRUCTION ISSUE AND CORRECTIVE MEASURE REPORTS

A Construction Issue is defined herein as material or workmanship that does not meet the requirements of the FRDR, RAWP, Technical Specifications (Appendix I of the RAWP), other Contract Documents, or other permit-equivalency approvals. Issues can be determined based upon the findings of the Principal Engineer, IQAT, and/or RAC QC teams. Construction Issue and Corrective Measures Reports will be cross-referenced to specific monitoring and testing data sheets where the issue was recorded. Construction Issue and Corrective Measures Reports shall be numbered sequentially and include the following detailed information:

- Detailed description of the issue.
- Location and probable cause of the issue.
- How and when the situation was identified.
- How the problem was corrected or resolved.
- Any measures taken to prevent similar problems in the future.
- Signatures of the IQAT/Principal Engineer, Construction Manager, and RAC; or authorized alternates.

4.5 PHOTOGRAPHIC RECORDS

The IQAT will take photographs with a digital camera identified by date, time, location, subject, and initials of the person taking the photograph. Photographic record sheets will be completed to organize photographs that will document the IQAT activities associated with the major elements of the work. The RAC will be responsible for the more complete photographic record of the RA work and its progress. IQAT photographic record sheets will be numbered sequentially and will include the following information:

- The date, time, and location where the photograph was taken.
- The orientation of the subject matter photographed.
- Location and description of the work.
- Initials of the photographer.

4.6 DESIGN CHANGES

The RAC may propose design changes, but such design changes cannot be implemented unless accepted by the Principal Engineer and the Project Coordinator. Any changes that may significantly affect the performance of the remedy or deviate from the FRDR will be submitted to USEPA for review and approval prior to implementation. The RAC will be responsible for providing the USEPA with all required documentation to assist in USEPA's approval. The RAC will also be responsible for maintaining record documentation during the course of the project. Upon completion of the RA, a final set of Record Drawings will be compiled by the RAC for inclusion in the RAR.

4.7 REMEDIAL ACTION REPORT

After completion of construction, the RAR will be prepared by the Client and submitted to the USEPA. The RAR will be completed in accordance with the requirements presented in Section 3.6 of the SOW, Appendix B to the CD.

4.8 RECORDS STORAGE

Throughout the construction, all original documents and copies will be kept in an organized file on-site. All records and documents related to the RA will be preserved and retained for a minimum of 10 years following receipt from USEPA of a Certificate of Completion of the Work. At the close of this 10-year period, documents may be destroyed with USEPA concurrence in accordance with the procedures outlined in the CD (Section XIX, Retention of Records).

4.9 MEETINGS

A pre-construction meeting will be held at the Site prior to the beginning of the work. The meeting will be attended by the Project Coordinator, Principal Engineer, RAC, major subcontractors and regulatory agencies, as desired. Progress meeting will also be held on-site. Representatives may participate in the progress meetings through conference calls, when unable to be present at the Site. The agenda for the progress meetings is as follows:

- Review minutes of previous meetings.
- Review of work progress.
- Field observations, problems, and decisions.
- Any resident/community concerns and corrective action(s);
- Identification of problems impeding planned progress.
- Review of monitoring activities and corrective actions, if any;
- Health and safety.
- Review of submittal schedule and status of submittals.
- Review of material or equipment delivery schedules.
- Maintenance of Project Schedule including 3-week look ahead.
- Corrective measures to regain projected schedules.
- Planned progress during succeeding work period.
- Coordination of projected progress.
- Maintenance of quality and work standards.
- Effect of proposed changes on Progress Schedule and coordination.
- Other business relating to work.

5.0 CONSTRUCTION COMPLETION

As required in Section 3.6 of the SOW, the Client will notify the USEPA upon completion of construction including confirmation that the performance standards have been achieved. The RAC, Project Coordinator, Principal Engineer and IQAT Official will be available to accompany USEPA personnel and/or their representatives on a pre-certification inspection within 30 days of completion. The pre-certification inspection will consist of a walkover of the Site to determine the completeness of the construction and its consistency with the FRDR, the RAWP, the CD, and applicable federal, state and local laws, rules, and regulations.

Following the pre-certification inspection, the USEPA will specify any necessary corrective measures to the construction phase of the RA. If the USEPA requires corrective measures, the RAC will undertake the corrective measures according to a schedule approved by the USEPA. Within 14 days after completion of the corrective measures, the RAC, Project Coordinator, Principal Engineer and IQAT Official will be available to accompany USEPA personnel and/or their representatives on another inspection similar to the one described above. This inspection will be followed by further directions to implement corrective measures, if necessary, and subsequent inspections, until the USEPA determines the construction is complete. The USEPA will then formally notify the Client of construction completion.

ATTACHMENT A

SAMPLE CQA/QCP FORMS

TETRA TECH

DAILY FIELD REPORT

Date: _____

Project: _____

Project No.: _____

Contractors(s): _____

Weather: AM _____ PM: _____

Temperature: AM: _____ PM: _____

Description of field activities (include labor, equipment, site conditions, sampling, etc.)

Copies To: _____

_____
Tetra Tech Representative

Project: _____

THE FOLLOWING WAS NOTED (CONT.):

Copies To: _____ _____

Tetra Tech Representative

TETRA TECH

Daily Field Report - Material Quantities

Project Name: _____ **QA/QC Monitor:** _____

Project Number: _____ **Date:** _____

Material	Units	Qty Today	Qty Total	Comments
Trees Cleared	EA			
Grubbing	SF			
Waste Excavation	load			
Soil Excavation	load			
Paint Waste	CY			
Drums	EA			
Subgrade Placement	CY			
Geotextile Placement	SF			
Geogrid Placement	SF			
Stabilization Stone	CY			
Barrier Protection Soil	CY			
Topsoil	SF			
Seeding	SF			
Silt Fence	LF			
Diversion Swale	LF			
Gas Monitoring Well	LF			
Groundwater Monitoring Well	LF			

CY=cubic yards
LF=linear feet
LS=lump sum
SF=square feet

TETRA TECH

GEOSYNTHETICS INVENTORY

Date: _____

Project: _____

Project No.: _____

Material: _____

Total Material Received: _____

ROLL NUMBER	LENGTH (ft)	WIDTH (ft)	AREA (sq ft)	QC CERTS RECEIVED	CONF. SAMPLE		QC ID	COMMENTS
					SENT	P/F		

NUCLEAR MOISTURE-DENSITY TEST SUMMARY

TETRA TECH

Date: _____

Project: _____

Project No.: _____

Tech: _____

Test No.	Lift No.	Northing	Easting	Probe Depth (in)	Proctor Density (pcf)	Optimum Moisture (%)	Wet Density (pcf)	Dry Density (pcf)	Moisture Content (%)	Percent Compaction (%)	P/F	Retest No.	Comments

CERTIFICATE OF SOIL SURFACE ACCEPTANCE

TETRA TECH

Date: _____

Project: _____

Project No.: _____

GEOSYNTHETIC INSTALLER

Company: _____

Address: _____

_____

I the Undersigned, a duly authorized representative of _____

do hereby accept the area of soil surface bounded by _____

_____

_____

_____

_____

_____

_____

as an acceptable surface on which to install geosynthetic materials, and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

Signature: _____ Date: _____

Name (print): _____

Title: _____

CERTIFICATE OF ACCEPTANCE RECEIVED BY CQA RESIDENT MANAGER

Signature: _____ Date: _____

Name (print): _____

Title: _____

Appendix B

SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Ringwood Mines/Landfill Superfund Sites

RECON® Remedial Construction Services, L.P.	Date: 12/17/2020
	Version 1.0

Prepared by: Brad Lockhart	Prepared for: Ford Motor Company
Project Number 02-4053	Project Identification: Ringwood Mines/Landfill Superfund Sites

Current Template Revision Date:	April 2020

Project Under COVID-19 Action Plan Requirements

Reviser:	Safety Steering Committee

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Acronyms and Abbreviations

AC	Area of Concern
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
AOC	Administrative Order on Consent
Auto IG	Autoignition Temperature
BBS	Behavior Base Safety
BMP	Best Management Practice
BP	Boiling Point
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CA	Circulating Air
CAMP	Community Air Monitoring Plan
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CL2	Chlorine
CMP	Cannon Mine Pit
CMS	Chip Measurement System
CO	Carbon Monoxide
COPC	Chemicals of Potential Concern
CRZ	Contaminant Reduction Zone
CWA	Clean Water Act
EAP	Emergency Action Plan
Emilcott	Emilcott Technologies
eV	Electron-volts
EZ	Exclusion Zone
FID	Flame Ionized Detector
FP	Flash Point
FRDR	Final Remedial Design Report
HCN	Hydrogen Cyanide
H_2S	Hydrogen Sulfide
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HOF	Hazard Observation Form
HSE	Health, Safety and Environment
IDLH	Immediately Dangerous to Life and Health
IP	Ionization Potential
IR	Infrared
JHA	Job Hazard Analysis
JMP	Journey Management Plan
JSA	Job Safety Analysis
JSAP	Job Safety Analysis Plan
LEL	Lower Explosive Limit
LMF	Local Medical Facility
LOD	Limit of Disturbance
mg/m3	milligrams per cubic meters
MoC	Management of Change
MP	Melting Point
MUTCD	Manual on Uniform Traffic Control Devices
NIOSH	National Institute of Occupational Safety and Health
O_2	Oxygen
OCDA	O'Connor Disposal Area
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit 2
OU3	Operable Unit 3

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Acronyms and Abbreviations

OVA	Organic Vapor Analyzer
OVM	Organic Vapor Monitor
Owner	Ford Motor Company
PA	Performing authority (properly trained and authorized site employee)
PEL	Permissible Exposure Limit
PgM	Program Manager
PHSM	Program Health and Safety Manager
pH	Potential of Hydrogen
PID	Photoionization Detector
PM	Project Manager
PMP	Peters Mine Pit
PNOS	Particles Not Otherwise Specified
PPE	Personal Protective Equipment
PPM	parts per million
RA	Remedial Action
RAM	Real-Time Aerosol Monitor
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RECON	Remedial Construction Services, L.P.
RF	Radio Frequency
ROD	Record of Decision
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet
SESC	Soil Erosion and Sediment Control
SIMOPS	Simultaneous Operations
Site	Ringwood Mines/Landfill Superfund Site
SM	Site Manager
SP	Safety Procedure
SSE	Short Service Employee
SSO	Site Safety Officer
SSup	On-Site Superintendent
STEL	Short Term Exposure Limit
T&D Plan	Transportation & Disposal Plan
TBTRA	Task-By-Task Risk Assessment
TLV	Threshold Limit Value
TLV-TWA	Threshold Limit Value - Time Weighted Average
TWA	Time Weighted Average
UEL	Upper Explosive Limit
USEPA	United States Environmental Protection Agency
UV	Ultra Violet
VOC	Volatile Organic Compound
VP HSE	Vice President of Health Safety and Environment
WTS	Water Treatment System

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1. Introduction

This Site-Specific Health and Safety Plan (HASP) has been prepared by Remedial Construction Services, L.P. (RECON) on behalf of Ford Motor Company (Owner) for Operable Unit 2 (OU2) of the Ringwood Mines/Landfill Superfund Site (Site). OU2 for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area. Background information on each of the three land ACs is presented in the Remedial Action Work Plan (RAWP; December 2020) to which this HASP is appended. This HASP has been developed to provide health and safety guidelines for RECON employees, subcontractors, and visitors during the OU2 Remedial Action (RA) construction. The purpose of this HASP is to protect all those who will be exposed or have the potential to be exposed such as RECON employees/subcontractors and site visitors from chemical, biological, and physical hazards that may be associated with the work activities.

It is RECONs policy to implement and enforce specific safety policies and procedures for all projects. If an unsafe or hazardous condition is observed during work activities, the unsafe activity along with other work in the area will be suspended until the unsafe condition has been corrected.

This plan was prepared to provide specific detail regarding health and safety requirements/expectations at the Site and is not a standalone document. This HASP is a living document in nature; personnel reading this plan and working on-site must be familiar with all RECON safety policies, procedures and programs, abiding by them during performance of this work. As conditions change, the HASP should be updated to reflect the changes, and said changes must be communicated to all those working on the project.

1.1 Scope of Work

The overall project scope of work will include the execution of select scopes of work at three independent areas located at the Site. The three land ACs, as described above, are noted as the CMP Area, the OCDA, and the PMP Area. Each land AC is scheduled for scopes of work that differ in detail, but generally include excavation of existing soil, segregation of waste, reuse of excavated material deemed acceptable, and installation of an engineered cap. All necessary labor, equipment, and materials to conduct the overall scope of work will include but are not limited to:

- Prepare Job Safety Analyses (JSAs), this Site-Specific HASP including attachment sub-plans, and associated Site plans such as the Vibration Monitoring Plan (Appendix C to the RAWP); Community Air Monitoring Plan (CAMP; Appendix D to the RAWP); and Transportation & Disposal Plan (T&D Plan; Appendix H to the RAWP).
- Mobilize equipment, materials, and personnel to the Site.
- Once mobilized, RECON will conduct all training associated with the Site.
- Upon completing Site-specific training, RECON will start setting up the project site controls. These controls include installing signage, establishing temporary facilities, temporary utilities, staging areas and the Best Management Practice (BMP) controls along with soil erosion and sediment control (SESC) measures.
- Pre-construction survey to define Limit of Disturbance (LOD), remedial limits, wetland areas, known utilities, existing elevations, and establishment of control points/offsets.
- Installation of habitat protection devices and water treatment system.
- Clearing and grubbing.
- Cut/fill operations and waste/debris removal at three independent land ACs.
- Management of waste and transportation/disposal as necessary.
- Dewatering/water treatment.
- Installation of engineered cap systems.

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- Construction of a new Recycling Center at the OCDA.
- Site restoration: seeding, wetland planting, riparian zone planting, and wildlife habitat construction.
- Demobilization.

Throughout the duration of the project, dust control measures along with visual and real time air monitoring practices will be completed to minimize exposure to known COPC.

1.2 Purpose

This HASP defines the operational, health, safety, and environmental considerations for the management of RECON and RECON subcontractor personnel working on site as well as for visitors to the Site. This document is required by RECON and, when appropriately completed, complies with Occupational Safety and Health Administration (OSHA), Title 29 of the Code of Federal Regulations (CFR) Part 1910.120 and Part 1926. The basic requirements for the health and safety of the project workers are found in this HASP and RECON's safety procedures located in RECON's field office. All personnel working on the Site will be familiar with RECON Standards of Safety as well as the RECON Employee handbook and will be knowledgeable of this HASP. Visitors will undergo training, as described in Section 2.4 and Attachment F of this HASP.

1.3 Regulatory Status

The below listed domestic site regulatory agencies, acts, or standards will be implemented and followed during all work activities at the Site.

OSHA 1910	The most commonly encountered OSHA rules are those that apply to the "general industry," or most workplaces in the United States, and these rules appear in Part 1910 of Title 29.
OSHA 1926	Because of this, a separate set of OSHA standards provide safety and health regulations for construction workers. 29 CFR 1926, Safety and Health Regulations for Construction, was established under Section 107 of the Contract Work Hours and Safety Standards Act, and provides the standards for construction safety.
USEPA	USEPA is an independent executive agency of the United States federal government, tasked with environmental protection matters.
RCRA	The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste.
Hazard Communication	Hazard Communication, also known as HazCom, is a set of processes and procedures that employers and importers must implement in the workplace to effectively communicate hazards associated with chemicals during handling, shipping, and any form of exposure.
Clean Water Act	The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

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1.4 Authorized to Issue Permit to Work

The following personnel have been authorized to issue and sign the Permit to Work for this project. Each person has received the additional 8-hour RECON Supervisor Training along with site specific HASP training.

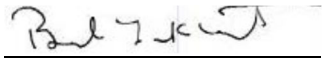
Name	RECON Project Manager (PM) Approval	Owner Representative Acceptance (*When Applicable*)
On-Site Superintendent (SSup) Scott Sutton	Larry Endicott	
Site-Safety Officer (SSO) Rodney Cockerel	Larry Endicott	
(SSup) Carl Walker	Larry Endicott	
Site Manager (SM) Douglas Jumper	Larry Endicott	

1.5 Review and Approval Documentation

Approved by:

Site Safety:	Rodney Cockerel Name	_____ Signature	_____ Date
Project Manager	Larry Endicott Name	_____ Signature	_____ Date

Reviewed by:

Program Health and Safety Manager	Brad Lockhart Name	 Signature	12/16/2020 Date
Vice President of Health Safety and Environment (VP HSE)	Jeff Watts Name	_____ Signature	_____ Date

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1.6 Required Content Location

All permits, Job Hazard Analyses (JHAs), JSAs, completed Job Safety Analyses Plans (JSAPs), Daily Safety Meeting Agenda/Forms, Visitor Orientation/Safety Briefing Forms, Site Inspection Forms, Daily Sign-In/Sign-Out forms, Safety Data Sheets (SDS), Stop Works, Hazard Observation Forms (HOFs), Journey Management Plans (JMPs), short service employee (SSE) orientations/training/experience forms are all part of the RECON Daily Package and will be filed the day after use in binders or files in the same location as the Site-Specific HASP, which typically is the job trailer, for inspection by RECON and other on-site personnel or Regulatory Agencies upon request.

Amendments/Changes to this HASP must be attached to the original HASP at the front of the HASP (before this page). All amendments must be routed through RECON Program Health and Safety Manager for review as well as the Site PM, Site Manager (SM), SSup, and SSO. This HASP has been prepared to comply with RECON's safety requirements and associated processes that are part of the Permit-To-Work (SP-49 Permit to Work Procedure), as well as the health and safety regulations set forth in 29 CFR 1910 and 29 CFR 1926.

Project Start Date:	This site HASP must be reissued/reapproved for any activities conducted after (no longer than 1 year after issue date):	Amendment Date		Amended by	
March 15, 2021		1		1	
		2		2	
Estimated End Date:		3		3	
October 1, 2022		4		4	
	Date: March 15, 2022	5		5	

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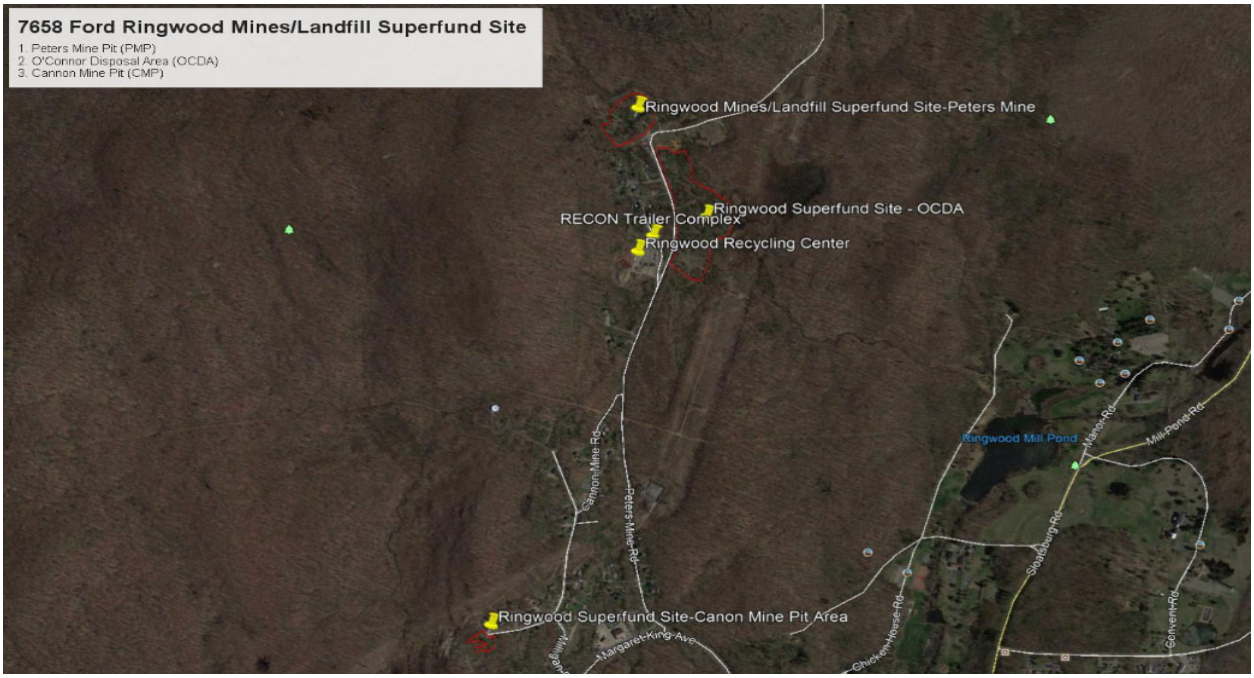
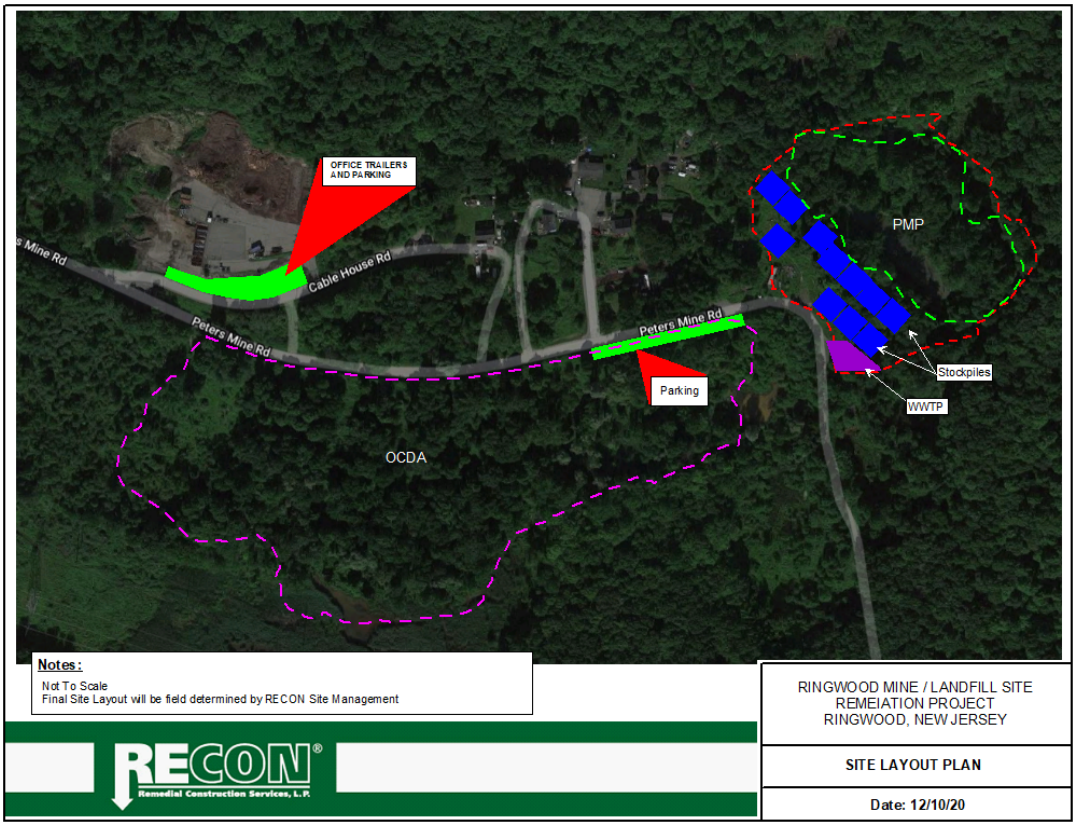
1.7 Site Maps

Ringwood Mines/Landfill Superfund Site



Site Layout



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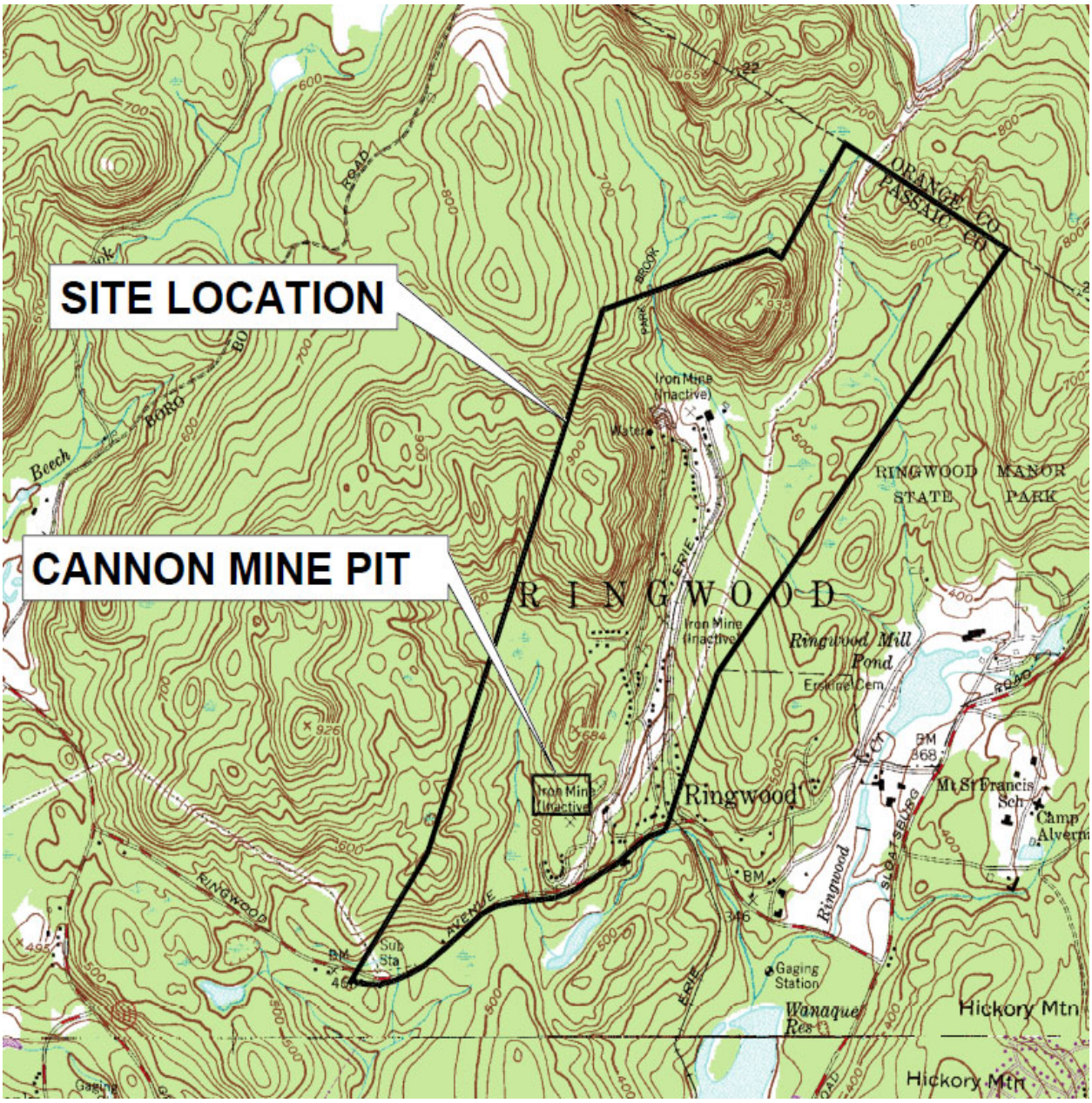
CMP Area Location Map



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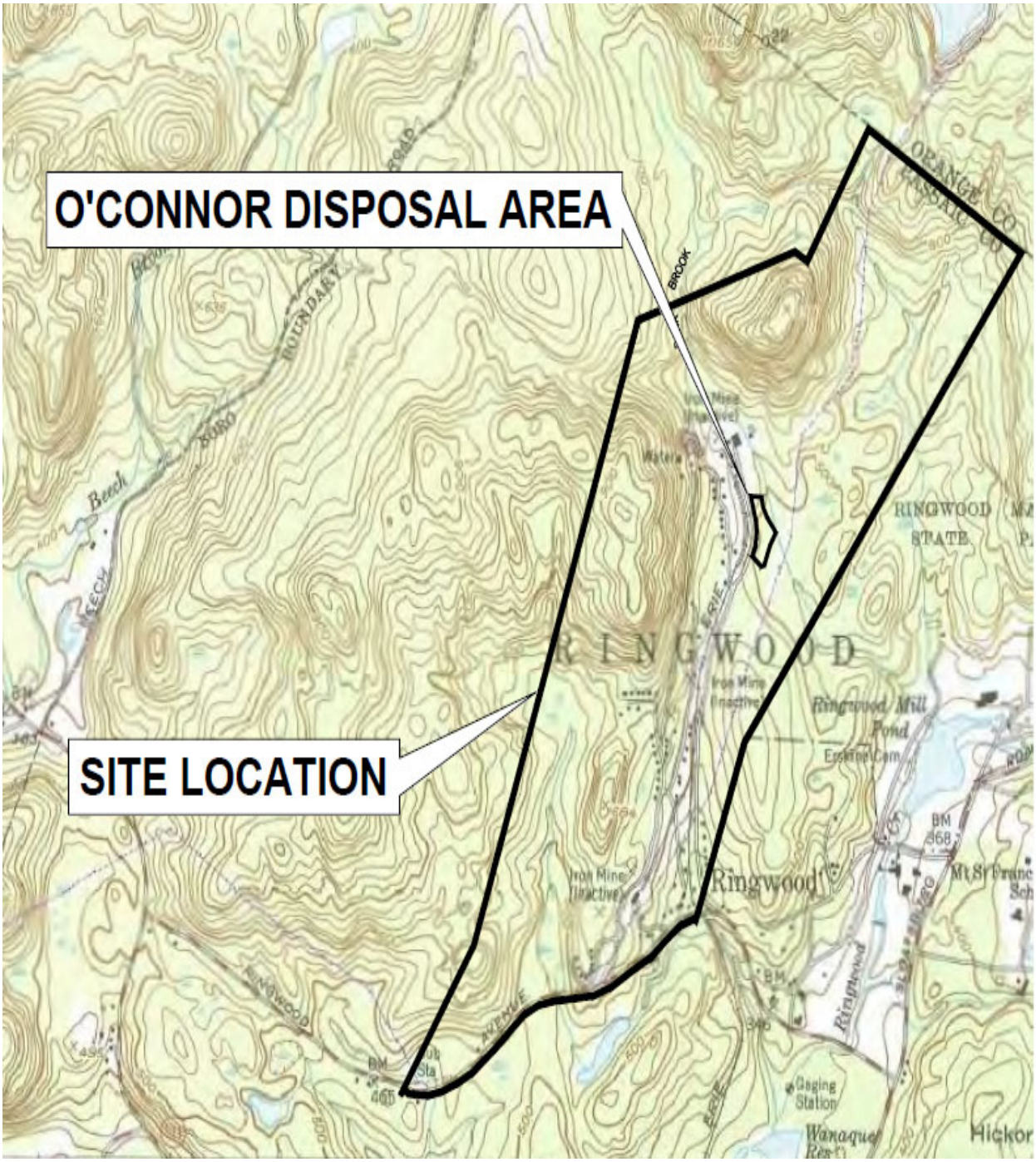
OCDA Location Map



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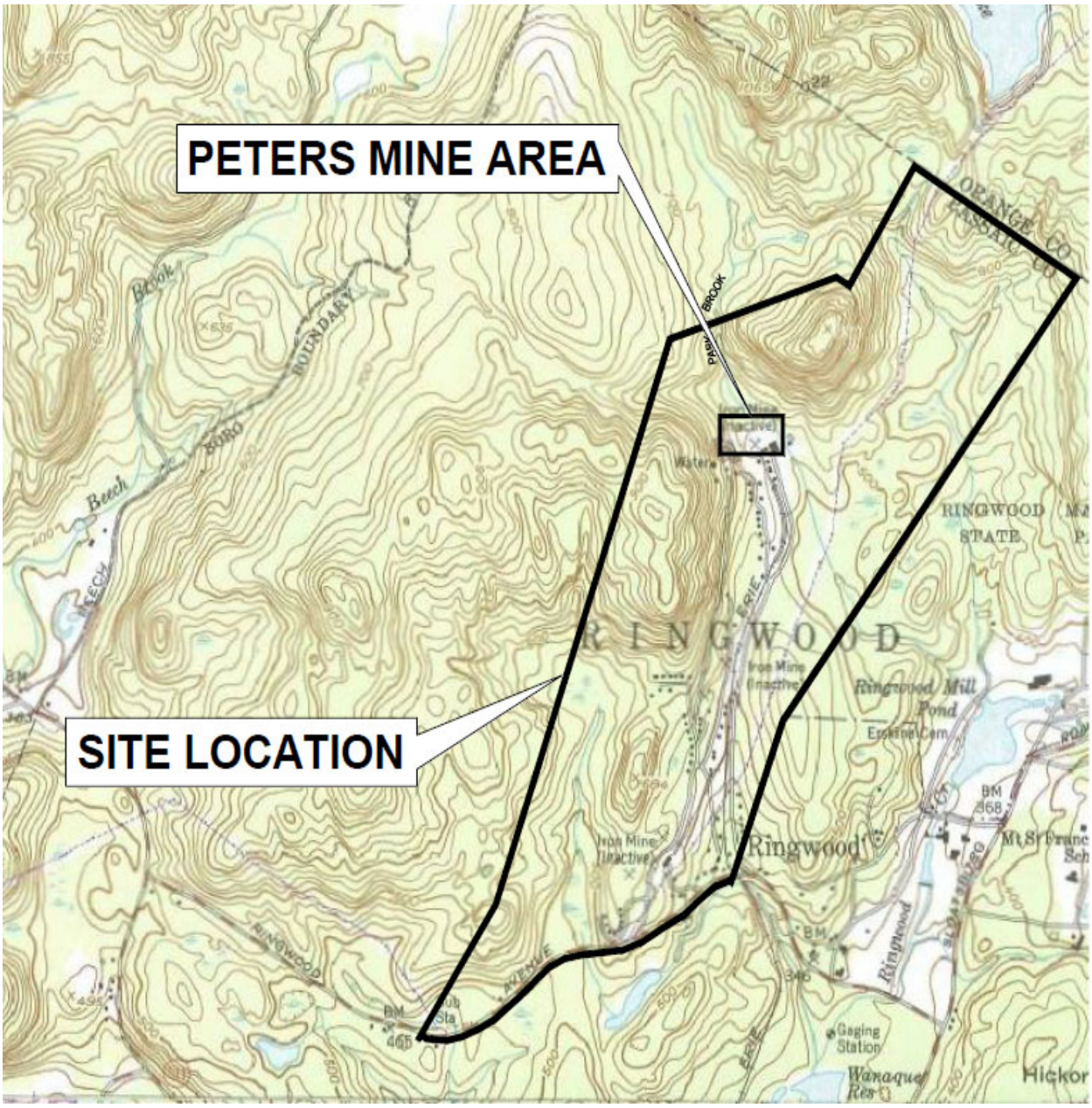
PMP Area Location Map



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2. Site Specific Health and Safety Personnel

The table below is a summary of key site tasks along with the authorized/designated personnel to perform these tasks based off competency and/or verifiable training.

Site Duties	Authorized or Designated Project Personnel
Implementation of HASP and Project:	Larry Endicott (Project Manager)
	Scott Sutton (On-Site Superintendent)
	Carl Walker (On-Site Superintendent)
	Douglas Jumper (Site Manager)
	Rodney Cockerel (Site Safety Officer)
Designated Alternates Include:	Richard Badis (Business Unit Leader)
	Brad Lockhart (Program Health and Safety Manager)
	Joe Naselli (Director of Operations)
	Todd King (Project Director)
First Aid Trained Personnel:	Larry Endicott (Project Manager)
	Scott Sutton (On-Site Superintendent)
	Carl Walker (On-Site Superintendent)
	Douglas Jumper (Site Manager)
	Rodney Cockerel (Site Safety Officer)
Designated Competent Person:	Larry Endicott (Project Manager)
	Scott Sutton (On-Site Superintendent)
	Carl Walker (On-Site Superintendent)
	Douglas Jumper (Site Manager)
	Rodney Cockerel (Site Safety Officer)

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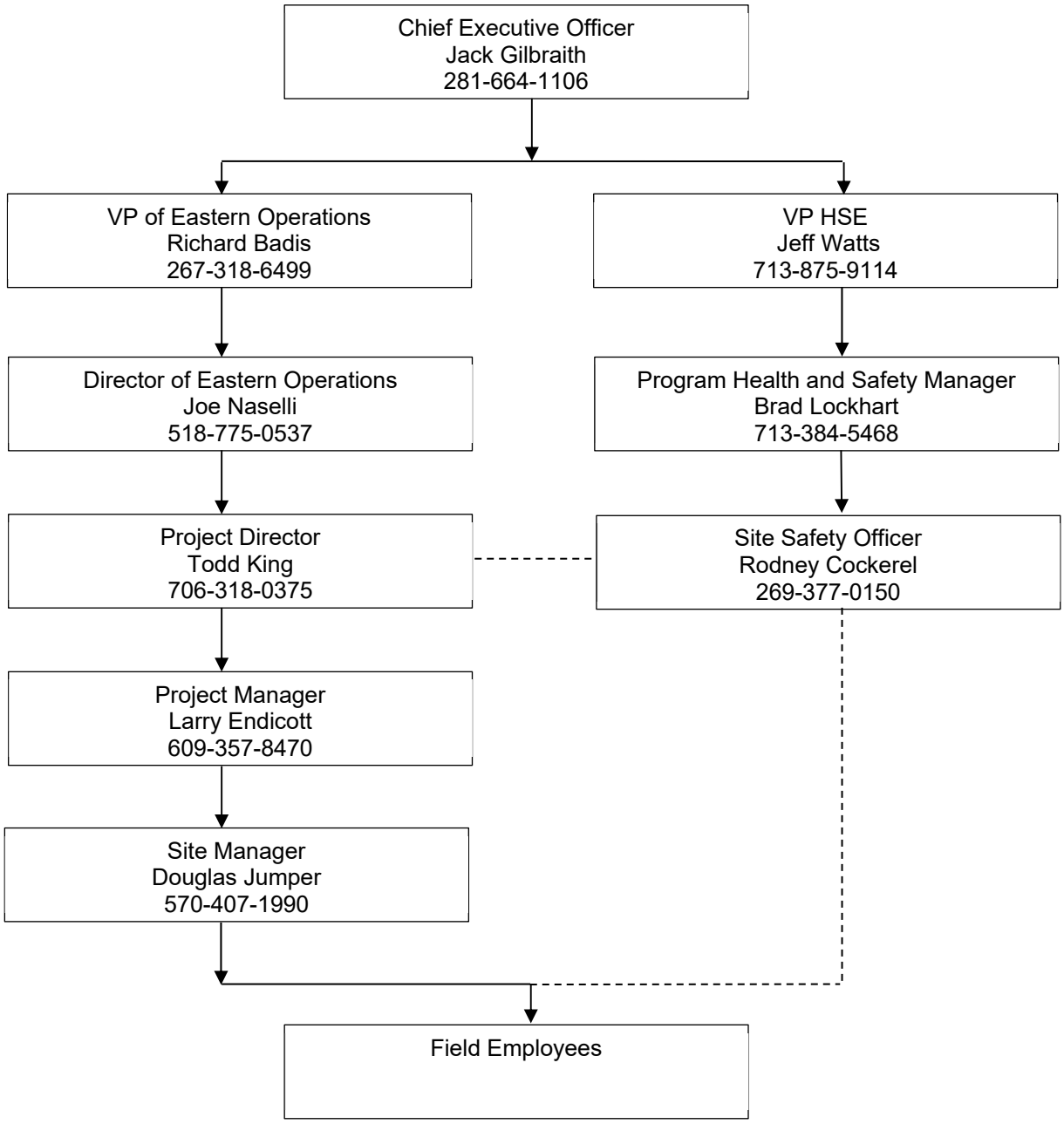
2.1 RECON Heath, Safety and Environment (HSE) Staffing Organization

RECON places great emphasis on Behavior Based Safety (BBS) and emphasizes that "Safety is a Core Value". As part of the BBS program, RECON emphasizes that safety is everyone's responsibility with commitment at all levels within the organization. Below is a flow chart of key personnel responsible for the implementation and management of RECON's BBS program.



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2.2 Roles and Responsibilities

The VP HSE, or his representative, the Program Health and Safety Manager (PHSM), are responsible for the overall development and implementation of the health and safety program and management of safety personnel for RECON. They work closely with the PM and Site Manager to ensure the project is being done safely and within regulations. Additional duties will include:

- Developing/implementing/maintaining this written HASP program in compliance with applicable regulatory requirements, as well as best practices with input from safety personnel and operations management;
- Developing/implementing/maintaining effective protocols, procedures and/or checklists to monitor, audit, and review implementation and compliance with health and safety policies and programs;
- Performing evaluations, inspections, and audits to provide information and recommendations to RECON management regarding the status of the corporation's safety program and personnel performance;
- Keeping managers and field personnel advised on federal, state, and other safety regulations and furnishing interpretations of these regulations;
- Developing/maintaining occupational medical monitoring program including medical consultant selection, management, oversight; policy development, invoicing and payment, systems for appointments, and certification tracking;
- Participating in pre-project planning conferences;
- Providing educational training materials (informational programs) designed to develop and maintain an effective health and safety program; and
- Approving final Site-Specific HASP.

RECON's PM reports to RECON's business unit leader and has overall responsibility for ensuring that project personnel (including subcontractor personnel) comply with health and safety regulations, program requirements, and procedures along with all project activities, ensuring the following health and safety responsibilities are met:

- Ensuring all project tasks receive appropriate health and safety review before commencement of field activities, and confirming that necessary equipment, facilities, and staffing are available to implement the task;
- Assisting or preparing site-specific plans under the direction of the corporate HASP;
- Ensuring the development and implementation of project HASP;
- Inspecting project personnel to ensure compliance with the corporate safety program to verify compliance with all policies and procedures.
- Analyzing all safety trends data for the project monthly and identifying and correcting any potential gaps or negative trending;
- Ensuring all stop works reported are properly addressed and the hazards have been mitigated;
- Having the authority to terminate any employee that fails to follow the corporate safety program;
- Reviewing accident, first aid, and near miss reports; and
- Verifying and validating that corrective action is being taken to prevent reoccurrence.

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The Site Manager (SM) and/or SSup are primarily responsible for implementing and directing field operations and ensuring that they are conducted in accordance with this HASP and OSHA, state, and local regulations as well as the Owner's procedures. Responsibilities include:

- Giving detailed instructions about job tasks and explaining hazards and safety precautions;
- Providing workers with tools and equipment to safely perform their job;
- Participating in all hazard hunts and job hazard analysis;
- Reviewing and approving all JSAs and JSAPs;
- Conducting the daily safety meetings;
- Supervising all hazardous work or work that is new and unusual;
- Considering the health and safety factors in operational planning, and providing personal protective equipment (PPE), warning signs, barricades, fire extinguishers, etc.;
- Assuring that subcontractors comply with the HASP;
- Assuring site visitors are provided with a safety orientation and escorted as necessary;
- Ensuring any injured worker receive proper first aid or medical attention; and
- Being responsible for orderliness and good housekeeping on the project.

The SSO is responsible for implementing the HASP, overseeing any work zone air monitoring programs, and completing any written amendments to the HASP. Additional responsibilities include:

- Maintaining a log of all job health and safety meetings;
- Supporting the SSup and participating in the daily and weekly health and safety meetings, using the time to review safe practices that cover the work being performed;
- Introducing the health and safety program to new employees;
- Being thoroughly familiar with the health and safety program for the project;
- Maintaining an adequate stock of, and control over, first aid supplies and other safety equipment to ensure their immediate availability and making sure there are always an adequate number of first aid trained people on the project;
- Investigating all accidents, first aid incidents, or near misses, and correcting any unsafe practices and conditions;
- Ensuring that injured workers receive first aid or medical attention, accompanying the injured worker to the clinic or hospital, and securing a drug and alcohol test;
- Maintaining roped-off areas and barricades to ensure that only authorized personnel enter the exclusion zones;
- Conducting documented safety inspections and posting findings, as well as promptly resolving any finding; and
- Identifying and ensuring those conditions affecting employee's health and safety are monitored and the existing PPE remains appropriate.

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2.3 Training

At a minimum, all personnel, including visitors, entering the ACs must have the designated training as shown in the matrix below in section 2.3.1. Typically, visitors will not be allowed to enter the exclusion zone. However, in certain situations, authorized visitors will be allowed to enter an exclusion zone if they have the required training certifications, follow all RECON safety procedures, and are escorted by a designated RECON employee.

2.3.1 Site-Specific Requirements

The matrix below describes the minimum site-specific training required for the scope of the project depending on the individual's involvement with the project tasks. All training will be conducted in accordance with OSHA 29 CFR 1910, 29 CFR 1926, and/or RECON's SP-14 which will be located onsite in RECON's safety office. Documentation for the completed training will be maintained in files stored in RECON's field office located on the Site.

	RECON Employees	RECON Labor	RECON Equipment Operators	Front Line Supervisors	Health & Safety Professionals	RECON Subcontractors	Vendor	Visitors
Site Specific Briefing for Visitors	☐	☐	☐	☐	☐	☐	☒	☒
HASP Competency Review and Quiz	☒	☒	☒	☒	☐	☒	☐	☐
Site Specific HASP Orientation	☒	☒	☒	☒	☐	☒	☐	☐
Site Specific Training	☒	☒	☒	☒	☐	☒	☐	☐
Excavation & Trenching Competent Person	☐	☐	☐	☒	☒	☒	☐	☐
Confined Space Entry Competent	☐	☐	☐	☒	☒	☒	☐	☐
Competent Operator Certification	☐	☐	☒	☒	☐	☐	☐	☐
First Aid CPR	☐	☐	☐	☒	☒	☐	☐	☐
OSHA 10 Hour Training	☐	☐	☐	☐	☒	☐	☐	☐
OSHA 30 Hour Training	☐	☐	☐	☐	☒	☐	☐	☐
OSHA 500 Course	☐	☐	☐	☐	☒	☐	☐	☐
Rigging/Signal Person	☐	☐	☐	☒	☒	☐	☐	☐
Visitor Orientation	☒	☒	☒	☒	☐	☐	☒	☒
Silica Awareness	☒	☒	☒	☒	☐	☐	☐	☐
RECON Standards of Safety	☒	☒	☒	☒	☐	☐	☐	☐
40 Hour Hazardous Waste Operations and Emergency Response (Hazwoper) Training	☒	☒	☒	☒	☐	☒	☐	☐
8 Hazwoper Supervisor Training	☐	☐	☐	☒	☒	☐	☐	☐
8 Hour Hazwoper Annual Refresher Training	☒	☒	☒	☒	☐	☒	☐	☐

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2.3.2 Training Representatives

Name	Title	Contact Number
Larry Endicott	Project Manager	267-240-3415
Scott Sutton	Site Superintendent	570-499-8487
Douglas Jumper	Site Manager	570-407-1990
Carl Walker	Site Superintendent	805-268-3131
Rodney Cockerel	Site Safety Officer	269-377-0150
Brad Lockhart	Program Health and Safety Manager	713-384-5468

2.4 Short Service Employees

A short service employee (SSE) is an individual who has been employed by RECON for less than six (6) months. SSE determination can also be designated if an employee is assigned to a new trade and has less than six (6) months experience in that trade. In the situation were an employment agreement with RECON has been terminated and/or has been absent for one year or greater, the re-hired employee will be considered an SSE until an SSE status evaluation process is completed.

An exception may be granted for a new employee with a high level of previous work experience in the same industry. A case-by-case variance on an employee's SSE status can be made based on the employee previous position or employment history such as new hire employee or returning employee assigned in a leadership role or through past verifiable experience. Variances will be requested by operational management and reviewed/approved by RECON's VP HSE.

SSEs shall be kept to a minimum on a RECON work location at any given time. SSEs cannot staff one-person crews. For crews of five or more employees and with more than 20% of said crew designated as SSEs, a variance request must be filled out justifying the request and listing the steps to be taken to manage/mitigate the SSE risk to an acceptable level. Additionally, each SSE employee must fill out the SSE Checklist with audit checks performed by site management every thirty days. SSE variance and checklist forms will be available at the RECON field office located on the Site.

SSE personnel shall be visibly identified with a hi-visibility orange RECON sticker. For project sites that prohibit the use of SSE stickers, an orange hard hat will be used to identify SSEs in the field. RECON will notify the host facility prior to starting work of the number of SSE personnel present in the crew.

All SSEs must have an appropriate and approved mentor who will meet with them daily to access performance and provide opportunities for question/answer sessions. The mentor will coach and supervise work. The SSE's safety will be of highest priority while learning the new job and unfamiliar tasks.

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3. Contingencies

Below is a list of emergency contacts identified for the project. This list will be posted in key locations such as doorways to field trailers and SSO/PM work locations. This is utilized for a quick reference in the event of an emergency. **Section 3.7** of this plan provides a flow chart outlining the Site notification procedures. Additional tables of responsibilities and flow charts on how to manage an incident can be found in RECON's SP-11 Medical Services Occupational Injury Management Procedure and SP-19 Accident/Incident Reporting Procedure. SP-11, SP-19, and all other RECON safety procedures (SP) can be accessed through RECON's Health & Safety portal or by a hard copy located in in the field office trailer.

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Emergency Contacts and Phone Numbers

Agency	Contact	Phone Number(s)
RECON VP HSE	Jeff Watts	(281) 664-1134 (office) (713) 757-4255 (cell)
RECON Program Health and Safety Manager	Brad Lockhart	(713) 384-5468 (cell)
RECON Medical Emergency Contact	RECON Safety Administrative Coordinator	(281) 664-1134 (office) (713) 829-7026 (cell)
Workplace Safety Screenings	Third Party Administrator Contact	1-855-572-5577
RECON Site Manager	Douglas Jumper	(570) 407-1990 (cell)
RECON Superintendent	Carl Walker	(805) 268-3131 (cell)
RECON Superintendent	Scott Sutton	(570) 499-8487 (cell)
RECON Site Safety Officer	Rodney Cockerel	(269) 377-0150(cell)
RECON Project Manager	Larry Endicott	(484) 367-5436 (office) (609) 357-8470 (cell)
RECON Project Director	Todd King	(706) 318-0375 (cell)
RECON Director of Operations	Joe Naselli	(518) 775-0537 (cell)
RECON Business Unit Leader	Richard Badis	(484) 367-5421 (office) (267) 318-6499 (cell)
Ringwood Health Department (COVID 19)	Reception	(973) 962-7079 (office)
Fire & Rescue	Ringwood Fire and Rescue	(580) 883-5550 or 911
Police Department	Ringwood Police Department	(973) 962-7017 or 911
Poison Control Center	National Hotline	(800) 222-1222
Underground Utility Location Service	National Location Number	811
de maximis Assistant Project Coordinator	Danielle Ondic	(732) 703 1076 (cell)
de maximis Project Coordinator	Craig Coslett	(610) 360-7539 (cell)
de maximis Construction Manager	Tom Perkins	(973) 670-2871 (cell)
Additional Emergency Reporting Contact Information		
Ford Motor Company Project Manager	Colleen Liddell	(313) 322-9934
Borough of Ringwood	Scott Heck	(973) 475-7101
USEPA	Joseph Gowers	(212) 637-4413

3.1 Evacuation Procedure

The following evacuation procedures will be implemented at the site. RECON's SM and SSO will designate muster locations for each AC prior to mobilization. The locations of the musted points as well as these evacuation procedures will be communicated to all on site personnel and posted in the field offices.

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1. At the sound of the air horn (one long blast), and/or voice command and visual hand signal (grabbing the wrist with the opposite hand and extending your arms into the air) all site personnel will proceed to closest assembly area.
2. Check the direction of the wind at your location. Always head upwind (into the wind); if moving upwind takes you toward the emergency area, then move cross wind away from the emergency before proceeding upwind. The need for notification of emergency services will be assessed and completed by supervisor personnel.
3. Sign In/Out log (located at office trailer) will be used for accountability of all site personnel. All foremen/task leads will call the SSup with the roster of personnel at their assembly area.
4. Air horn locations will be at assembly areas as well as in spill kits.
5. For Geological Occurrences – move to the assembly areas and stay away from buildings, equipment and overhead obstructions. If in a building, shelter in a doorway frame.
6. For Meteorological Occurrences – shelter in below ground areas, in basements, in permanent buildings in rooms with no windows, or lie in the lowest possible areas (ditches) covering your head with your arms. Evacuate the job trailers. Evacuate to the assembly areas after the danger has passed the Site.
7. Off-site Impacts – find shelter first to provide protection to you, owner, owner's representatives, and co-workers. After danger has passed, evacuate to the assembly area for an accurate count of all site personnel.

3.2 Local Medical Emergency Facility

Name of Hospital:	Good Samaritan Hospital	
Address:	257 Lafayette Ave, Suffern, NY 10901	
Emergency Room Contact:	On Duty Emergency Nurse	Phone: (845) 368-5000
Type of Service	Route to Hospital:	**Travel Time from Site:**
☐ Physical Trauma Only		20 min
☐ Chemical Exposure Only	See page 25	**Distance to Hospital**
☒ Physical Trauma (Level II)		11.3 miles
☒ Chemical Exposure		**24-hour Ambulance Service**
☒ Available 24 hours		911

3.3 RECON Approved Clinic

Name of Clinic:	Concentra Urgent Care	
Address:	283 Piaget Ave, Clifton, NJ 07011	
Emergency Room Contact:		Phone: (973) 772-3930
Type of Service	Route to Clinic:	**Travel Time from Site:**
☒ Physical Trauma Only		36 min
☐ Chemical Exposure Only	See page 26	**Distance to Clinic**
☐ Physical Trauma (Level II)		23.3 miles
☐ Chemical Exposure		**24-hour Ambulance Service**
☐ Available 24 hours		911

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3.4 Route to Hospital

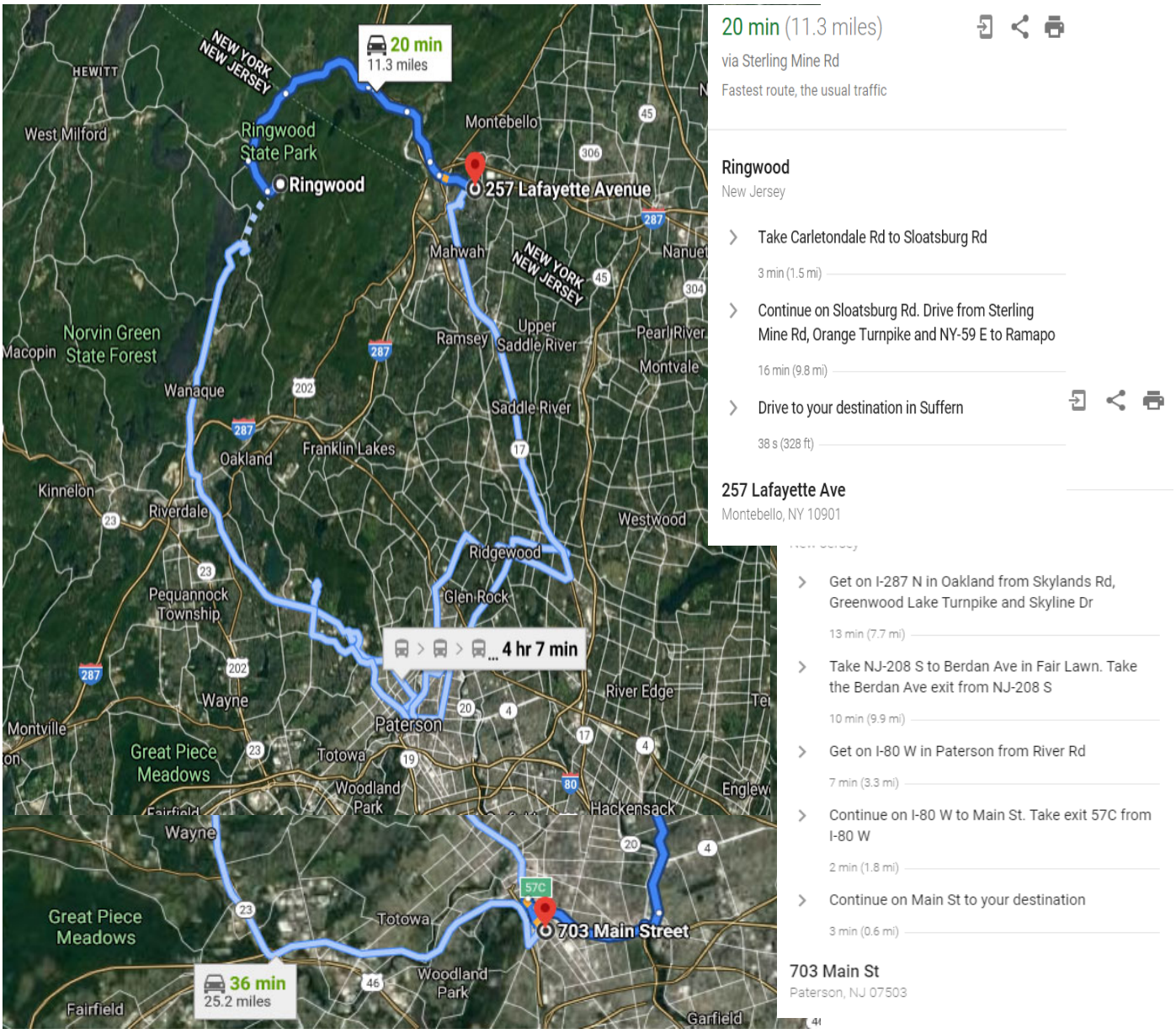
Good Samaritan Hospital

257 Lafayette Ave, Suffern, NY 10901

(845) 368-5000

Route Time: 20 min

Distance: 11.3 miles



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3.5 Clinic Route

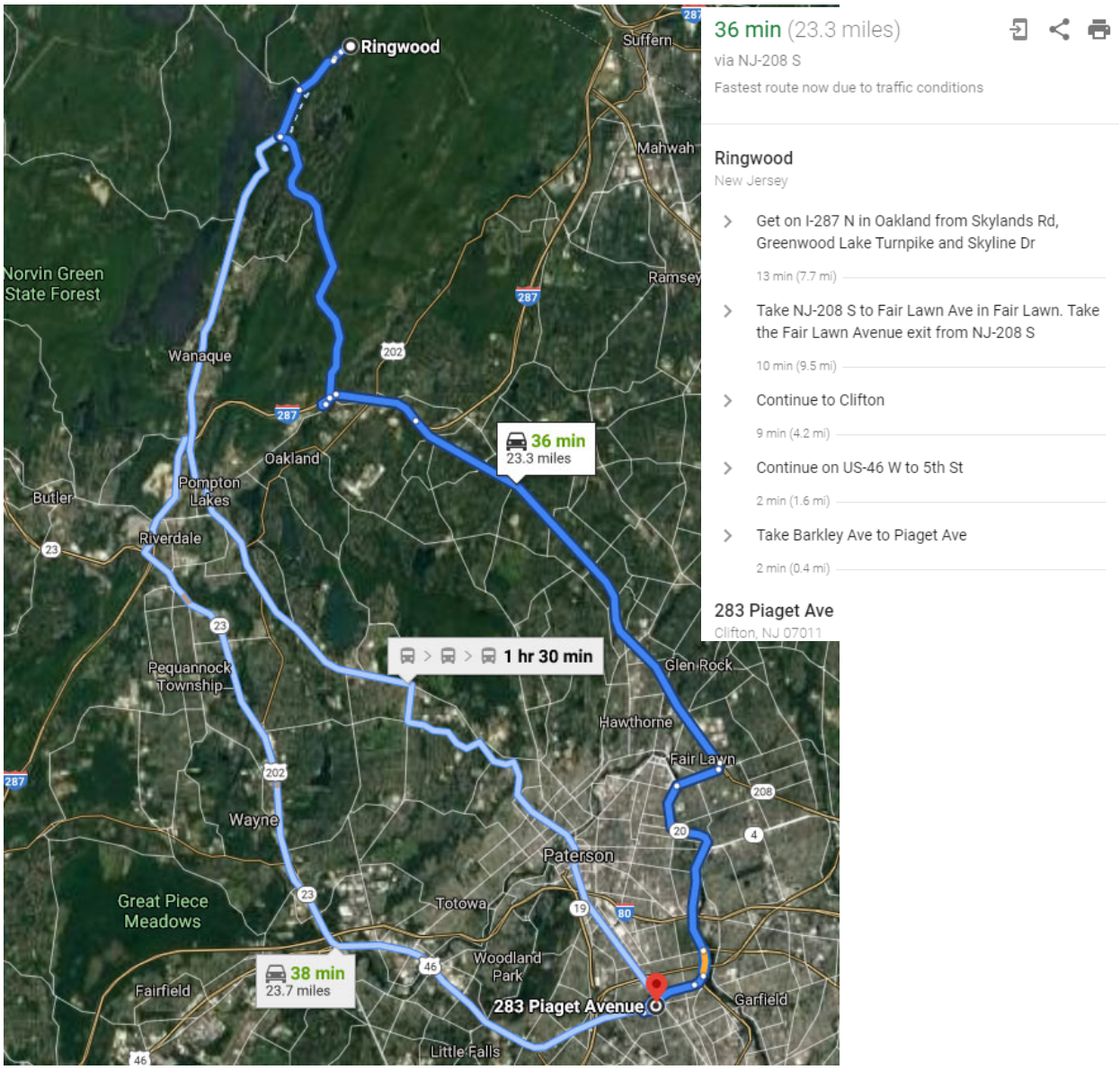
Concentra Urgent Care

283 Piaget Ave, Clifton, NJ 07011

(973) 772-3930

Route Time: 36 min

Distance: 23.3 miles



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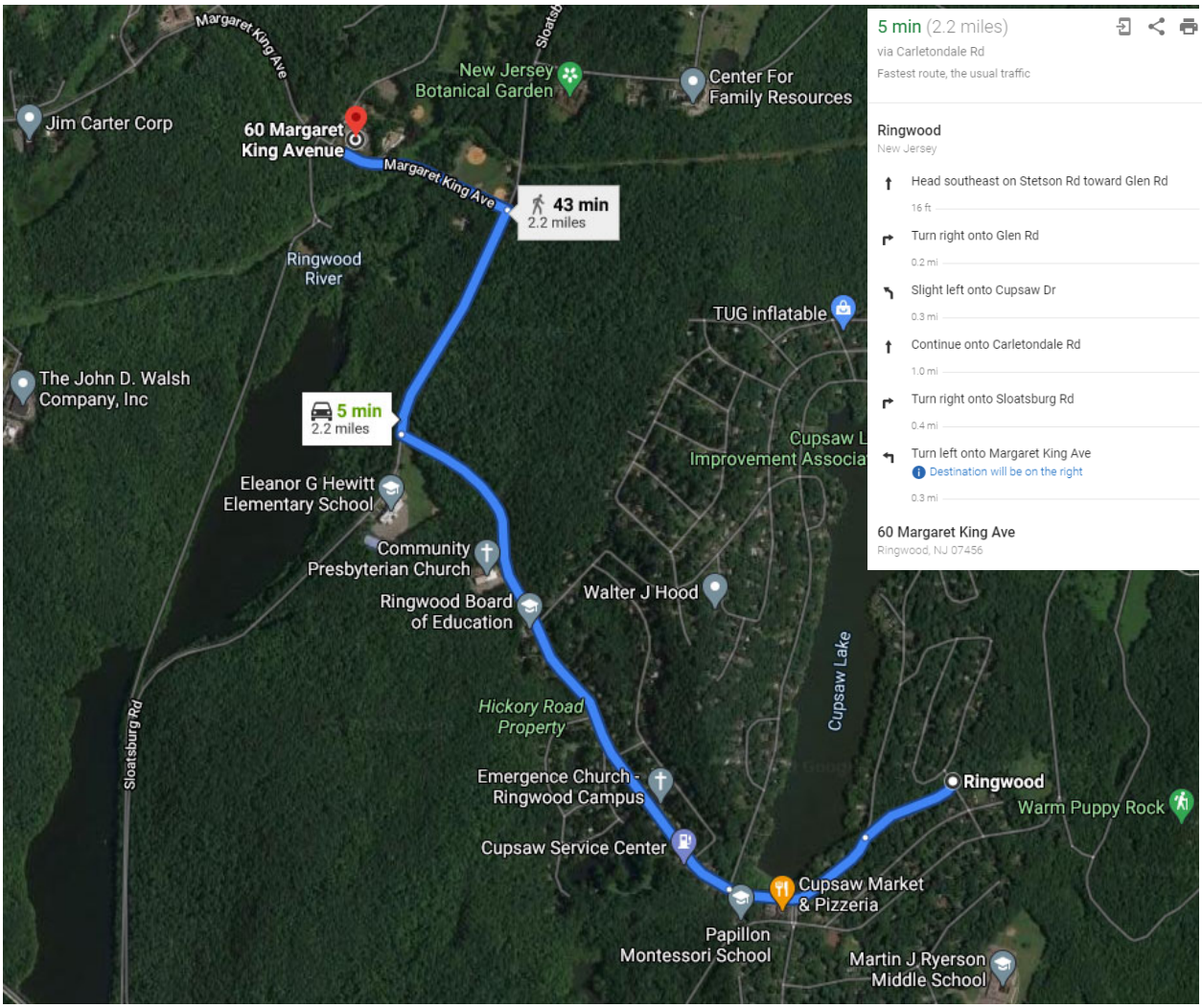
3.6 Ringwood Health Department

COVID 19
60 Margaret King Ave
Ringwood, NJ 07456
973-962-7079

Route Time: 5 min

Distance: 2.2 miles



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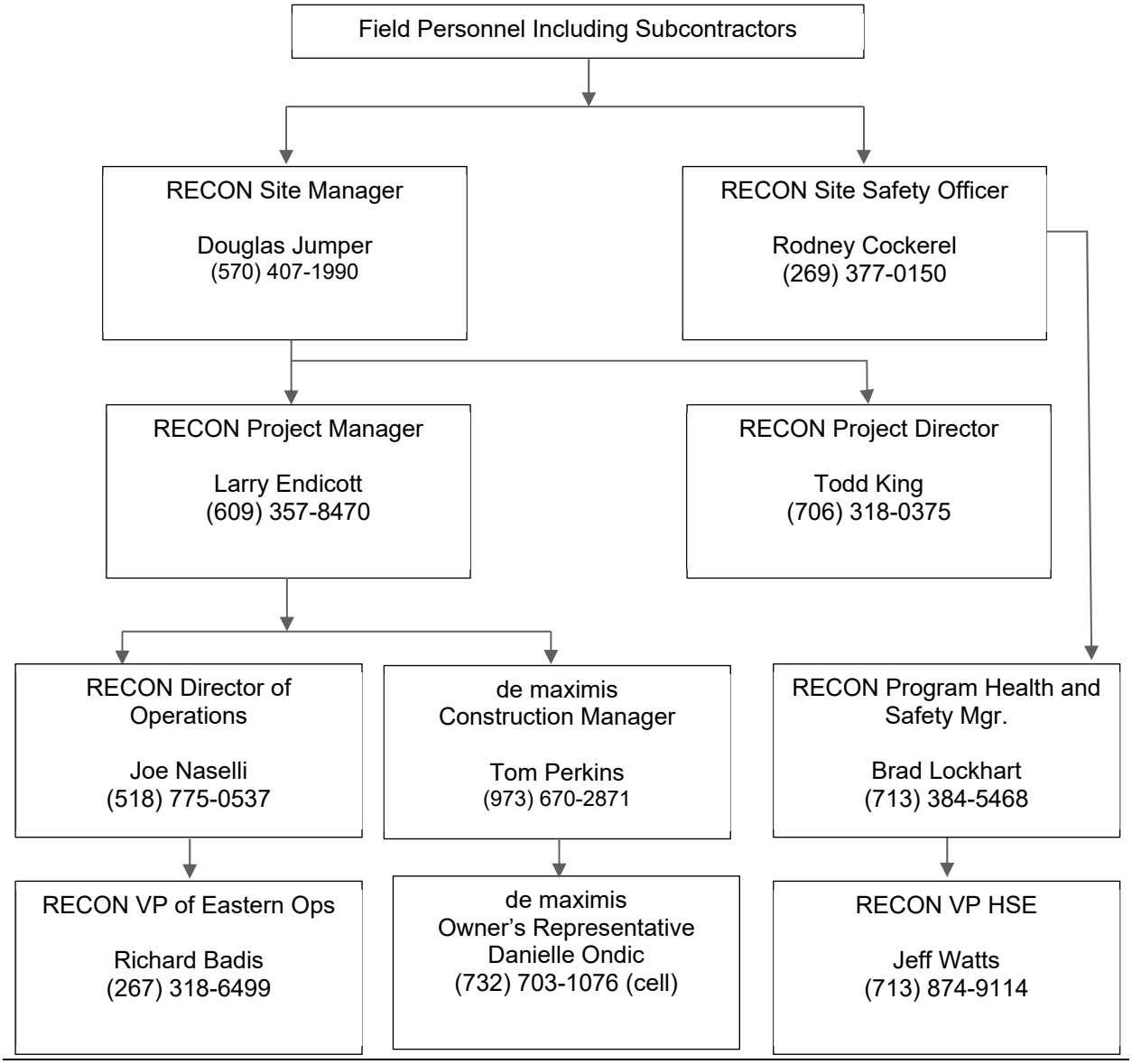
3.7 Incident Flow Chart

The following Incident Flow Chart provides a snapshot of the Site notification process. In the event of an emergency, field personnel will contact their immediate supervisor who will make notification to the Site SM or SSO which will initiate on/-/off-site notifications. Additional tables of responsibilities and flow charts on how to manage an incident can be found in RECON's SP-11 Medical Services Occupational Injury Management procedure and SP-19 Accident/Incident Reporting procedure. SP-11, SP-19, and all RECON's other SPs can be accessed through RECON's Health & Safety portal or by a hard copy in the field office trailer.



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Root Cause Investigation Team	
RECON Director of Eastern Operations	Joe Naselli
RECON Project Director	Todd King
RECON Project Manager	Larry Endicott
RECON Site Manager	Douglas Jumper
RECON Site Superintendent	Carl Walker
RECON Site Superintendent	Scott Sutton
RECON Site Safety Officer	Rodney Cockerel
RECON Program Health and Safety Manager	Brad Lockhart
RECON VP HSE	Jeff Watts
RECON VP of Eastern Operations	Richard Badis

3.8 Contingency Response Plans

The table below provides a list of general emergency response equipment/kits to use as a reference by the Site project management team when setting up emergency response stations.

Medical General

A qualified first aid trained personnel SHALL:

- Assess and determine nature and location of the injury, equipment involved and if any further medical assistance requirement or need.
- Transport or arrange for transport after decontamination in accordance with RECON's incident table of responsibilities and flow charts located in SP-11 Medical Services for Occupational Injury Management and SP-19 Accident/Incident Reporting appendices. All site-specific safety procedures can be found on the RECON Health &Safety portal along with a binder in the field office trailer.

First Aid Kit Required: ☒ Yes ☐ No	**Type:** Standard field, including blood borne pathogen kit	**Location:** Field Crew Trailer/Site Field Vehicle, Field Office	**Special First Aid Procedures:** Cyanides on Site ☐ Yes ☒ No If yes, contact Local Medical Facility (LMF). Do they have antidote kit? ☐ Yes ☐ No
Eye Wash Required: ☒ Yes ☐ No	**Type:** 15-minute eye wash station and individual eye wash bottles for use in route to 15-minute eye wash station	**Location:** Field Crew Trailer/CONNEX storage location, Field Office	Hydrogen Fluoride on Site ☐ Yes ☒ No If yes, need neutralizing ointment for First Aid Kit
Shower Required: ☐ Yes ☒ No	**Type:**	**Location:**	**Procedure:**

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Spills In the event of a spill or release, ensure safety, assess situation and perform containment and set in place control measures as appropriate.	**Type:** Small spill response kits will be provided in each piece of equipment consisting of spill pads and a small roll of plastic.	**Location:** Equipment and Vehicles	**Procedure:** a. If small spill, clean up per SDS; Notify Emergency Coordinator (SSup or SSO) b. If large spill, Sound Alarm; Notify Emergency Coordinator (SSup or SSO) c. Evacuate to pre-determined muster location d. Account for all personnel e. Determine if Team can respond safely
Fire/Explosion In the event of a fire or explosion, ensure personal safety, assess situation and perform containment and set control measures into place, as appropriate	**Type:** 20-lb ABC	**Location:** All equipment, vehicles, field offices, and fueling stations.	**Procedure:** a. Use fire extinguisher, only if safe and trained b. Sound Alarm and call assistance, Notify SM, SSup, or SSO c. Evacuate to predetermined muster location d. Account for personnel e. Standby to inform Emergency responders of materials and conditions
Security Problems: Assess safety of field team, contact local police if necessary (911). If unknown person appears on site, ask person(s) to leave, avoid confrontation, and call security.			

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4. Site Specific Hazard Evaluation

A JHA will be filled out at the start of any project and prior to the project team starting any new task in a sub-area within the overall project boundary. A JHA review meeting and a thorough job walk will be performed by the Site Management Team: the SM, SSup, SSO and Task Leaders to first identify all tasks within the project scope of work.

Once all tasks have been identified and documented on the JHA form, the team will perform a "hazard hunt" on each task and document the findings on the JHA. Once the hazards have been identified and documented, the team will develop a mitigation plan for each hazard. The mitigation for each hazard will be documented on the JHA, as well as any control documents that will be used to mitigate the hazards (i.e., JSA, JMP), or combination of documents).

The project team will then identify, and include in the JHA, any specialized training or orientations an employee will need prior to performing work. In addition, the RECON SM and/or SSup are required to ensure that the required mitigations and engineering controls have been installed, after which the CM and/or SSup will get validation of completion and final approval to start work by the PM prior to movement of any equipment other than foot traffic into any areas designated as the "work area". If equipment is needed to install necessary mitigations or controls this same procedure is to be used.

The CM and/or SSup must notify and get approval from the PM to start work and mobilize into the "work area". Refer to RECON's SP-17 (Hazard Analysis and Planning Procedure, section 13.0 JHA Template) for more information.

4.1 Health and Safety Evaluation – Biological Hazards of Concern

The below table provides general guidance as to biological hazards that may be found at the Site. A more comprehensive list can be found in the site-specific Habitat Best Management Practice Manual and Wildlife Protection Plan/Measures.

☒ **Animals, Snakes, Reptiles, Insects, Ticks, Poisonous Plants**			☒ **Other Biological Hazards (list)**		
Source Black Widow, Brown Recluse, Brown Widow, Wildlife	☐ Known	☒ Suspect	**Source** Poison oak/ivy	☐ Known	☒ Suspect
Route of Exposure	☐ Inhalation ☒ Contact	☐ Ingestion ☒ Direct Penetration	**Route of Exposure**	☐ Inhalation ☒ Contact	☐ Ingestion ☐ Direct Penetration
☒ SP 41 – Bloodborne Pathogens Exposure Control Plan			☒ SP 11- Medical Services, Occupational Injury Management & First Aid Procedures		
Note: A tetanus injection is recommended every 10 years for employees with normal exposure risks. If employees have frequent potential for exposure at "higher risk," such as working with raw sewage, then a frequency of 7 years is recommended.					

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4.2 Health and Safety Evaluation – Radiological Hazards of Concern

While radiological hazards do not appear to be present outside of ultraviolet (UV Rays) rays, the below tables should be referenced during the review of this plan when communicating radiological concerns.

Non-ionizing Radiation
(Non-ionizing radiation types include ultraviolet, infrared, radio frequency, microwave, and laser)

Task #	Type	Onsite Source	TLV/PEL	Wavelength Range	Control Measures	Monitoring Instrument
All	Solar	none	n/a	n/a	Sunscreen	Visual

Ionizing Radiation

Task #	Radionuclide	Major Radiations	Radioactive Half-Life (years)	DAC (µCi/mL)			Surface Contamination Limit	Monitoring Instrument
				D	W	Y		

4.3 Source/Location of Contaminants and Hazardous Substances

The below table provides known or presumed locations of chemicals of potential concern (COPCs) and hazardous substances at the Site. In the event COCs or hazardous substances are found outside of the below areas noted, this section should be updated and communicated to all site personnel.

Directly related to tasks Outlined in Section 5.0 of this plan.	Indirectly related to tasks Nearby processes that could affect employees
☐ Air ☐ Other surfaces ☒ Groundwater ☒ Soil ☐ Surface water ☐ Sanitary water ☐ Process water ☐ Other _____	☒ Client facility/RECON work location ☐ Nearby non-client facility (Describe) ☐ Have activities (tasks) been coordinated with facility?

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5. Project Tasks to Be Performed

Outlined below are the planned tasks to be performed by RECON along with a short narrative of the description of activities for each task. Task durations are only an estimate. Please reference the project schedule for a more accurate representation. Prior to starting the below listed tasks, the project management team should perform daily hazard analysis reviews and complete all associated job safety analysis, permits and inspections.

Background Review	☒ Complete	☐ Partial	If partial, why?

Activities covered under this plan

No.	Task/Subtask	Description	Task Duration (Est. days)	CMP Area	PMP Area	OCDA
1	Mobilization	Mobilize equipment, crews, project trailer, and temporary facilities to the jobsite.	Initial - 10 Days Ongoing as needed	x	x	x
2	Site Preparation	Begin setting up the project site controls. These controls include installing signage, establishing temporary facilities, BMPs, snake fencing, Decontamination Zone (DZ) set-up, SESC measures, utility clearance measures, and site-specific training	Initial – 10 Days CMP – 5 Days PMP – 5 Days OCDA – 5 Days	x	x	x
3	Site Security	In accordance with site security plan, establish LOD boundary for remedial operations prior to conducting any activities.	On going	x	x	x
4	Air Monitoring	RECON will retain the services of Emilcott Technologies (Emilcott), for support in the performance of community/perimeter air monitoring for dust and volatile organic compounds (VOCs) in accordance with the Technical Specification Section 00 73 19 Health and Safety Requirements. Additional personnel monitor will be performed by RECON SSO along with daily exclusion zone air monitoring during soil removal.	On going	x	x	x

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Activities covered under this plan						
No.	Task/Subtask	Description	Task Duration (Est. days)	CMP Area	PMP Area	OCDA
5	Vibration Monitoring	RECON will retain the services of Vibratech, specializing in the generation of vibration monitoring plans and performance of installation of system and oversight during active vibration monitoring.	On going	x	x	x
6	Dust and Odor Control	RECON will perform odor and dust monitoring within the work zones during the execution of work and furnish and operate a minimum of one (1) particulate meter and one (1) 5-gas meter (oxygen [O_2], hydrogen sulfide [H_2S], Lower Explosive Limit [LEL], carbon monoxide [CO], photoionization detector [PID]) within each work zone. Providing dust suppression taking the appropriate measures preventing the release of fugitive dust or silica during earthwork activities, concrete/pavement cutting and sawing activities	On going	x	x	x
7	Surveying Activities	Perform site survey actives that will include all vertical and horizontal layout controls, limits of attainment, LOD, wetland/riparian zone delineation; survey as-built conditions.	On going	x	x	x
8	Clearing & Grubbing	Clearing and grubbing will be required at all three areas to facilitate the removal of potentially impacted material and/or the performance of cut/fill operations.	31 Days	x	x	x
9	Stormwater Management	RECON will effectively manage surface water accumulation and flow to minimize the entrance of water into open excavations. Where excavations cannot be immediately backfilled, upgradient berms will be constructed with clean material generated during the excavation activities. The berms will be maintained to divert stormwater around the excavation and ultimately utilized as backfill material.	On going		x	

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Activities covered under this plan						
No.	Task/Subtask	Description	Task Duration (Est. days)	CMP Area	PMP Area	OCDA
10	Dewatering/Water Treatment	RECON will utilize mobile, temporary sumps to dewater active excavation areas during excavation and to remove standing water where present. RECON will maintain a water treatment system (WTS) on-site for treatment of collected water and discharge back to groundwater.	On going		x	
11	Temporary Material Stockpile	Establishment of temporary material stockpile areas will be required at only the PMP Area for all material requiring excavation. The other areas may require stockpile areas for impacted material discovered during cut/fill operations.	On going	x	x	x
12	Excavation of Impacted Material	Removal of potentially impacted material and/or cut fill operations at each of the three land ACs differ in scopes of work and associated approaches to render the areas suitable for site restoration. At all areas, the removal of large rock outcroppings and/or boulders will be left in place if standard excavation machinery is incapable of moving them. Material surrounding the rock will be removed to the greatest extent possible, but the rocks will not be further decontaminated via pressure washing.	CMP – 1 Day PMP – 55 Days OCDA – 34 Days	x	x	x
13	Backfill of Excavations	Excavated material will be approved for reuse as backfill and grading material will be redistributed to achieve design subgrades. Where additional material is required to achieve design subgrades, material meeting the project specifications will be imported as necessary at each AC.	CMP – 1 Day PMP – 65 Days OCDA – 34 Days	x	x	x
14	Installation of Cap	RECON will install a cover system at each AC consisting of a layer of geotextile, 18-inches of clean, imported fill and 6-inches of clean topsoil.	CMP – 28 Days PMP – 44 Days OCDA – 38 Days	x	x	x

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Activities covered under this plan						
No.	Task/Subtask	Description	Task Duration (Est. days)	CMP Area	PMP Area	OCDA
15	Site Restoration	Backfilling and restoring the area by planting grass, shrubs, trees and asphalt in select areas. Also includes the decommissioning of the existing Recycling Center.	CMP – 10 Days PMP – 20 Days OCDA – 11 Days	x	x	x
16	Recycling Center Construction	RECON will construct a new Ringwood Recycling Center consisting of support utilities, building, asphalt/concrete cover installation, retaining wall, canopy, storage container bin walls, curbing and access roads.	80 Days			x
17	Demobilization	Demobilize equipment, crews, any temporary facilities from the jobsite.	10 Days	x	x	x

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6. Types of Hazards and Analysis

Hazard analysis is an effective tool for the identification and control of hazards in the workplace that is crucial to the success of an effective safety program. In the workplace, each site and every task present their own unique types of hazards. It is through the control of hazards that the frequency and severity of accidents is reduced, resulting in parallel reduction in human and financial costs.

The below table, while not all inclusive, has been prepared for employees to reference and apply for the work being performed at the Site. The boxes checked within the table reference the tasks outlined in Section 5.0. Any box not checked should be evaluated when completing the task specific safety analysis. It is the responsibility of those performing the work to understand and comply with legal and regulatory requirements and RECON's policies and procedures.

Hazard Analysis Table Types of Hazards:

A JHA/JSA evaluation form will be completed for each task number listed in Section 5 of this HASP prior to starting work activities. Mark the appropriate hazards that exist, below, for all the tasks listed in Section 5 for each appropriate hazard class.

<table>
<tr><th>Physiochemical</th><th>Chemically Toxic</th><th>Radiation</th><th>Biological</th></tr>
<tr><td rowspan="2">☐ Flammable
☐ Explosive
☐ Corrosive
☐ Reactive
☐ O_2 Rich
☐ O_2 Deficient</td><td rowspan="2">☐ Inhalation ☐ Mutagen
☒ Ingestion ☐ Teratogen
☒ Contact
☐ Absorption
☒ Carcinogen</td><td rowspan="2">Ionizing
☐ Internal exposure
☒ External exposure

Non-ionizing
☒ Ultra violet (UV) ☐ Infrared (IR)
☐ Radio Frequency (RF) ☐ Microwave
☐ Laser</td><td>☐ Etiological Agent
☒ Other (plant, animal)</td></tr>
<tr><td>Physical Hazards
☒ Construction Activities</td></tr>
<tr><td></td><td>☒ OSHA 1910.1000 Substance (Air Contaminants/ OSHA Specific Hazards Substance Standard)</td><td></td><td></td></tr>
</table>

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7. Personal Protection Plan

In accordance with RECON's PPE Program and 29 CFR 1926, at each of the land ACs, prior to personnel beginning work, the SSO, SM, or SSup will evaluate Site conditions and verify that the PPE selection outlined within this HASP is appropriate for the hazards known or expected to exist. Changing Site conditions and PPE requirements will be evaluated daily or as conditions change as part of the JSAP process. A copy of this HASP is always to be maintained on-site.

The SSO is responsible for verifying all certifications and fit tests.

Fit Test Current: Respirator Fit Testing – All persons, including visitors, entering any area requiring the use or potential use of any negative pressure respirator must have had as a minimum, a qualitative fit test, administered in accordance with OSHA 29 CFR 1910.134 or American National Standards Institute (ANSI) within the last 12 months. If conditions with the ACs require the use of a full-face negative pressure, air purifying respirator for protection from Asbestos or Lead, employees must have had a qualitative fit test, administered according to OSHA 29 CFR 1910.1001 or 1025 within the last 6 months.

Medical Current: All personnel, including visitors, entering the Exclusion Zone (EZ) or CRZ must be certified as medically fit to work, and to wear a respirator, if appropriate, in accordance with 29 CFR 1910 and 29 CFR 1926.

Subcontractors: Subcontractors will each conduct their own appropriate safety planning to meet RECON's and the Owner's requirements. Subcontractors must also prepare their own Subcontractor HASP, which must cover activities specific to their portion of the work and be submitted prior to mobilization. At a minimum, the Subcontractor HASP must meet the requirements of this HASP and provide safety equipment and safeguards suitable for the hazards involved.

Controls	Mitigation	Tasks
Engineering Controls Describe engineering controls used as part of personal protection plan	Dust minimization by misting with the water truck, etc. to maintain dust levels below action levels based upon air monitoring results.	All
Administrative Controls Describe administrative controls used as part of personal protection plan	Appropriate work zone delineation. All field personnel: medical monitoring clearance. Blood borne pathogens, and extensive field experience, BBS training, supervisory training, site specific training (HASP, asbestos, rigging, EAP, respiratory protection, Hazard Communication)	All
Personal Protective Equipment List initial PPE for each task	Level D PPE Minimum	All

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7.1 Description of Protection Levels

Before field activities begin, RECON management will review all available information to make an informative decision on the types of PPE required. The type(s) of PPE usage shall be dependent upon the type of activity, the conditions of the site, concentration of contaminants, hazards present, and Owner requirements. A written activity hazard analysis will be completed for each task documenting the findings and the PPE expectations.

The below table SHALL be referenced and updated as needed for each of the tasked to be performed. If it is determined that the noted PPE is excessive or inadequate after completing the PPE assessment, the table will be updated and communicated to all site personnel.

Specific tasks	Task 1-Moblization	Task 2 - Site Preparation	Task 3- Site Security	Task 4- Air Monitoring	Task 5 - Vibration Monitoring	Task 6- Dust and Odor Control	Task 7- Surveying Activities	Task 8- Clearing & Grubbing	Task 9- Stormwater Control	Task 10- Dewatering	Task 11- Material Stockpile	Task 12- Excavation	Task 13- Backfill	Task 14- Install cap	Task 15- Restoration	Task 16- Recycling Center Construction	Task 17-Demoblization	Conditions Requiring Use
Head Protection																		
Hard Hat	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	Always within work zone
Hard Hat-Side Impact Protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Welding Hood/Shield	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Ear Protection																		
Ear Plugs	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	As needed unless decibel level is over 85 decibels
Earmuffs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Eye Protection																		
Safety Glasses (Spoggals)	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☒	☒	☒	☒	As part of RECON's COVID 19 Action Plan included in Attachment C of this HASP.
Face Shield	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Anytime pressure washing is needed.
Goggles	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

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Specific tasks	Task 1-Moblization	Task 2 - Site Preparation	Task 3- Site Security	Task 4- Air Monitoring	Task 5 - Vibration Monitoring	Task 6- Dust and Odor Control	Task 7- Surveying Activities	Task 8- Clearing & Grubbing	Task 9- Stormwater Control	Task 10- Dewatering	Task 11- Material Stockpile	Task 12- Excavation	Task 13- Backfill	Task 14- Install cap	Task 15- Restoration	Task 16- Recycling Center Construction	Task 17-Demoblization	Conditions Requiring Use
Hand Protection (must be high visibility)																		
Heat Resistant (leather palm)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Chemical Resistant – Heavy Duty	☒	☒	☐	☐	☒	☐	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☐	As needed when refueling or exposed to contaminated material.
Chemical Resistant – Surgical	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☐	☐	☐	☐	When there is an exceedance requiring upgrade to level C or when there are interactions with others, hard surfaces and general-purpose construction gloves are not being worn. Collection of soil and water samples.
Silvershield	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Level 4 Laceration Resistant Work Gloves	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	Any time a cutting tool is needed.
Laceration Resistant Liners	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Impact/Anti-Vibration Gloves	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Foot Protection																		
Safety Toe	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	
Chemical Resistant Covers	☐	☐	☐	☐	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	As needed when handling chemicals – refer to SDS in RECON Office Trailer for specific requirements

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Specific tasks	Task 1-Moblization	Task 2 - Site Preparation	Task 3- Site Security	Task 4- Air Monitoring	Task 5 - Vibration Monitoring	Task 6- Dust and Odor Control	Task 7- Surveying Activities	Task 8- Clearing & Grubbing	Task 9- Stormwater Control	Task 10- Dewatering	Task 11- Material Stockpile	Task 12- Excavation	Task 13- Backfill	Task 14- Install cap	Task 15- Restoration	Task 16- Recycling Center Construction	Task 17-Demoblization	Conditions Requiring Use
Chemical Resistant Composition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Metatarsal Cover	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Body Protection																		
Fire Resistant Clothing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Poly-Coated Tyvek Coveralls	☐	☐	☐	☒	☒	☐	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	As needed – Determined during JSAP development
Chemical Resistant Apron (Splash)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Retro-reflective High Visibility Vest or outer layer	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	Always when within work zone or high traffic areas
Cooling Vest	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Lightning Indicator	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Respiratory Protection																		
Air Purifying Respirator – Half Face	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Air Purifying Respirator – Full Face	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Cartridge – Organic Vapor	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Cartridge – Particulate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

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Specific tasks	Task 1-Moblization	Task 2 - Site Preparation	Task 3- Site Security	Task 4- Air Monitoring	Task 5 - Vibration Monitoring	Task 6- Dust and Odor Control	Task 7- Surveying Activities	Task 8- Clearing & Grubbing	Task 9- Stormwater Control	Task 10- Dewatering	Task 11- Material Stockpile	Task 12- Excavation	Task 13- Backfill	Task 14- Install cap	Task 15- Restoration	Task 16- Recycling Center Construction	Task 17-Demoblization	Conditions Requiring Use
Cartridge – Acid Gas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Cartridge – Ammonia	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Escape Respirator	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
PAPR	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
SCBA Airline with Escape	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Face Mask COVID 19	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	Review RECON's COVID 19 Action Plan (included in Attachment C of this HASP) for when a face mask is required during site activities.
Biological Protection																		
Insect Repellent – DEET	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	As needed – Determined during JSAP development
Insect Repellent – Permethrin	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Poison Ivy Barrier Cream	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	As needed – Determined during JSAP development
Snake Chaps	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	As needed – Determined during JSAP development
Tick Gators	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	As needed – Determined during JSAP development
Fall Protection																		
Barriers / Guard Rails	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Restraint Device	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

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Specific tasks	Task 1-Moblization	Task 2 - Site Preparation	Task 3- Site Security	Task 4- Air Monitoring	Task 5 - Vibration Monitoring	Task 6- Dust and Odor Control	Task 7- Surveying Activities	Task 8- Clearing & Grubbing	Task 9- Stormwater Control	Task 10- Dewatering	Task 11- Material Stockpile	Task 12- Excavation	Task 13- Backfill	Task 14- Install cap	Task 15- Restoration	Task 16- Recycling Center Construction	Task 17-Demoblization	Conditions Requiring Use
Personal Fall Arrest System	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☐	☐	☐	As needed during equipment inspection/maintenance
Water Protection																		
Personal Flotation Device	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Waders	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Other																		
Life Rings and Rope Lines	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

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8. Site or Project Hazard Monitoring Program

The Site may warrant air monitoring and sampling to quantify concentrations of COPCs. An initial review of the Site air monitoring and sampling needs will be based off current and historical air monitoring data. Periodic reviews of the project will also be performed at both the project and RECON Corporate levels to determine if site conditions have changed or additional monitoring or controls are needed. Community Air monitoring will also be performed separately as part of the CAMP which is included in Appendix D of the OU-2 RAWP.

8.1 Health and Safety Evaluation – Site Sampling Activities

The following table is utilized as a reference during the review of the HASP when developing task-specific safety analysis. Real time air monitoring events will be conducted utilizing the air monitoring instruments checked below for the task identified. In the event additional air monitoring techniques or equipment is required, this section will be updated and communicated to all site personnel.

Is sampling to be conducted?	☒ Yes	☐ No	If yes, list analytical parameters: lab analysis will be completed on an as needed basis. The determinations of sampling will be made based off real time data for each of the known COPCs listed in Section 8.2 of this plan.
Is sampling subsurface?	☒ Yes	☐ No	If yes, call the applicable dig safe coordinating agency for this state. International Work should follow applicable European Commission, American National Standard and/or International Standard Organization.

Direct Reading Air Monitoring Instruments:					
Instrument selection and initial check record					
Reporting Format:	☒ Field logbook	☐ Field data sheets	☒ Air monitoring log	☐ Trip Report	☐ Other – electronic download

Instrument	Task No(s)	Instrument No.	Checked on receipt	Comment	Initials
☐ Combustible Gas Indicator (CGI)/O_2			☐		
☒ CGI/O_2/H_2S/CO (MultiRAE)	8,10,11,12,13,14		☐	During all excavation or handling of impacted residual activities.	
☐ RAD			☐		
☐ Micro-R			☐		

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Instrument	Task No(s)	Instrument No.	Checked on receipt	Comment	Initials
☐ GM			☐		
☐ Other			☐		
☒ PID (MultiRAE)	8,10,11,12,13,14		☐	During all excavation or handling of impacted residual activities.	
☐ PID (AreaRAE)			☐		
☐ Flame Ionized Detector (FID)			☐		
☒ Real-Time Aerosol Monitor (RAM), Mini-RAM, Other, PDR 1000AN	All		☐		
☐ Mercury Vapor Analyzer			☐		
☐ MonoTox			☐		
☐ H_2S			☐		
☐ Chlorine (CL2)			☐		
☐ Hydrogen Cyanide (HCN)			☐		
☐ Other			☐		
☐ Pump- Dräeger			☐		
☐ Tubes/type: Ammonia; Benzene, Toluene, Ethylbenzene, Xylene (BTEX)			☐		
☐ Other- Dräeger CMS- Benzene Monitor			☐		
☐ Chlorine Meter			☐		
☐ Ammonia Meter			☐		
☒ Personal/Area Sampling	8,11,12,13,14		☐		
☐ Asbestos			☐		
☒ Lead	8,11,12,13,14		☐		
☐ Other			☐		
☐ Other (List):			☐		

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8.2 Health and Safety Evaluation – Chemical Hazards

The below table outlines the COPCs at the Site and corresponding action levels and exposure characteristics. Information about each of the listed potential COCs can be found in the specific SDS, located in Attachment A of this HASP, or National Institute of Occupational Safety and Health (NIOSH) pocket guide or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) booklet.

Contaminant	TWA/IDLH	Source of Concentration Onsite	Route of Exposure	Acute Exposure Symptoms	First Aid	Real Time Monitoring Devices
Aldrin	0.25 mg/m3 / 25 mg/m3	Soil	Inh, Abs, Ing, Con	Head; dizz; nau, vomit, mal; myoclonic jerks of limbs; clonic, tonic convuls; coma; hema, azotemia; [carc]	Eyes: Irrigate immediately Breath: Resp support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Aluminum	10 mg/m3 / Not Determined	Groundwater	Inh, Con	Irrit eyes, skin, resp sym	Eyes: Irrigate immediately Breath: Fresh Air	visual, olfactory, dust monitor
Antimony	0.5 mg/m3 / 50 mg/m3	Soil	Inh, Ing, Con	Irrit eyes, skin, nose, throat, mouth; cough; dizz; head; nua, vomit, diarr; stomach cramps; insom; anor; unable to smell properly	Eyes: Irrigate immediately Breath: Resp support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Arsenic	0.002 mg/m3 / 5 mg/m3	Soil and Groundwater	Inh, Abs, Con, Ing	Ulceration of nasal septum, derm, GI disturbances, peri neur, resp irrit, hyperpig of skin; [carc]	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Barium	0.5 mg/m3 / 50 mg/m3	Soil	Inh, Ing, Con	Irrit eyes, skin, upper resp sys; skin burns; gastrenteritis, musc spasm; slow pulse, extrasystoles, hypokalemia	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Water flush Imm	visual, olfactory, dust monitor

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Benzene	0.1 ppm / 500 ppm	Soil and Groundwater	Inh, Abs, Ing, Con	Irrit eyes, skin, nose, resp sys, dizz, head, nau, staggered gait; anor, lass; derm; bone marrow depres; [carc]	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Soap wash immed	PID, visual, olfactory, dust monitor
Benzo (a) Pyrene	0.2 mg/m3 / 80 mg/m3	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Skin: Water flush prompt Breath: Respiratory support Swallow: Medical attention	PID, visual, olfactory, dust monitor
Benzo(k)flouranthene	Not Determined	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Breath: Fresh air	PID, visual, olfactory, dust monitor
Bis (2-Ethylhexyl) Phthalate	5 mg/m3 / 5000 mg/m3	Soil and Groundwater	Inh, Ing, Con	Irrit eyes, muc memb; in animals: liver damage; terato effects; [carc]	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately	PID, visual, olfactory, dust monitor
Cadmium	0.5 mg/m3 / 250 mg/m3	Soil	Inh, Ing	Pulm edema, dysp, cough, chest tight, subs pain; head; chills, musc aches, nau, vomit, diarr, anos, emphy, prot, mild anemia; [carc]	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Chromium	0.5 mg/m3 / 250 mg/m3	Soil	Inh, Ing, Con	Irrit eyes, skin; lung fib	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Chrysene	0.1 mg/m3	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Breath: Resp support Swallow: Medical Attention immediately Skin: Soap wash immediately	PID, visual, olfactory, dust monitor
Fluoranthene*	Not Determined	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Breath: Fresh air	PID, visual, olfactory, dust monitor

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Indeno(1,2,3-cd)pyrene	Not Determined	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Breath: Fresh air	PID, visual, olfactory, dust monitor
Iron	5 mg/m3 / 2500 mg/m3	Groundwater	Inh	Benign pneumoconiosis and X-ray shadows indistinguishable from fibrotic pneumoconiosis	Breath: Resp support	visual, olfactory, dust monitor
Lead	0.050 mg/m3 / 100 mg/m3	Soil	Inh, Ing, Con	Lass, insom, facial pallor, anor, low-wgt, malnut, constip, abdom pain, colic, anemia, gingival lead line, tremor, para wrist, ankles, encephalopathy; kidney disease; irrit eyes; hypotension	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical Attention immediately Skin: Soap flush prompt	visual, olfactory, dust monitor
PCBs	0.001 mg/m3 / 5 mg/m3	Soil	Inh, Abs, Ing, Con	Irrit eyes, chloracne; liver damage; repro effects; [carc]	Eyes: Irrigate immediately Breath: Resp support Swallow: Medical Attention immediately Skin: Soap wash immediately	visual, olfactory, dust monitor
Pyrene	80 mg/m3	Soil	Inh, Con	Dermatitis, bronchial	Eyes: Irrigate immediately Breath: Resp support Swallow: Medical Attention immediately Skin: Soap wash immediately	PID, visual, olfactory, dust monitor
Sodium	2.5 mg/m3 / 250 mg/m3	Groundwater	Inh, Ing, Con	Irrit eyes, resp sys; nau, abdom pain, diarr; salv, thirst, sweat; stiff spine; derm; calcification of ligiments of ribs, pelvis	Eyes: Irrigate immediately Breath: Fresh air Swallow: Medical Attention immediately Skin: Water flush prompt	visual, olfactory, dust monitor
Thallium	0.1 mg/m3 / 15 mg/m3	Soil	Inh, Abs, Ing, Con	Nau, diarr, abdom pain, vomit; ptosis, strabismus; peri neuritis, tremor; retester	Eyes: Irrigate immediately Breath: Resp Support Swallow: Medical	visual, olfactory, dust monitor

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				tight, chest pain, pulm edema; convuls, chorea, psychosis; liver, kidney damage; alopecia; pares legs	Attention immediately Skin: Water flush prompt	
Zinc	5 mg/m3 / 500 mg/m3	Soil and Groundwater	Inh	Metal fume fever; chills, musc ache, nau, fever, dry throat, cough; lass; metallic taste; head; blurred vision; low back pain; vomit; mal; chest tight; dysp, ralesdecr pulm func	Breath: Respitory support	visual, olfactory, dust monitor

KEY:

ppm - parts per million
TWA - Time weighted Average
IDLH - Immediate Danger to Life and Health
prot - Proteinuria
mg/m^3 - miligrams per cubic meter
verti - Vertigo (an illusion of movement)
som - Somnolence (sleepiness, unnatural drowsiness)
Inh - Inhalation
Ing - Ingestion
Con - Skin or Eye Contact
com opac - Com Opacity
Abs - Skin Absorption
anos - Anosmia (loss of sense of smell)
drow - Drowsiness
anor - Anorexia
nau - Nausea
diarr - Diarrhea
pulm - Pulmonary
eryt - Erythema (skin redness)
perf - Perforation
gidd - Giddiness
ftg - Fatigue
emphy - Emphysema
lass - Lassitude (weakness, exhaustion)
dysp - Dyspnea (breathing difficulty)

NOTES:

* denotes that contaminant is not listed in September 2005 "Pocket Guide to Chemical Hazards

All values obtained from the National Institute for Occupational Safety and Health (NIOSH) "Pocket Guide To Chemical Hazards," September 2005 edition.

To obtain other information about occupational safety and health problems, call 1-800-356-4674 or visit the NIOSH website at www.cdc.gov/niosh

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OSHA Site Specific Hazardous Substances

The following substances may require specific medical, training, or monitoring based upon concentration or evaluation of risk. The list below will continue to be evaluated and revised, as necessary, throughout the duration of the project. See the appropriate citation listed under 29 CFR 1910, 1926 and Cal/OSHA title 8 for additional information.

☐ 1910.1001 Asbestos	☐ 1910.1002 Coal tar pitch volatiles	☐ 1910.1003 4-Nitrobiphenyl
☐ 1910.1004 alpha-Naphthylamine	☐ 1910.1005 [Reserved]	☐ 1910.1006 Methyl chloromethyl ether
☐ 1910.1007 3,3'-Dichlorobenzidine (and its salts)	☐ 1910.1008 bis-Chloromethyl ether	☐ 1910.1009 beta-Naphtylamine
☐ 1910.1010 Benzidine	☐ 1910.1011 4-Aminodiphenyl	☐ 1910.10125 Ethyleneimine
☐ 1910.1013 beta-Propiolactone	☐ 1910.1014 2-Acetylaminofluorene	☐ 1910.1015 4-Dimethylaminoazobenzene
☐ 1910.1016 N-Nitrosodimethylamine	☐ 1910.1017 Vinyl chloride	☐ 1910.1018 Inorganic arsenic
☒ 1910.1025 Lead	☐ 1910.1027 Cadmium	☒ 1910.1028 Benzene
☐ 1910.1029 Coke oven emissions	☐ 1910.1043 Cotton Dust	☐ 1910.1044 1, 2-dibromo-3-chloropropane
☐ 1910.1045 Acrylonitrile	☐ 1910.1047 Ethylene Oxide	☐ 1910.1048 Formaldehyde
☐ 1910.1050 Methylenedianiline	☐ 1910.1051 1, 3 Butadiene	☐ 1910.1052 Methylene chloride

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9. Site Work Zone Air Monitoring Program

The table below summarizes the parameters that RECON will monitor using real time monitoring equipment within the active work zone to protect personnel from any potential or prolonged exposures to the COPCs. This table includes Action Levels that will be monitored and the associated action that will occur in the event that one of these action levels is encountered. These Action Levels, if not defined by regulation, are 50% of the applicable PEL/REL/TLV. The Action Levels may be adjusted, if necessary, to account for instrument response factors. If specific Site analytical data are provided that requires RECON to amend the Action Levels, below, then RECON's safety management team will make appropriate adjustments for each contaminant. In addition to the work zone monitoring, RECON will also perform community air monitoring at the perimeter of the ACs as part of the CAMP which is provided as Appendix D of the OU-2 RAWP.

	Tasks	Action Levels		Action
		Ambient Air Concentration	Confined Space Concentration	
☐ Explosive Atmosphere				
		<10% LEL	0 to 1% LEL	Work may continue because the value is within safe working conditions or not a risk to health and safety. Consider toxicity potential.
		10 to 25% LEL	1 to 10% LEL	Work may continue because the value is within safe working conditions or not a risk to health and safety. However, increase monitoring frequency and evaluate the need to implement additional engineering controls.
		>25% LEL	>10% LEL	Work shall stop. Ventilate area. Engage with RECON VP of HSE, Jeff Watts, to discuss exposure hazards/risks prior to resuming work.
☐ Oxygen				
		<19.5% O_2	<19.5% O_2	Leave area. Re-enter only with self-contained breathing apparatus. Work will stop, and exposure hazards/risks will be discussed with the VP HSE prior to resuming work.
		19.5 to 25% O^2	19.5 to 23.5% O_2	Work may continue because the value is within safe working conditions or not a risk to health and safety. Investigate changes from 21%.
		>25% O_2	>23.5% O_2	Work must stop. Ventilate area before returning. Exposure hazards/risks will be discussed with the VP HSE prior to resuming work.
☒ Particulates				
Silica or Visible Dust-Particles Not Otherwise Specified (PNOS)	All	<0.025 mg/m^3		Continue work and monitor air because the value is within safe working conditions or not a risk to health and safety.
	All	At 0.025 mg/m^3		Initiate dust suppression (through the application of water) to eliminate visible dust or stop work to redesign task to reduce the dust emissions. **0.5 mg/m3 Threshold Limit Value - Time Weighted Average (TLV-TWA) will be used as the Site Action Level for upgrade of PPE for**

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	Tasks	Action Levels		Action
		Ambient Air Concentration	Confined Space Concentration	
				protection against potential exposure for contaminated particulates. (ACGIH TLV-TWA of 0.025 mg/m3 PNOS).
	All	Dust Levels > 0.025 mg/m^3 to < 0.05 mg/m^3		Upgrade to Level C - Use full-face respirators with OV/CL/SD/CD/HC/HS P100 cartridges.
	All	At 0.05 mg/m^3		Upgrade to Level B – Use Self-Contained Breathing Apparatus (SCBA) or cascade system with airline respirator and 5-minute escape bottles. Stop Work, contact VP HSE for discussion on exposure hazards/risks before further upgrade.
☒ Organic Gases and Vapors				
VOCs		< 5.0 ppm (Units)		Level D and continue air monitoring (MultiRAE) because the value is within safe working conditions or not a risk to health and safety.
		< 0.1 ppm for Benzene Specific Monitor		Level D and continue air monitoring (Benzene Chip Measurement System (CMS) monitor or Dräeger w/colorimetric tubes).
VOCs		= 5.0 ppm (Units) Sustained in the breathing zone (1 min. or longer)		Notify SSO, determine if readings are spikes or are continuous levels. Based on conditions and air monitoring, work will proceed after the proper PPE level is determined by the VP HSE and will follow NIOSH publications. Air monitoring will continue with the AreaRAE and MultiRAE.
		0.1 to 0.5 ppm for Benzene Specific Monitor		Same as above in this box. Air monitoring will continue with the Benzene CMS monitor or Dräeger w/colorimetric tubes.
VOCs		> 5 ppm (Units) Sustained in the breathing zone (1 min or longer) Toluene > 10 ppm Ethylbenzene > 10 ppm Xylene > 50 ppm		Stop Work and evacuate affected area. Check Benzene CMS monitor and use a Dräeger hand pump with a Toluene 5/b, Ethylbenzene 30/a, & Xylene 10/a tube to determine if any of the BTEX compounds are causing the increase in readings by the PID. Consult VP HSE before work continues and re-assess work area. Work will not continue without an upgrade to Level C unless the conditions listed below are all under their required Action Levels based upon direct reading Dräeger Colorimetric Tubes. Frequency of sampling will be during the conditions that will release the highest number of VOCs (e.g., digging contaminated dirt, loading/stock piling contaminated dirt).
VOCs		> 250 ppm (Units)		Stop Work and evacuate affected area based on MultiRAE readings. Upgrade to Level B will be required and an amendment to this HASP.
		5.0 ppm for Benzene Specific Monitor		Stop Work and evacuate affected area based on Benzene CMS monitor or Dräeger w/colorimetric tubes. Upgrade to Level B will be required and an amendment to this HASP.
☒ Inorganic and Particulates				

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	Tasks	Action Levels		Action
		Ambient Air Concentration	Confined Space Concentration	
Particulates	All	Same as for Particulates above.		Same as for Particulates above.
Inorganics		Same as for Organic Gases and Vapors		Same as for Organic Gases and Vapors.

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Attachment A: Chemical Contaminants Data Sheets

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Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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Health and Safety Evaluation – Chemical Hazards

The below Health and Safety Evaluation table is a tool that will be completed by the project management team prior to beginning each task and used in the development of task specific safety analysis.

<table>
<tr><th>Hazardous Substance/ Tasks</th><th>Physical Properties</th><th>Normal Physical State</th><th>State at Site/ Proj. Temp.</th><th>Characteristics</th><th>Exposure Limits</th><th>Route(s) of Exposure/ Symptoms</th><th>Monitoring Instruments/ Ionization Potential + % Response</th></tr>
<tr><td rowspan="3">Hot Work Activities</td><td rowspan="6">☐ Explosive
☐ Flammable
☐ Corrosive
☐ Reactive
☐ Water Reactive
☐ Oxidizer
☐ Radioactive
☐ Other</td><td>☒ Solid
☐ Liquid
☐ Gas</td><td>☒ Solid
☐ Liquid
☐ Gas</td><td>Potential of Hydrogen (pH):</td><td rowspan="6">☐ Circulating Air (CA):
☐ Permissible Exposure Limit (PEL)
☐ Threshold Limit Value (TLV)
☐ Immediately Dangerous to Life and Health (IDLH)
☐ Only Toxicological Data Available
☐ Other</td><td rowspan="3">☐ Inhalation
☐ Ingestion
☐ Skin Absorption
☐ Contact
☐ Direct Penetration
☐ Other</td><td rowspan="3">☒ Photoionization Detector (PID)
☐ 11.7 eV (Electron-volts)
☐ 10.6 eV
☐ 9.6 eV
☐ Organic Vapor Monitor (OVM)
☐ Combustible Gas Indicator (CGI)
☐ Organic Vapor Analyzer (OVA)
☐ Other</td></tr>
<tr><td>Flash Point (FP):</td></tr>
<tr><td>Lower Explosive Limit (LEL):</td></tr>
<tr><td rowspan="3">Chemical Abstracts Service (CAS) No:</td><td rowspan="2">Incompatible with:</td><td>Upper Explosive Limit (UEL):</td></tr>
<tr><td>Autoignition Temperature (Auto IG):</td></tr>
<tr><td>Boiling Point (BP):</td></tr>
<tr><td rowspan="5">Synonyms:</td><td rowspan="5">Melting Point (MP):
Specific Gravity
Vapor Density:
Vapor Pressure:
H_2O Soluble:
Other</td><td rowspan="5">Symptoms</td><td>Ionization Potential (IP):</td></tr>
<tr><td>% Response</td></tr>
</table>

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Attachment B: Safety Data Sheets

These regulations, within the framework of the Hazardous Communications Standard and the Global Harmonization Standard, require producers, importers, distributors or sellers of a hazardous substance to supply recipients with Safety Data Sheets (SDS), and call for the maintenance of an SDS in the factory or business in order to inform users about hazards in their workplace. The SDS compiles relevant data on a hazardous substance in a uniform format and provides information on how the material can be safely handled, used and stored. The regulations are based on the standards developed by the International Standard Organization, the American National Standard Institute and the guidelines of the United Nations.

Note: *SDS specific to the Site are located and maintained in RECON's field office with the Site Safety Officer.*

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Attachment C: Safety Procedures

The following is a list of RECON's Safety Procedures (SPs). All RECON SPs can be found on the RECON portal. Hard copies of RECON's SPs are also provided in RECON's on-site field office trailer.

RECON Safety Procedures

Safety Procedure	Procedure Name
1	General Safety Rules
2	Safety Incentive Procedure
3	Performance Reviews
4	Access to Employee Exposure and Medical Records
5	Disciplinary Procedure
6	Behavioral Based Safety
7	Stop Work Authority
8	Substance Abuse Policy
9	Short Service Employee
10	Medical Surveillance
11	Medical Services Occupational Injury Management
12	Health and Safety Plan Procedure
13	Health and Safety Meeting Procedure
14	Health and Safety Training Procedure
15	Safety Inspection Form, Senior Management
16	Hazard Communication Procedure
17	Hazard Analysis Planning Procedure
18	Job Safety Analysis Procedure
19	Accident/Incident Reporting
20	Process Safety Management Procedure
21	Decontamination
22	Site Control Procedure
23	Hearing Conservation
24	Heat – Cold Stress Procedures
25	Personal Protective Equipment Procedures
26	Respiratory Protection Procedures
27	Confined Space Entry
28	Electrical Work Procedures
29	Ground Disturbance and Excavation
30	Ladder Safety Procedures
31	Fall Protection Procedures
32	Fire Safety Procedure
33	Heavy Equipment Procedure
34	Hoisting Rigging Procedure
35	Control of Haz Energy – Lock out Tag out
36	Sign and Tag Procedures
37	Welding, Cutting and Braising Procedure
38	Air Monitoring and Sampling Procedures
39	Management of Change
40	Benzene Awareness
41	Bloodborne Pathogens
42	Lead Awareness
43	Health and Safety Emergency Response Training
44	Motor Vehicle Operations
45	Competent Person Procedure
46	Environmental Drilling

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Safety Procedure	Procedure Name
47	Working Alone
48	Overhead Utilities
49	Permit to Work
50	Simultaneous Operations
51	Subcontractor Due Diligence
52	Boat Safety
53	In Plant Rail Safety
54	Hydrogen Sulfide (H_2S)
55	Fatigue Management
56	Journey Management Plan
57	Manual Handling
58	Compressed Gas Cylinders
59	Asbestos Awareness
60	Silica
61	Demolition Procedure

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RECON COVID 19 Action Plan

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COVID-19 (Coronavirus) Action Plan

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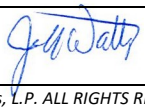
Approval: COVID-19 Action Plan

The following key project personnel have reviewed and have agreed to implement and comply with requirements of the Insert Project Name COVID-19 Action Plan established by RECON for the above indicated project.

Title	Name	Signature	Date
RECON National Safety Manager	Brad Lockhart		
RECON Project Manager			
RECON Superintendent			
RECON Site Safety Officer			
Client			
Oversight			

Issuing Authority	Signature	Date	Revision
Jeff Watts, VP of HSE		09/03/20	4

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Revision Log

Rev. No	Description	Date
1	Nitrile glove and cloth mask requirements – Section 6	04/09/20
1	Table 2 Cloth Mask Chart	04/09/20
1	Pandemic Flow Chart	04/09/20
1	Journey Management Plan	04/09/20
2	Added Section 10, Emergency Response	04/20/20
2	Attachment G JMP Subcontractors, Visitors & Vendors	04/20/20
2	Emergency Contact List Section 2	04/20/20
2	Added CISA documentation to Section 1	04/20/20
3	Travel recommendations in vehicles with more than one person	05/15/20
3	Recirculating air while traveling in vehicle with more than one person	05/15/20
3	Duration of time defined regarding prolonged exposure - Section 3	05/15/20
3	Definition of close contact - Section 3	05/15/20
3	Updated Table 2- Cloth Mask Donning Criteria	05/15/20
4	Section 7 – added exposure to somene who previously had COVID	09/02/20
4	Section 8 – Decreased return to work from 14 to 10 days	09/02/20
4	Section 9 – Added critical essential project exposure precautions	09/02/20
4	Reformatted Pandemic Flow Chart	09/02/20

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1. Purpose and Summary

This plan is a living document and designed to meet or exceed all local, state and Federal requirements as outlined based on Center for Disease Control (CDC) and best practice recommendations. Remedial Construction Services, L.P. (RECON) qualifies as a "Essential Critical Infrastructure Employer" delivering assistance and guidance to a broad range of partners in the Chemical, Energy and Hazardous Materials sectors. Please see **Attachment A for** more details and qualifications under the U.S. Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA). Our goal will be to keep the time needed for essential business functions away from home to a minimum, but this does not mean that all functions can work from home 100%. The purpose of COVID-19 (Coronavirus) Action Plan is to contain and/or manage an outbreak caused by COVID-19. With an outbreak of respiratory illness that was first identified in 2019 in Wuhan, Hubei Province of China, COVID-19 has become a pandemic. Since then, tens of thousands of cases have been confirmed spreading internationally, including in the United States.

CDC and World Health Organization (WHO), the coronaviruses are a group of related viruses that cause diseases in mammals and birds. In humans, coronaviruses cause respiratory tract infections that can be mild, such as some cases being a common cold, and others that can be lethal, such as SARS, MERS, and COVID-19. There are yet to be vaccines or antiviral drugs to prevent or treat human coronavirus infections however studies are ongoing.

Based on what is currently known about the coronavirus, it spreads from person-to-person occurring most frequently among close contact (within about 6 feet). This type of transmission occurs via respiratory droplets. Transmission of novel coronavirus to persons from surfaces contaminated with the virus is suspected as well. Transmission of coronavirus, in general, occurs much more commonly through respiratory droplets than through fomites. Current evidence suggests that novel coronavirus may remain viable for hours to days on surfaces made from a variety of materials.

2. Plan Responsibility

RECON's Vice President of Health, Safety and Environment (VP of HSE) and or his designee National Safety Manager (NSM) are responsible for the issuance, revision, and maintenance of this procedure with support and direction from RECON's COVID-19 Executive Management Team (**Table 1**). It is further directed that senior and field level managers implement and enforce this plan on each project. The Site Safety Officer (SSO), Construction Manager (CM) and Superintendent (Ssup) are responsible for monitoring this plan to ensure all employees are following the requirements outline within. Employees are always responsible to know these requirements and adhere to them while working on RECON premises. Any violation of these requirements, a STOP WORK will be initiated with an investigation while implementing prompt corrective actions.

Table 1: RECON COVID-19 Management Team

Name	Title	Contact Information
Jack Gilbraith	President & Chief Executive Officer	jack.gilbraith@reconservices.com (281) 664-1106
Danny P. Brown	Senior Vice President of Operations	danny.brown@reconservices.com (281) 664-1163
Jeff Watts	Vice President of Health, Safety and Environment	jeff.watts@reconservices.com (281) 664-1134
Krissi Parks	Vice President of Human Resources	krissi.parks@reconservices.com (281) 664-1146

Insert Project Name Project Emergency Contact		
Name	**Title**	**Contact Information**
RECON National Safety Manager	Brad Lockhart	(713) 384-5468 (cell)
RECON Medical Emergency Contact	RECON Safety Administrative Coordinator	(281) 664-1134 (office) (713) 829-7026 (cell)
Workplace Safety Screenings	Third Party Administrator Contact	1-855-572-5577
RECON Superintendent		
RECON Site Safety Officer		
RECON Project Manager		
RECON Director of Operations		
RECON Business Unit Leader		
Project County Health Department		
Client Representative		
Oversight Representative		
Fire Department		
Police Department		

3. Acronymns, Definitions and Language

The terms in this section are specific to this plan.

Acronyms	
BUL	Business Unit Leader
BMP	Best Management Practices
CDC	Centers for Disease Control and Prevention
CM	Construction Manager
IDERPP	Infectious Disease Emergency Response Properness Plan
NSM	National Safety Manager
PM	Project Manager
RECON	Remedial Construction Services, L.P.
SSO	Site Safety Officer
Ssup	Site Superintendent
VP of HR	Vice President of Human Resources
VP of HSE	Vice President of Health Safety and Environment
WHO	World Health Organization

Definitions	
Clinic	Place or hospital department where outpatients are given medical treatment or advice, especially of a specialist nature.
Distance	CDC recommends about 6 feet.
Employee	People directly employed by a company. These can be RECON Employees if they are working directly for RECON or contractor employees if they are working directly for a contractor.
Escort	A person, accompanying another for protection, security, or as a mark of rank.
Occupational Medicine	The branch of medicine that deals with the prevention and treatment of occupational injuries and diseases.
Personal Protective Equipment (PPE)	Personal protective equipment, commonly referred to as 'PPE,' is equipment worn to minimize exposure to a variety of hazards. Examples of PPE include gloves, foot and eye protection and protective hearing devices.
RECON Employees	All RECON employees and all contractor employees working at, or for, RECON.
RECON Premises	Any site where RECON has a contractual or other legal right to enter to perform remediation construction services
Subcontractor	An individual or a company under a contractual relationship to supply RECON with goods and/or services.
Isolation	The practice of sick people staying away from healthy people to prevent the spread of disease.
Incubation Period	The time between the infection and showing symptoms of illness. Most estimations give COVID-19 an incubation period of 2-14 days, with symptoms most commonly showing at about five days after infection, according to the World Health Organization.
Quarantine	Separating and restricting the movement of people who were exposed to a contagious disease to see if they become sick.
Social Distancing	The practice of staying away from large public gatherings, avoiding public transportation including buses and taxis and keeping about six feet distance from other people.
Stay at Home/Shelter in Place	A government order used to limit residents from leaving their homes, except out of necessity for tasks like buying groceries or seeking medical care.
Presumptive Positive	The time between an initial positive test for the virus by a public health lab but before the federal CDC has confirmed the results. A presumptive positive result from a CDC test is treated as if the patient is positive for the virus, according to the CDC.
Close Contact	A person within approximately 6 feet (2 meters) of another person. Factors to consider when defining close contact include proximity, the duration of exposure (e.g., longer exposure time likely increases exposure risk), whether the individual has symptoms (e.g., coughing likely increases exposure risk) and whether the individual was wearing a facemask (which can efficiently block respiratory secretions from contaminating others and the environment).
Suspected COVID-19 Case Location	Location having one or more suspected COVID-19 cases.
Prolong Period of Time	The operational definition for PROLONG PERIOD OF TIME is 15 minutes or greater within 6 feet of another person regardless if they are suspected or positive for COVID 19.

Language
Throughout RECON Procedures, when used in the context of actions by RECON or others, the following words have specific meanings: ▪ 'Shall' is used where a provision is mandatory. ▪ 'Should' is used where a provision is preferred. ▪ 'May' is used where alternatives are equally acceptable.

4. Reporting Known of Suspected Exposure to COVID-19

In the event of a known or suspected exposure to COVID-19, the project team SHALL initiate a STOP WORK, segregating workers with immediate notification to RECON's VP of HSE and VP of HR.

5. Symptoms of COVID-19

Symptoms may appear 2-14 days after exposure based on the incubation period of MERS-CoV viruses. It is extremely important to monitor all individuals that will come in contact with RECON operations. This includes vendors, subcontractors, clients, members of the local community and RECON employees.

Symptoms of COVID-19 are non-specific, and the disease presentation can range from no symptoms (asymptomatic) to severe pneumonia and death. Typical signs and symptoms include fever, dry cough, fatigue, sputum production, shortness of breath, sore throat, headache, myalgia or arthralgia, chills, nausea or vomiting, nasal congestion, diarrhea, hemoptysis, and conjunctival congestion.

People with COVID-19 generally develop signs and symptoms, including mild respiratory issues and fever. Most people infected with the COVID-19 virus have mild cases and recover. Approximately 80% of laboratory confirmed patients have had mild to moderate disease, which includes non-pneumonia and pneumonia cases, 13.8% have severe disease with 6.1% being critical (respiratory failure, septic shock, and/or multiple organ dysfunction/failure).

Individuals at highest risk for severe disease and death include people aged over 60 years and those with underlying conditions such as hypertension, diabetes, cardiovascular disease, chronic respiratory disease, and cancer.

6. Exposure Prevention

RECON will implement the protection of all controlled premises such as the Regional and Corporate offices and projects sites against COVID-19 a top priority See **Attachment B** - CDC GUIDANCE ON PREPARING WORKPLACES FOR COVID-19 (https://www.osha.gov/Publications/OSHA3990.pdf).

Best management practices have been developed and will be implemented throughout the company to maintain ZERO exposures as detailed below:

- **Safety and Pre-Job Meetings:**
  - Limiting tailgate safety meetings to a maximum of 10 individuals per group, unless space is available to maintain social distancing great than 6 feet from one other.
  - Splitting up business partners and crew members to limit attendance during meetings.
  - Stagger safety meetings and locations to maximize social distancing.
  - In favorable weather conditions, discontinuing indoor safety meetings in the crew trailers or buildings performing meetings for groups greater than 10 individuals and holding the meeting at an outdoor location. In the event weather is not favorable, the use of communication devices such as radio, and or cell phones will be used allowing employees to receive information remotely in their equipment or assigned work areas.
  - All meetings will include a daily topic related to the COVID-19 virus and remind everyone to use Stop Work Authority when unsure as part of ongoing training while keeping the communication lines open.
  - Safety personnel to sign every person in to prevent multiple people from touching the same paper. This includes RECON's daily sign in sheet, RECON's Safety Meeting Agenda, and RECON's Health Questionnaire.
  - Supervisors are to designate one employee to complete RECON's daily task specific JSAP. This employee reviews with the entire work crew and signs each employee's name to the form.
- **Facility Sanitation:**
  - The RECON office location is cleaned twice a day. This cleaning is verified using a checklist (**Attachment C**) and is signed by the employee performing the cleaning. Safety verifies that the checklist is completed and signs off on it as well.
  - Clean all "high-touch" surfaces every day. This includes counters, tabletops, doorknobs, bathroom fixtures, phones, keyboards, tablets, remote controls, frequently used handles such as those on portable toilets, bathrooms, ice chests, or vehicles are cleaned prior to each use or access by the accessing employee.
  - Increase janitorial duties for common work areas twice a day. Common areas are considered those amenities such as port-a-jon's, hand wash station and ice chest. Crew members are performing cleaning duties to disinfect their personal spaces three times per day.
  - All RECON locations will purchase additional hand sanitizer, soap, and disinfectants for daily use.
  - If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry.
  - Wash hands often with soap and water for at least 20 seconds, especially after you have been in a public place, or after blowing your nose, coughing, or sneezing.
  - Place signs or other postings as depicted in **Attachment D** throughout the work areas creating good habits and reminders to avoid touching their faces and covering coughs and sneezes.
  - Increase ventilation for enclosed work areas by opening windows and doors of buildings or cabs of equipment or adjust air conditioning.

- Purchase additional toilet paper, water, paper towels, disinfectants, hand sanitizers and other necessary supplies.
- Display signage for all to practice good hygiene (i.e. port-a-johns, handwash stations, and office areas).

PPE Requirements:

- Utilize nitrile gloves for use in common areas to prevent cross-contamination. Crew members are required to wear gloves at all times where applicable.
- Utilize cloth masks in areas of potential social distancing accidental impact areas and prolonged contact scenarios as detailed in Table 2 below.

Table 2 - Cloth Mask Donning Criteria

	Yes	No
In solitary office alone		X
In office with others	X	
Coffee station	X	
Shared office space	X	
Community restrooms	X	
Port-a-Jons		X
Break areas	X	
Smoke areas – one at a time		X
Traveling to work or onsite in a vehicle alone		X
Ride sharing in a personal or company vehicle.	**X – Partition required if trip is longer than 15 minutes. Diagonal front to back seating required.**	
Ride sharing with UTV/ATV.	**X - Partition required if trip is longer than 15 minutes. Diagonal front to back seating required.**	
Inside equipment working alone		X
In the field working alone		X
In the field with others working in close contact/proximity and/or having the potential to be within 10 feet of contact	X	

Personnel Practices:

- Crew members will disinfect their radios and use their own pens daily.
- Instruct employees to clean their hands often with wash stations made accessible at each work area.

- Stop handshaking by using other noncontact methods or greetings.
- Train staff on how to prepare for COVID-19 (Coronavirus) disease.
- Discourage food sharing.
- Prior to opening an ice chest, all employees are required to use hand sanitizer.
- When traveling in company or personal vehicles with passengers, avoid using the recirculated air option for the vehicle's ventilation during passenger transport; use the vents to bring in fresh outside air and/or lower the vehicle windows.

Equipment Practices:

- Design/arrange office common area environments in segmented layouts assigning areas/equipment to groups of individuals to limit total access.
- Utilize same operator on same piece of equipment where applicable.
- During equipment transitions at the end of the shift as well as prior to use, the current operator will sanitize equipment prior to departure and new operator will sanitize equipment prior to use. All operators should use a spray bottle with a 1:32 bleach to water solution for operators to decontaminate their equipment every time they enter and exit. This is to be documented on their daily inspection checklist.

  All employees will be provided with a personal ink pens to prevent multiple employees from sharing.
- For the use of passenger vehicles (trucks) or a UTV/ATV it SHALL be limited to 2 persons sitting diagonal one driving and other in the rear passenger seat. A fix partition between the driver and passenger is required (i.e. Plexiglas or other nonpermeable barriers) if ride is longer than 15 minutes. Cloth face masks required at all times. Hard surface where both the driver and passenger may come in contact with, SHALL be properly wiped down with disinfectant prior to and after each transport.

- **Site Staff, Security, and Visitors Site Entry:**
  - Advanced Project Manager (PM) approval is required to allow a site visitor to enter the site.
  - Routine vendors such as fuel deliveries should be established on a regular schedule, following all BMP's spelled out in this plan prior to entering the work areas.
  - Advised staff to avoid unnecessary travel. This includes offsite management to avoid travel to the project site if not necessary.
  - Office staff and managers have been advised to telecommute/teleconferencing for meetings. In the event a face to face meeting is required, hold it in an open well-ventilated space.
  - When possible adjust or postpone large meetings or gatherings.
  - Assess the risk associated with business travel and limit when possible.
  - Provide a site qualification health letter and associated questionnaire (**Attachment E**) to evaluate potential exposure risks with COVID-19 prior to site visitors (subcontractor, vendor, or visitor), which will be completed prior to site entry. RECON employees will complete the health questionnaire daily.

- RECON's COVID-19 Executive Management team will utilize the Pandemic Response Flow Chart in **Attachment F** when determining the appropriate actions for all Potential, Suspected or Known COVID-19 cases. Cases are based on ***Positive, Suspected or No Known Exposures***, contact, location and symptoms as specified in the definitions. Case determination will be conducted by RECON's VP of HSE and Pandemic Coordinator for determination and reviewed for agreement with RECON's Sr. VP or Operations and VP of Human Resources.
- RECON has instituted a medical digital infrared temporal thermometer measurement program. Designees will take a measurement pre-shift and post-shift of body temperature recording results on the daily sign-in and out, fit for duty form. The "Daily Fit for Duty" form has been updated to include fields capturing body temperature measurements for all personnel entering the site. Non-daily staff (i.e. visitors) will be required to take a temperature measurement when reporting to the RECON location prior to site entry. A temperature of 100.4 °F will be utilized as the threshold. Daily temperatures will be collected and recorded on the "Health Questionnaire" (**Attachment E)** and "Sign in – Fit for Duty" form located in **Attachment G**.

  If questionnaire is found to be of concern by individual checking (Yes), the employee, subcontractor, vendor or visitor will be placed on self-quarantine for 14 days. If employee is positive for COVID-19, the employee may return to work after a 10-days, 24 hours with no fever without the use of fever-reducing medications, and other symptoms of COVID-19 are improving.

- Crew members have been provided guidance through this plan for COVID-19 and SHALL be printed and readily available for all.
- Maintain open lines of communication between all field level employees and COVID-19 Management Team by posting contact information in all common areas.

- **Social Distancing and Fitness for Duty:**
  - Crew members will maintain a social distance from one another of at least 10 feet during all activities (work, training, meeting, etc.)
  - Distribution of site personnel specific radios for onsite communication.
  - Assign operators to the same equipment as much as possible to avoid cross-contamination.
  - Advised staff to stop eating lunch together and to change clothes at home.
  - Staff has been directed to stay home if they are ill, have anyone in their residence that is ill, or feel the beginning symptoms of an illness.
  - A doctor's note is not required if an employee is absent for 3 days or more because the doctor's office may become overcrowded and an unsafe location.
  - Staff may stay home and care for sick family members.
  - Work in office locations with doors closed and alone when possible. The office trailer for the Unisys project will be shared by Geosyntec and RECON. There is a door at each end of the trailer allowing isolated access with a shower curtain installed in the center of the trailer establishing no social face to face contact when occupied. Additionally, only one person from each company will occupy the trailer at any given time.

- Employees are discouraged from carpooling on or off the job site. Each employee is to drive their personal or company vehicle as a first option. In the event ride sharing is required, it will be limited to 2 persons sitting diagonal one driving and other in the rear passenger seat. A fix partition between the driver and passenger is required (i.e. Plexiglas or other nonpermeable barriers) if trips are longer than 15 minutes. Facial masks are to be worn at all times. Hard surfaces where both the driver and passenger may come in contact, SHALL be properly wiped down with disinfectant prior to and after each transport.

7. If You Are Exposed or Suspected Exposure

DO NOT COME TO WORK, NOTIFY YOUR SUPERVISOR IMMEDIATELY SO THEY CAN CONTACT RECON'S VP OF HSE and VP of HR.

For anyone who has had close contact with someone with **Suspected** or **Positive** for COVID-19 should stay home for 14 days after their last exposure to that person.

However, anyone who has had close contact with someone with COVID-19 and who:

- Developed COVID-19 illness within the previous 3 months, **and**
- Has recovered, **and**
- Remains without COVID-19 symptoms (for example, cough, shortness of breath) **does not** need to stay home.

IF YOU ARE OR BECOME SICK:

- You should wear a facemask when you are around other people (sharing a room or vehicle) and before you enter a healthcare provider's office. If you are not able to wear a facemask (for example, because it causes trouble breathing), then you should do your best to cover your coughs and sneezes, and people who are caring for you should wear a facemask if they enter your room.
- Call ahead before visiting your primary care physician (family doctor). If you have an appointment, please call your doctor's office to let them know you may have or have COVID-19.
- Monitor your symptoms. Seek prompt medical attention if your illness is worsening (e.g., difficulty breathing).
- If you have a medical emergency and need to call 911, notify the dispatch personnel that you have, or are being evaluated, for COVID-19. If possible, put on a facemask before emergency medical services arrive.
- Stay home except to receive medical care. People who are mildly ill with COVID-19 can isolate at home during their illness. Don't go to school or public areas. Avoid using public transportation, ridesharing, or taxis.
- Separate yourself from other people and animals in your home.

8. Return to Work Premises

CDC's recommendations for "Return to Work" situations are described below:

- **I think or know I had COVID-19, and I had symptoms**

You can be around others if:

- **10** days since symptoms first appeared, **and**
- 24 hours with no fever without the use of fever-reducing medications, **and**
- Other symptoms of COVID-19 are improving.**Loss of taste and smell may persist for weeks or months after recovery and need not delay the end of isolation.

Most people do not require testing to decide when they can be around others; however, if your healthcare provider recommends testing, they will let you know when you can resume being around others based on your test results.

Note that these recommendations **do not** apply to persons with severe COVID-19 or with severely weakened immune systems (immunocompromised). These persons should follow the guidance below for "I was severely ill with COVID-19 or have a severely weakened immune system (immunocompromised) due to a health condition or medication. When can I be around others?"

- **I tested positive for COVID-19 but had no symptoms**

If you continue to have no symptoms, you can be with others after **10** days have passed since you had a positive viral test for COVID-19. Most people do not require testing to decide when they can be around others; however, if your healthcare provider recommends testing, they will let you know when you can resume being around others based on your test results.

If you develop symptoms after testing positive, follow the guidance above for "I think or know I had COVID-19, and I had symptoms."

- **I was severely ill with COVID-19 or have a severely weakened immune system**

  People who are severely ill with COVID-19 might need to stay home longer than 10 days and up to 20 days after symptoms first appeared. Persons who are severely immunocompromised may require testing to determine when they can be around others. Talk to your healthcare provider for more information. If testing is available in your community, it may be recommended by your healthcare provider. Your healthcare provider will let you know if you can resume being around other people based on the results of your testing.

Your doctor may work with an infectious disease expert or your local health department to determine whether testing will be necessary before you can be around others.

9. Critical Essential Projects - Only When Approved by RECON Management

To ensure continuity of operations of essential functions, the CDC advises that critical infrastructure workers may be permitted to continue work following potential exposure to COVID-19, provided they remain asymptomatic with additional precautions are implemented to protect them and the community.

- A potential exposure means being a household contact or having close contact within 6 feet of an individual with confirmed or suspected COVID-19. The timeframe for having contact with an individual includes the period of time of 48 hours before the individual became symptomatic.

Critical Infrastructure workers **when approved by RECON management** who have had an exposure but remain asymptomatic, should adhere to the following practices prior to and during their work shift:

- **Pre-Screen:** The employee's temperature should be taken and assess symptoms prior to them starting work. Ideally, temperature checks should happen before the individual enters the facility.

- **Regular Monitoring:** If the employee doesn't have a fever or symptoms, they should self-monitor under the supervision of the onsite Site Safety Officer with coordination from RECON's VP of HR and VP of HSE.
- **Wear a Mask:** The employee should wear a face mask at all times while in the workplace for 14 days after last exposure.
- **Social Distance:** The employee should maintain **10** feet and practice social distancing as work duties permit in the workplace.
- **Disinfect and Clean workspaces:** Clean and disinfect all areas such as offices, bathrooms, common areas, and no sharing of electronic equipment.

If the employee becomes sick during the day, they should be sent home immediately. Surfaces in their workspace should be cleaned and disinfected. Information on persons who had contact with the ill employee during the time the employee had symptoms and 2 days prior to symptoms should be compiled. Others at the facility with close contact within **6** feet of the employee during this time would be considered exposed.

10. Journey Management Plans

A Journey Management Plan for RECON employees (**Attachment H**) shall be developed and followed for all travel other than local commuting to and from the project location. This includes all rotations and visitors coming to the project location outside the area. If a RECON subcontractor, vendor or visitor does not have a COVID-19 journey management process, it is expected that they will utilize the Site Visitor JMP as a guide located in **Attachment I** as a resource for non-RECON employee site travel. All JMPs must be approved prior to arrival. Additionally, all site personnel are required to complete RECON's Health Questionnaire (**Attachment E**) 24 hours before arriving at the job site

The JMP shall include at a minimum:

1. Who will be traveling
2. Departing city
3. Destination city
4. Drive time with miles
5. Detailed travel route with map and turn by turn direction
6. Precautions and travel best management practices (BMPs)
7. Anticipated stops for fuel, meals and lodging avoiding COVID-19 hot spots.
8. Exposure risk and mitigations if traveling through COVID-19 hot spots with map

In an effort to avoid COVID-19 hot spots, the following links should be used when developing a JMP.:

- https://www.bing.com/covid
- https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

Once the JMP has been developed at the project level it should be sent to RECON's National Safety Manager (NSM) for review. Once the NSM has accepted the JMP, it will be sent to RECON's COVID-19 Executive Management team for final approval.

11. COVID-19 Emergency Response

In the event of an COVID-19 emergency on RECON premises, the project team will designate emergency responders in order to secure and quarantine individuals and areas. Once questionable areas and individuals have been secured and quarantined, the designated emergency responders will don the appropriate PPE spelled out in this plan before entering to begin disinfecting any potential tools, equipment and or areas suspected or known to have contacted COVID-19. As part of the response measures, each project will have emergency response kits readily available in the event decontamination procedures are needed.

Kit Contents:

- Bucket with lid
- 2 – N95 respirators
- 2 – Poly-coated Tyvek coveralls
- 2 – Pairs of Poly-coated Tyvek boot covers
- 1 – Roll of caution tape
- 1 – Bottle of bleach/water cleaning solution
- 2 – Pairs of neoprene gloves
- 2 – 55-gallon drum liners
- Rags for cleaning
- COVID–19 Emergency Response Kit Form (**Attachment J**)

Personal Protective Equipment will consist of Level D clothing along with the following:

- N-95 Respirator
- Poly coated Tyvek suit with boot covers
- Neoprene gloves

12. Training

This plan has been developed and designed for purposes of training when there is the known or suspected exposure to COVID-19. It shall be reviewed and acknowledged by all personnel working on a RECON site or controlled premises. Additional training was provided to employees via web-based training. See **Attachment K** for the training PowerPoint for reference.

Attachment A - CISA Essential Work Letter

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Remedial Construction Services, L.P.
Corporate Headquarters
9977 W. Sam Houston Parkway N.
Suite 100
Houston, Texas 77064
Tel (281) 955 2442
www.reconservices.com

March 24, 2020

Subject: CISA Essential Employer Status

To Whom it May Concern:

Remedial Construction Services, L.P. (RECON) qualifies as a "Essential Critical Infrastructure Employer" as defined by the U.S. Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA) and allowed to deliver assistance and guidance to a broad range of partners in the Chemical, Energy and Hazardous Materials sectors as detailed in the "***Memorandum on Identification of Essential Critical Infrastructure Workers During COVID-19 Response"*** dated March 19, 2020 (https://www.cisa.gov/publication/guidance-essential-critical-infrastructure-workforce#download). RECON's goal will be to keep the time needed for essential business functions away from home to a minimum, but this does not mean that all functions can work from home 100%.

Should you have any questions please feel free to contact me.

Sincerely,

Jeff Watts
Vice President of HSE
jeff.watts@reconservices.com
281-664-1134

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Attachment B - CDC Guidance on Preparing Workplaces for COVID-19

https://www.osha.gov/Publications/OSHA3990.pdf

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Keeping the workplace safe

Encourage your employees to…

Practice good hygiene

- Stop handshaking – use other noncontact methods of greeting
- Clean hands at the door and schedule regular hand washing reminders by email
- Create habits and reminders to avoid touching their faces and cover coughs and sneezes
- Disinfect surfaces like doorknobs, tables, desks, and handrails regularly
- Increase ventilation by opening windows or adjusting air conditioning

Be careful with meetings and travel

- Use videoconferencing for meetings when possible
- When not possible, hold meetings in open, well-ventilated spaces
- Consider adjusting or postponing large meetings or gatherings
- Assess the risks of business travel

Handle food carefully

- Limit food sharing
- Strengthen health screening for cafeteria staff and their close contacts
- Ensure cafeteria staff and their close contacts practice strict hygiene

Stay home if…

- They are feeling sick
- They have a sick family member in their home

What every American and community can do now to decrease the spread of the coronavirus

Keeping the school safe

Encourage your faculty, staff, and students to…

Practice good hygiene

- Stop handshaking – use other noncontact methods of greeting
- Clean hands at the door and at regular intervals
- Create habits and reminders to avoid touching their faces and cover coughs and sneezes
- Disinfect surfaces like doorknobs, tables, desks, and handrails regularly
- Increase ventilation by opening windows or adjusting air conditioning

Consider rearranging large activities and gatherings

- Consider adjusting or postponing gatherings that mix between classes and grades
- Adjust after-school arrangements to avoid mixing between classes and grades
- When possible, hold classes outdoors or in open, well-ventilated spaces

Handle food carefully

- Limit food sharing
- Strengthen health screening for cafeteria staff and their close contacts
- Ensure cafeteria staff and their close contacts practice strict hygiene

Stay home if…

- They are feeling sick
- They have a sick family member in their home

What every American and community can do now to decrease the spread of the coronavirus

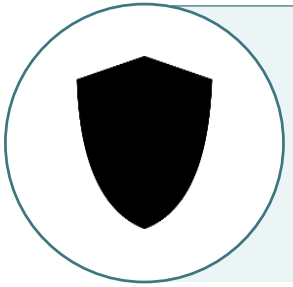
Keeping the home safe

Encourage your family members to…

All households

- Clean hands at the door and at regular intervals
- Create habits and reminders to avoid touching their face and cover coughs and sneezes
- Disinfect surfaces like doorknobs, tables, and handrails regularly
- Increase ventilation by opening windows or adjusting air conditioning

Households with vulnerable seniors or those with significant underlying conditions



Significant underlying conditions include heart, lung, kidney disease; diabetes; and conditions that suppress the immune system

- Have the healthy people in the household conduct themselves as if they were a significant risk to the person with underlying conditions. For example, wash hands frequently before interacting with the person, such as by feeding or caring for the person
- If possible, provide a protected space for vulnerable household members
- Ensure all utensils and surfaces are cleaned regularly

Households with sick family members

- Give sick members their own room if possible, and keep the door closed
- Have only one family member care for them
- Consider providing additional protections or more intensive care for household members over 65 years old or with underlying conditions

What every American and community can do now to decrease the spread of the coronavirus

Keeping commercial establishments safe

Encourage your employees and customers to…

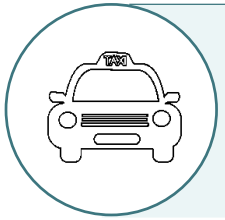
Practice good hygiene

- Stop handshaking – use other noncontact methods of greeting
- Clean hands at the door, and schedule regular hand washing reminders by email
- Promote tap and pay to limit handling of cash
- Disinfect surfaces like doorknobs, tables, desks, and handrails regularly
- Increase ventilation by opening windows or adjusting air conditioning

Avoid crowding

- Use booking and scheduling to stagger customer flow
- Use online transactions where possible
- Consider limiting attendance at larger gatherings

For transportation businesses, taxis, and ride shares



- Keep windows open when possible
- Increase ventilation
- Regularly disinfect surfaces

What every American and community can do now to decrease the spread of the coronavirus

Attachment C - Cleaning Checklist

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	Area Cleaned	Time	Cleaner Signature
	Exterior Door Knob		
	Interior Door Knob		
	Countertops		
	Restroom Door Knobs		
	Faucet Handles		
	Area Cleaned	Time	Cleaner Signature
	Exterior Door Knob		
	Interior Door Knob		
	Countertops		
	Restroom Door Knobs		
	Faucet Handles		
	Area Cleaned	Time	Cleaner Signature
	Exterior Door Knob		
	Interior Door Knob		
	Countertops		
	Restroom Door Knobs		
	Faucet Handles		

Job Number: _____

SSO: _____

Date: _____

Attachment D – Postings

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Stop Germs! Wash Your Hands.

When?

- After using the bathroom
- Before, during, and after preparing food
- Before eating food
- Before and after caring for someone at home who is sick with vomiting or diarrhea
- After changing diapers or cleaning up a child who has used the toilet
- After blowing your nose, coughing, or sneezing
- After touching an animal, animal feed, or animal waste
- After handling pet food or pet treats
- After touching garbage

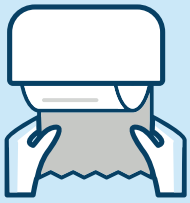
How?

Wet your hands with clean, running water (warm or cold), turn off the tap, and apply soap.

Lather your hands by rubbing them together with the soap. Be sure to lather the backs of your hands, between your fingers, and under your nails.

Scrub your hands for at least 20 seconds. Need a timer? Hum the “Happy Birthday” song from beginning to end twice.

Rinse hands well under clean, running water.



Dry hands using a clean towel or air dry them.

Keeping hands clean is one of the most important things we can do to stop the spread of germs and stay healthy.

LIFE IS BETTER WITH CLEAN HANDS

www.cdc.gov/handwashing

This material was developed by CDC. The Life is Better with Clean Hands Campaign is made possible by a partnership between the CDC Foundation, GOJO, and Staples. HHS/CDC does not endorse commercial products, services, or companies.

CS310027-A

¡Detenga los microbios! Lávese las manos

¿CUÁNDO?

- Después de ir al baño.
- Antes, durante y después de preparar alimentos.
- Antes de comer.
- Antes y después de cuidar a alguien que tenga vómitos o diarrea.
- Antes y después de tratar cortaduras o heridas.
- Después de cambiarle los pañales a un niño o limpiarlo después de que haya ido al baño.
- Después de sonarse la nariz, toser o estornudar.
- Después de tocar animales, sus alimentos o sus excrementos.
- Después de manipular alimentos o golosinas para mascotas.
- Después de tocar la basura.

¿CÓMO?

Mójese las manos con agua corriente limpia (tibia o fría), cierre el grifo y enjabónese las manos.

Frótese las manos con el jabón hasta que haga espuma. Asegúrese de frotarse la espuma por el dorso de las manos, entre los dedos y debajo de las uñas.

Restriéguese las manos durante al menos 20 segundos. ¿Necesita algo para medir el tiempo? Tararee dos veces la canción de “Feliz cumpleaños” de principio a fin.

Enjuáguese bien las manos con agua corriente limpia.

Séquese Séquese las manos con una toalla limpia o al aire.

Mantener las manos limpias es una de las cosas más importantes que podemos hacer para detener la propagación de microbios y mantenernos sanos.

LA VIDA ES MEJOR CON LAS MANOS LIMPIAS

www.cdc.gov/lavadodemanos

Este material fue elaborado por los CDC. La campaña La Vida es Mejor con las Manos Limpias es posible gracias a una asociación entre la Fundación de los CDC, GOJO y Staples. El HHS y los CDC no respaldan productos, servicios ni empresas comerciales.

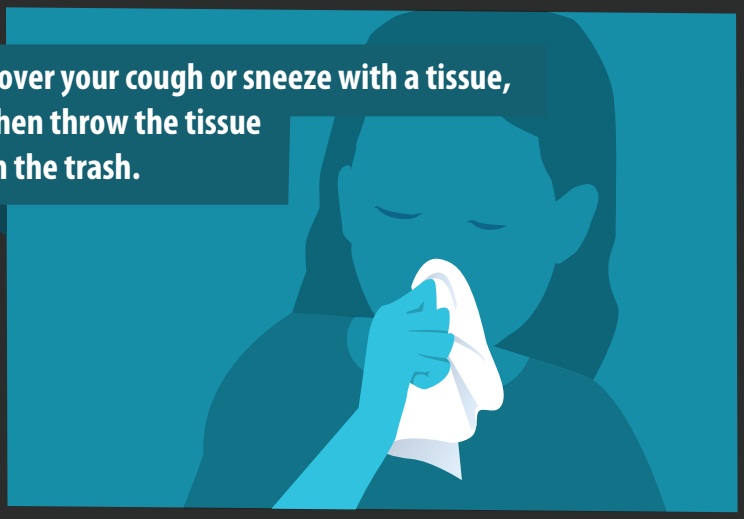
CS310027-A

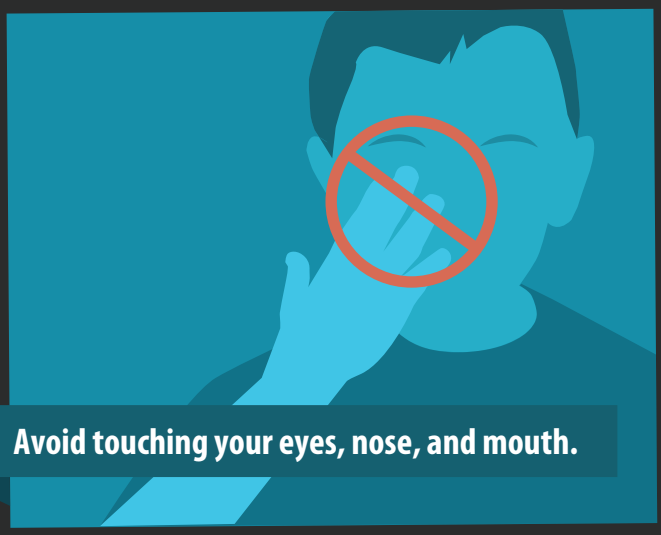
STOP THE SPREAD OF GERMS

Help prevent the spread of respiratory diseases like COVID-19.

Avoid close contact with people who are sick.

Cover your cough or sneeze with a tissue, then throw the tissue in the trash.





Avoid touching your eyes, nose, and mouth.

Clean and disinfect frequently touched objects and surfaces.

Stay home when you are sick, except to get medical care.

Wash your hands often with soap and water for at least 20 seconds.

cdc.gov/COVID19

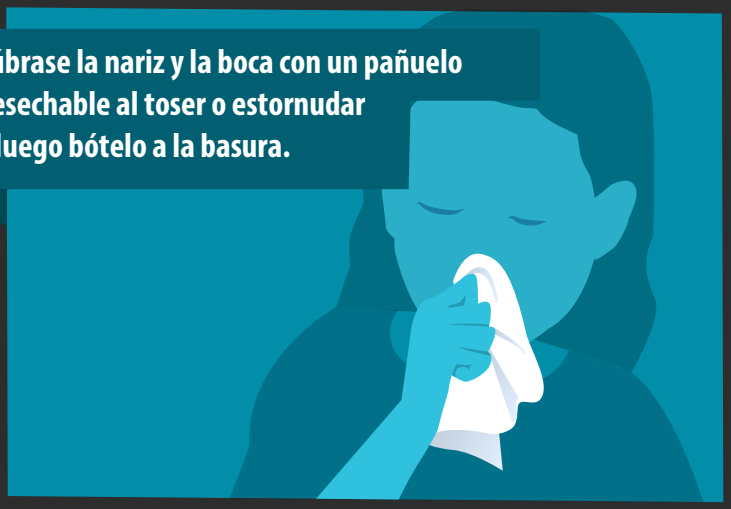
314915-A March 16, 2020 1:02 PM

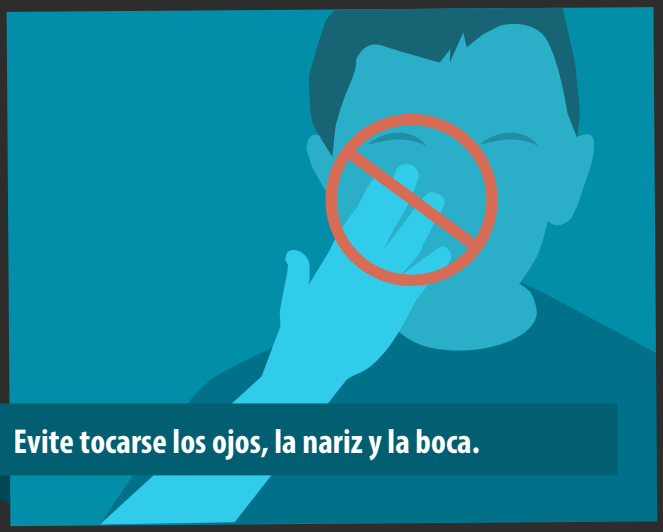
DETENGA LA PROPAGACIÓN DE LOS MICROBIOS

Ayude a prevenir la propagación de enfermedades respiratorias como el COVID-19

Evite el contacto cercano con las personas enfermas.

Cúbrase la nariz y la boca con un pañuelo desechable al toser o estornudar y luego bótelo a la basura.

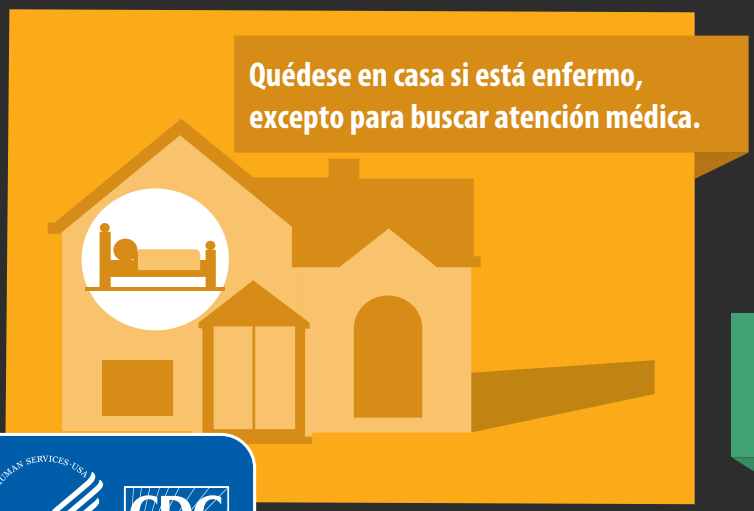


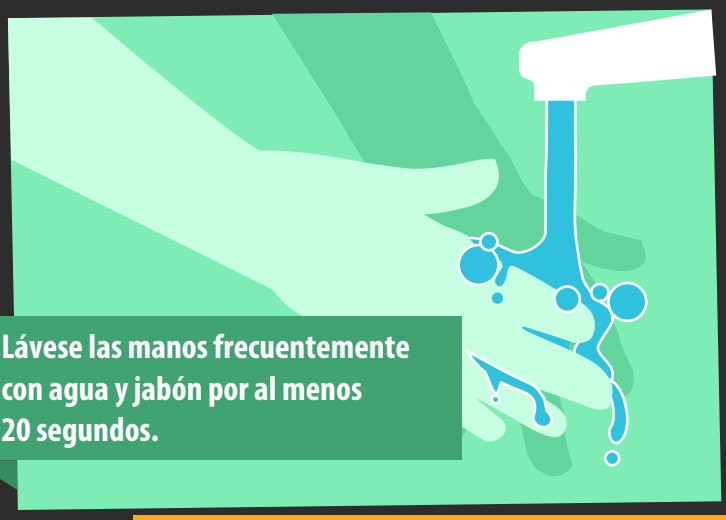


Evite tocarse los ojos, la nariz y la boca.

Limpie y desinfecte los objetos y las superficies que se tocan frecuentemente.

Quédese en casa si está enfermo, excepto para buscar atención médica.





Lávese las manos frecuentemente con agua y jabón por al menos 20 segundos.

cdc.gov/COVID19-es

314915-B

SYMPTOMS OF CORONAVIRUS DISEASE 2019

Patients with COVID-19 have experienced mild to severe respiratory illness.

Symptoms* can include

FEVER

COUGH

*Symptoms may appear 2-14 days after exposure.

SHORTNESS OF BREATH

Seek medical advice if you develop symptoms, and have been in close contact with a person known to have COVID-19 or if you live in or have recently been in an area with ongoing spread of COVID-19.

DEPARTMENT OF HEALTH & HUMAN SERVICES·USA CDC

cdc.gov/COVID19-symptoms

CS 315252-A March 20, 2020, 12:51PM

SÍNTOMAS DE LA ENFERMEDAD DEL CORONAVIRUS 2019

Los pacientes con COVID-19 han presentado enfermedad respiratoria de leve a grave.

Los síntomas* pueden incluir

FIEBRE

TOS

*Los síntomas pueden aparecer de 2 a 14 días después de la exposición.

DIFICULTAD PARA RESPIRAR

Consulte a un médico si presenta síntomas y ha estado en contacto cercano con una persona que se sepa que tiene el COVID-19, o si usted vive o ha estado recientemente en un área en la que haya propagación en curso del COVID-19.

cdc.gov/COVID19-es

CS 315252-B March 16, 2020, 1:35PM

Attachment E - Pre-Qualifying Letter and Health Questionnaire

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PROJECT HEALTH QUESTIONNAIRE

CLASSIFICATION: EMPLOYEE ☒ VENDOR ☐ SUBCONTRACTOR ☐ VISITOR ☐

Company Name:	Date:
Name:	Expected Days on Site: Temperature (^{0}F):

MEDICAL SURVEY

Please answer truthfully. Answering yes to any of the following questions does not automatically prohibit you from working on a RECON project site, but may require review by HR/HSE

1A. Are you feeling sick today? (Any Illness) **YES ☐ / NO ☐**

1B. Have you within the past 14 days? (Any Illness) **YES ☐ / NO ☐**

***** If answered "NO" to 1A or 1B - Proceed to Travel History section *****

	TODAY	**WITHIN 14 DAYS**
2. If yes, what is the date of first onset of symptoms?	**DATE:** _____	**DATE:** _____
3. Are you experiencing a cough with your illness?	**YES ☐ / NO ☐**	**YES ☐ / NO ☐**
4. Have you experienced a fever associated with this illness?	**YES ☐ / NO ☐**	**YES ☐ / NO ☐**
5. Are you experiencing shortness of breath?	**YES ☐ / NO ☐**	**YES ☐ / NO ☐**
6. Have you been seen by a physician for this illness?	**YES ☐ / NO ☐**	**YES ☐ / NO ☐**

TRAVEL HISTORY

1. Have you attended a public group function/gathering greater than 50 people in last 12 hours? **YES☐ / NO☐**
2. Have you travelled via cruise ship or outside of the U.S. w/in 14 days prior to arrival at the office? **YES☐ / NO☐**
3. Please list all major cities you have visited, travelled through, or anticipate travelling through, within 14 days of arriving at the site:

   Houston

   _____
4. Have you, within the past 14 days, been in contact with any person diagnosed with, suspected to have, or quarantined for, the COVID-19 Virus? (Fever, Cough, Shortness of Breath) **YES ☐ / NO ☐**

PRINT: _____ SIGN: _____ DATE: _____

INTERNAL USE ONLY

Reviewed by: RECON HR/HSE: _____ DATE: _____

Attachment F - Pandemic Response Flow Chart

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PANDEMIC RESPONSE FLOW CHART

POTENTIAL EXPOSURE

CASE 1
Employee had close contact with a positive case.

Case 2
Employee had close contact with suspected case.

Case 3
Employee visited a location having a positive case with no prolonged contact.

Case 4
Employee visited a location having a suspected case with no prolonged contact.

ARE THERE SIGNS OF SYMPTOMS?

YES

NO

If an employee is SUSPECTED or a CONFIRMED case, they should call in sick and notify their supervisor, seek medical care, and stay away from work. Supervisor SHALL contact Corporate HSE and or HR immediately. Discussion of "Return to Work" will take place during quarantine as outlined in Sections 7-9 of the COVID-19 Action Plan.

CASE 1 & 2
Employee SHALL self-quarantine and monitor for symptoms.

CASE 3 & 4
No self quarantine needed. Monitor the employee for symptoms.

NO KNOWN EXPOSURE

Employee with NO known exposure to a suspected or confirmed case.

ARE THERE SIGNS OF SYMPTOMS?

YES

- Call in sick
- Stay away from work until symptoms resolve. Refer to sections 7-9 of the COVID-19 Action Plan.

Attachment G - Sign-In and Out Fit For Duty With Core Temperature Form

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Safety Meeting &
Daily Sign In/ Sign Out Sheet

- I am fit for duty and I am not injured.
- I reported any injury to my foreman or supervisor
- I reported any unsafe conditions to my foreman or supervisor
- I worked injury free today

	Employee Name	Employer	Time In	AM-Body Temp	Time Out	PM-Body Temp	Signature
1							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
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35							

Supervisor/Safety Officer: _____ **Date:** _____

Attachment H - Journey Management Plan for RECON Employees

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PURPOSE

The purpose of this **COVID-19** Journey Management Procedure (JMP) is to prevent/reduce exposure risks associated with employee travel. By communicating exposure risks before mobilizing to an employee via air travel or a motor vehicle operator, the employee will be informed of areas to avoid and good practices to implement.

SPECIAL NOTE

Because the travel conditions regarding COVID-19 may change frequently, the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

Responsibilities

Project Manager

The Site Project Manager is responsible to ensure that all JMPs are approved prior to travel and update/modify if necessary the week of travel

Employee Requesting Travel

The RECON employee requesting travel, **Insert Name Here**, shall not mobilize (leave/return) without first receiving the approved JMP. It is employee's responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing. DO NOT mobilize before getting clarification to the JMP. Because COVID-19 conditions may change, RECON employees shall also notify the Project Manager of any COVID-19 situations not identified on the JMP in order update the JMP.

Things to consider before travel:

- **Is COVID-19 spreading in the area where you're going?**
  If COVID-19 is spreading at your destination, but not where you live, you may be more likely to get infected if you travel there than if you stay home. If you have questions about your destination, you should check your destination's local health department website for more information.
- **Will you be in close contact with others during your trip?**
  Your risk of exposure to respiratory viruses like coronavirus may increase in crowded settings, particularly closed-in settings with little air circulation.
- **Are you more likely to get severe illness if you get COVID-19?**
  People at higher risk for severe disease are older adults and people of any age with serious chronic medical conditions (such as heart disease, lung disease, or diabetes). CDC recommends that travelers at higher risk for COVID-19 complications avoid all nonessential air travel.
- **Do you have a plan for taking time off from work in case you are told to stay home for 14 days for self-monitoring or if you get sick with COVID-19?**
  If you have close contact with someone with COVID-19 during travel, you may be asked to stay home to self-monitor and avoid contact with others for up to 14 days after travel. If you become sick with COVID-19, you may be unable to go to work until you're considered noninfectious. You will be asked to avoid contact with others (including being in public places) during this period of infectiousness.
- **Do you live with someone who is older or has a serious, chronic medical condition?**
  If you get sick with COVID-19 upon your return from travel, your household contacts may be at risk of infection. Household contacts who are older adults or persons of any age with severe chronic medical conditions are at higher risk for severe illness from COVID-19.
- **Is COVID-19 spreading where I live when I return from travel?**
  Consider the risk of passing COVID-19 to others during travel, particularly if you will be in close contact with people who are older adults or have severe chronic health condition These people are at higher risk of getting very sick. If your symptoms are mild or you don't have a fever, you may not realize you are infectious.

Travel Request Description

Departure
- Departing City (Drive or Fly)
- Layover Airport or City Visited
- Final Destination
- Duration

Return
- Departing City (Drive or Fly)
- Layover Airport or City Visited
- Final Destination
- Duration

Best COVID-19 Travel Practices

- Practice social distancing, meaning avoiding public transportation, ride-share services, taxis, crowded places, as well as staying about **six** feet away from other people.
- Maintain good hand hygiene - It's one of the best ways to protect yourself from spreading diseases.
- In between handwashing, do your best to avoid touching your T-zone, the area of your face with mucous membranes.
- Wipe down communal surfaces. The CDC is urging people to clean and disinfect frequently used objects and surfaces that you touch with your hands, so bring disinfectant wipes on your trip. **List surfaces/objects here: Gas pump, transaction key pin, food received, etc.**
- **Air Travel Specific** - Bring disinfectant wipes on board if you'll be using an in-flight entertainment system or tray table. Choose a window seat if possible Some medical professionals recommend reserving a window seat on a plane to avoid catching an illness in-flight, noting that aisle seats have more access to potentially sick passengers. If possible, stay in your seat and do not get up until exiting the plane.

Travel Specific Conditions/Identified Hot Spots

- Insert travel specific exposure risks/hot spot areas to avoid and any other update restriction. For example, travel through New York City should be avoided. Please refer to area/county/city level health department for final destinations.

This Journey Management Plan is approved by VP of HR, VP of HSE or Sr. VP of Ops for use:

By:	Time:	To:	Time:

Journey Management Plan Created and Maintained by

Site Project Manager:	Cell:

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

PURPOSE

The purpose of this **COVID-19** Journey Management Procedure (JMP) is to prevent/reduce exposure risks associated with employee travel. By communicating exposure risks before mobilizing to an employee via air travel or a motor vehicle operator, the employee will be informed of areas to avoid and good practices to implement.

SPECIAL NOTE

Because the travel conditions regarding COVID-19 may change frequently, the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

Responsibilities

Project Manager

The Site Project Manager is responsible to ensure that all JMPs are approved prior to travel and update/modify if necessary the week of travel

Employee Requesting Travel

The RECON employee requesting travel, **Brady Russell**, shall not mobilize (leave/return) without first receiving the approved JMP. It is employee's responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing. DO NOT mobilize before getting clarification to the JMP. Because COVID-19 conditions may change, RECON employees shall also notify the Project Manager of any COVID-19 situations not identified on the JMP in order update the JMP.

Things to consider before travel:

- **Is COVID-19 spreading in the area where you're going?**
  If COVID-19 is spreading at your destination, but not where you live, you may be more likely to get infected if you travel there than if you stay home. If you have questions about your destination, you should check your destination's local health department website for more information.
- **Will you be in close contact with others during your trip?**
  Your risk of exposure to respiratory viruses like coronavirus may increase in crowded settings, particularly closed-in settings with little air circulation.
- **Are you more likely to get severe illness if you get COVID-19?**
  People at higher risk for severe disease are older adults and people of any age with serious chronic medical conditions (such as heart disease, lung disease, or diabetes). CDC recommends that travelers at higher risk for COVID-19 complications avoid all nonessential air travel.
- **Do you have a plan for taking time off from work in case you are told to stay home for 14 days for self-monitoring or if you get sick with COVID-19?**
  If you have close contact with someone with COVID-19 during travel, you may be asked to stay home to self-monitor and avoid contact with others for up to 14 days after travel. If you become sick with COVID-19, you may be unable to go to work until you're considered noninfectious. You will be asked to avoid contact with others (including being in public places) during this period of infectiousness.
- **Do you live with someone who is older or has a serious, chronic medical condition?**
  If you get sick with COVID-19 upon your return from travel, your household contacts may be at risk of infection. Household contacts who are older adults or persons of any age with severe chronic medical conditions are at higher risk for severe illness from COVID-19.
- **Is COVID-19 spreading where I live when I return from travel?**
  Consider the risk of passing COVID-19 to others during travel, particularly if you will be in close contact with people who are older adults or have severe chronic health condition These people are at higher risk of getting very sick. If your symptoms are mild or you don't have a fever, you may not realize you are infectious.

Travel Request Description

Departure: Thursday April 9th

- Departing City (Drive or Fly): Drive, Houston, TX
- Layover Airport or City Visited: Fueling or any other stops to avoid Brazos, McLennan and Tarrant counties as much as possible.
- Final Destination: Graham, TX
- Duration: Total: 4 days, two days travel, two days at home

Return: Sunday April 12th

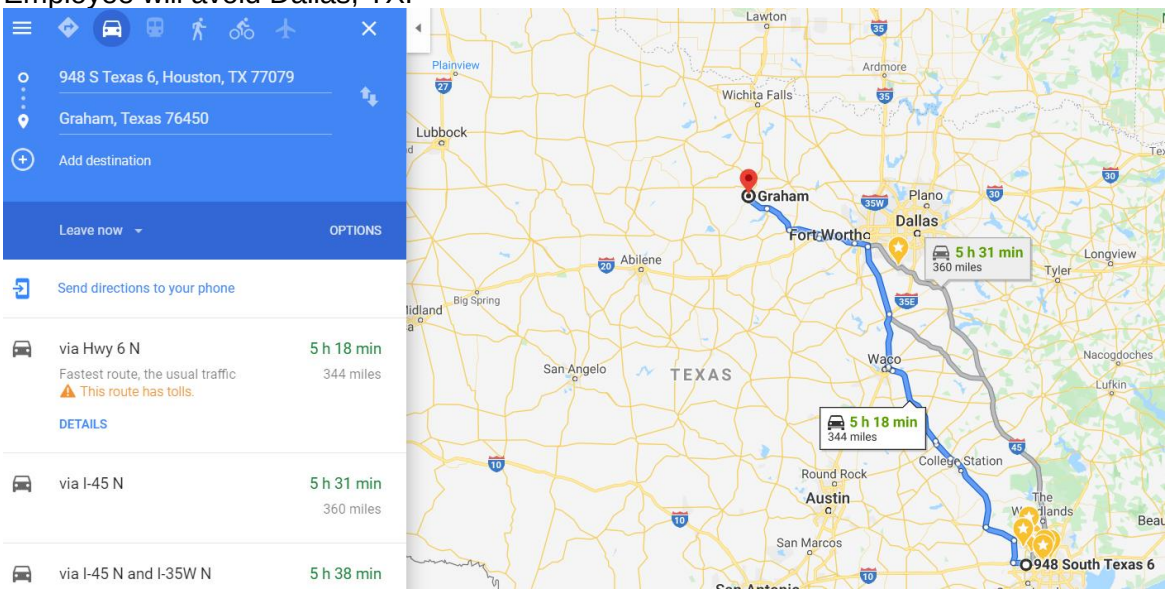
- Departing City (Drive or Fly): Drive, Graham, TX
- Layover Airport or City Visited: Fueling or any other stops to avoid Brazos, McLennan and Tarrant counties as much as possible.
- Final Destination: Houston, TX
- Duration: Total: 4 days, two days travel, two days at home

Best COVID-19 Travel Practices

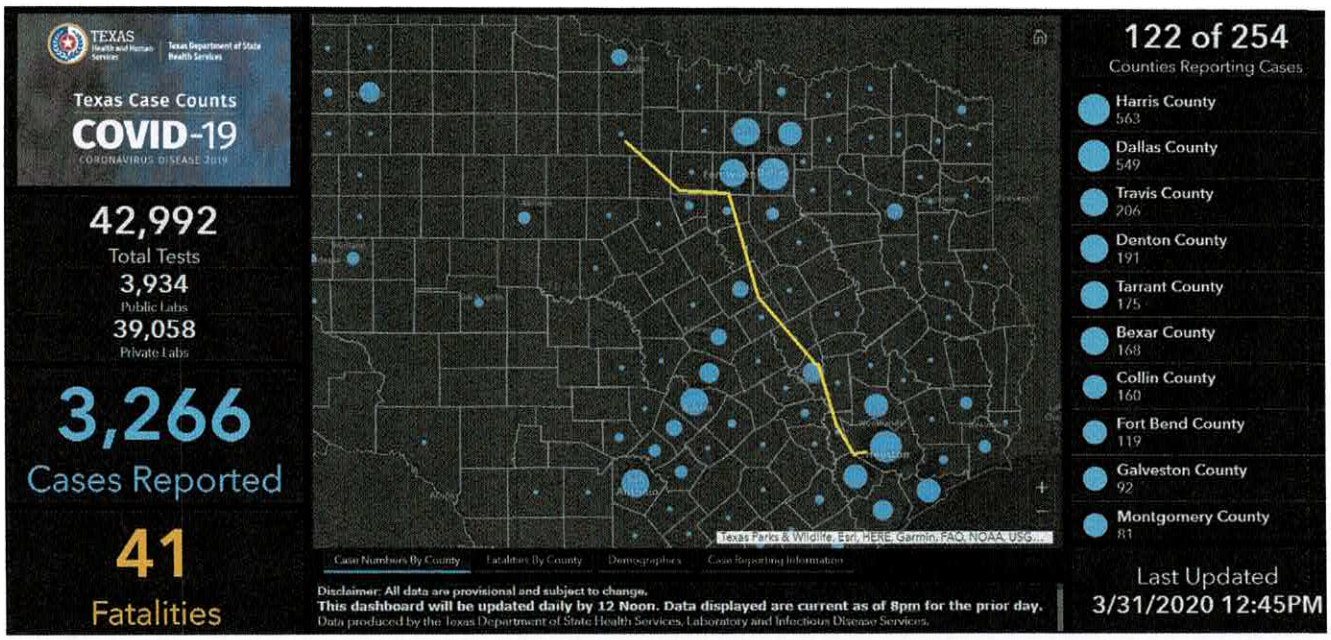
- Practice social distancing, meaning avoiding public transportation, ride-share services, taxis, crowded places, as well as staying about **six** feet away from other people.
- Maintain good hand hygiene - It's one of the best ways to protect yourself from spreading diseases.
- In between handwashing, do your best to avoid touching your T-zone, the area of your face with mucous membranes.
- Wipe down communal surfaces. The CDC is urging people to clean and disinfect frequently used objects and surfaces that you touch with your hands, so bring disinfectant wipes on your trip. **List surfaces/objects here: Gas pump, transaction key pin, fast food – drive through, door to the store, doors inside store.**
- **Air Travel Specific** - Bring disinfectant wipes on board if you'll be using an in-flight entertainment system or tray table. Choose a window seat if possible. Some medical professionals recommend reserving a window seat on a plane to avoid catching an illness in-flight, noting that aisle seats have more access to potentially sick passengers. If possible, stay in your seat and do not get up until exiting the plane.

Travel Specific Conditions/Identified Hot Spots

- Employee will avoid Dallas, TX.



- Travel approximately through the following counties: Harris 563 cases, Waller 3 cases, Grimes 3 cases, Washington 8 cases, Brazos 46 cases, Robertson 2 cases, Falls 1 case, McLennan 39 cases, Hill 1 case, Johnson 8 cases, Tarrant 175 cases, Parker 4 cases, Pallo Pinto 0 cases, Young 1 case.



This Journey Management Plan is approved by VP of HR, VP of HSE or Sr. VP of Ops for use:

By:	Time:	To:	Time:

Journey Management Plan Created and Maintained by

Site Project Manager:	Cell: 832-470-9117

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

Attachment I - Journey Managment Guide for Subcontractors, Visitors & Vendors

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PURPOSE

The purpose of this **COVID-19** Journey Management Procedure (JMP) is to use as a guide to prevent/reduce exposure risks associated with travel. By communicating exposure risks before mobilizing via air travel or a motor vehicle operator, the individual will be informed of areas to avoid and good practices to implement.

SPECIAL NOTE

Because the travel conditions regarding COVID-19 may change frequently, the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

Responsibilities

Project Manager

The Site Project Manager is responsible to ensure that all JMPs are approved prior to travel and update/modify if necessary the week of travel

Subcontractor Suggested Travel

The RECON **(Subcontractor, Vendor, or Visitor)** traveling to a RECON project, **Insert Full Name Here (Entity and Personnel Name)**, shall not mobilize (leave/return) without first receiving an approved JMP (RECON's or their own). It is the **(Subcontractor, Vendor, or Visitor)** responsibility to avoid COVID-19 "Hot Spot" locations read and become familiar with the description and stipulations of the JMP prior to mobilizing. DO NOT mobilize before getting clarification to the JMP. Because COVID-19 conditions may change, RECON **(Subcontractor, Vendor, or Visitor)** shall also notify the Project Manager of any COVID-19 situations not identified on the JMP in order update the JMP.

Things to consider before travel:

- **Is COVID-19 spreading in the area where you're going?**
  If COVID-19 is spreading at your destination, but not where you live, you may be more likely to get infected if you travel there than if you stay home. If you have questions about your destination, you should check your destination's local health department website for more information.
- **Will you be in close contact with others during your trip?**
  Your risk of exposure to respiratory viruses like coronavirus may increase in crowded settings, particularly closed-in settings with little air circulation.
- **Are you more likely to get severe illness if you get COVID-19?**
  People at higher risk for severe disease are older adults and people of any age with serious chronic medical conditions (such as heart disease, lung disease, or diabetes). CDC recommends that travelers at higher risk for COVID-19 complications avoid all nonessential air travel.
- **Do you have a plan for taking time off from work in case you are told to stay home for 14 days for self-monitoring or if you get sick with COVID-19?**
  If you have close contact with someone with COVID-19 during travel, you may be asked to stay home to self-monitor and avoid contact with others for up to 14 days after travel. If you become sick with COVID-19, you may be unable to go to work until you're considered noninfectious. You will be asked to avoid contact with others (including being in public places) during this period of infectiousness.
- **Do you live with someone who is older or has a serious, chronic medical condition?**
  If you get sick with COVID-19 upon your return from travel, your household contacts may be at risk of infection. Household contacts who are older adults or persons of any age with severe chronic medical conditions are at higher risk for severe illness from COVID-19.
- **Is COVID-19 spreading where I live when I return from travel?**
  Consider the risk of passing COVID-19 to others during travel, particularly if you will be in close contact with people who are older adults or have severe chronic health condition These people are at higher risk of getting very sick. If your symptoms are mild or you don't have a fever, you may not realize you

are infectious.

Travel Request Description

Departure
- Departing City (Drive or Fly)
- Layover Airport or City Visited
- Final Destination
- Duration

Return
- Departing City (Drive or Fly)
- Layover Airport or City Visited
- Final Destination
- Duration

Best COVID-19 Travel Practices

- Practice social distancing, meaning avoiding public transportation, ride-share services, taxis, crowded places, as well as staying about **six** feet away from other people.
- Maintain good hand hygiene - It's one of the best ways to protect yourself from spreading diseases.
- In between handwashing, do your best to avoid touching your T-zone, the area of your face with mucous membranes.
- Wipe down communal surfaces. The CDC is urging people to clean and disinfect frequently used objects and surfaces that you touch with your hands, so bring disinfectant wipes on your trip. **List surfaces/objects here: Gas pump, transaction key pin, food received, etc.**
- **Air Travel Specific** - Bring disinfectant wipes on board if you'll be using an in-flight entertainment system or tray table. Choose a window seat if possible Some medical professionals recommend reserving a window seat on a plane to avoid catching an illness in-flight, noting that aisle seats have more access to potentially sick passengers. If possible, stay in your seat and do not get up until exiting the plane.

Travel Specific Conditions/Identified Hot Spots

- Insert travel specific exposure risks/hot spot areas to avoid and any other update restriction. For example, travel through New York City should be avoided. Please refer to area/county/city level health department for final destinations.

This Journey Management Plan is approved by VP of HR, VP of HSE or Sr. VP of Ops for use:

By:	Time:	To:	Time:

Journey Management Plan Created and Maintained by

Site Project Manager:	Cell:

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

Attachment J - COVID–19 Emergency Response Kit Form

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COVID-19 Emergency Response Kit Form

Complete this form IMMEDIATELY and turn in to a RECON HSE representative if this COVID-19 Emergency Response Kit is used.				
Materials Checklist:	(2) N95 Respirator	☐	Drum Liner	☐
Poly-Coated Tyvek Coveralls		☐	Neoprene Gloves	☐
Poly-Coated Tyvek Boot Covers		☐	Cleaning Solution Spray Bottle	☐
Caution Tape		☐	Cleaning Rags	☐
Equipment Cleaned:				
Reason for using the COVID-19 Emergency Response Kit:				
Date:				
Print Name:				
Sign Name:				

Attachment K - Training Documents

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COVID-19 (coronavirus) Update

03/19/2020, 2020

RECON U

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What we Know about the Coronavirus and FAQs

What is COVID-19? - Official name given by the WHO.

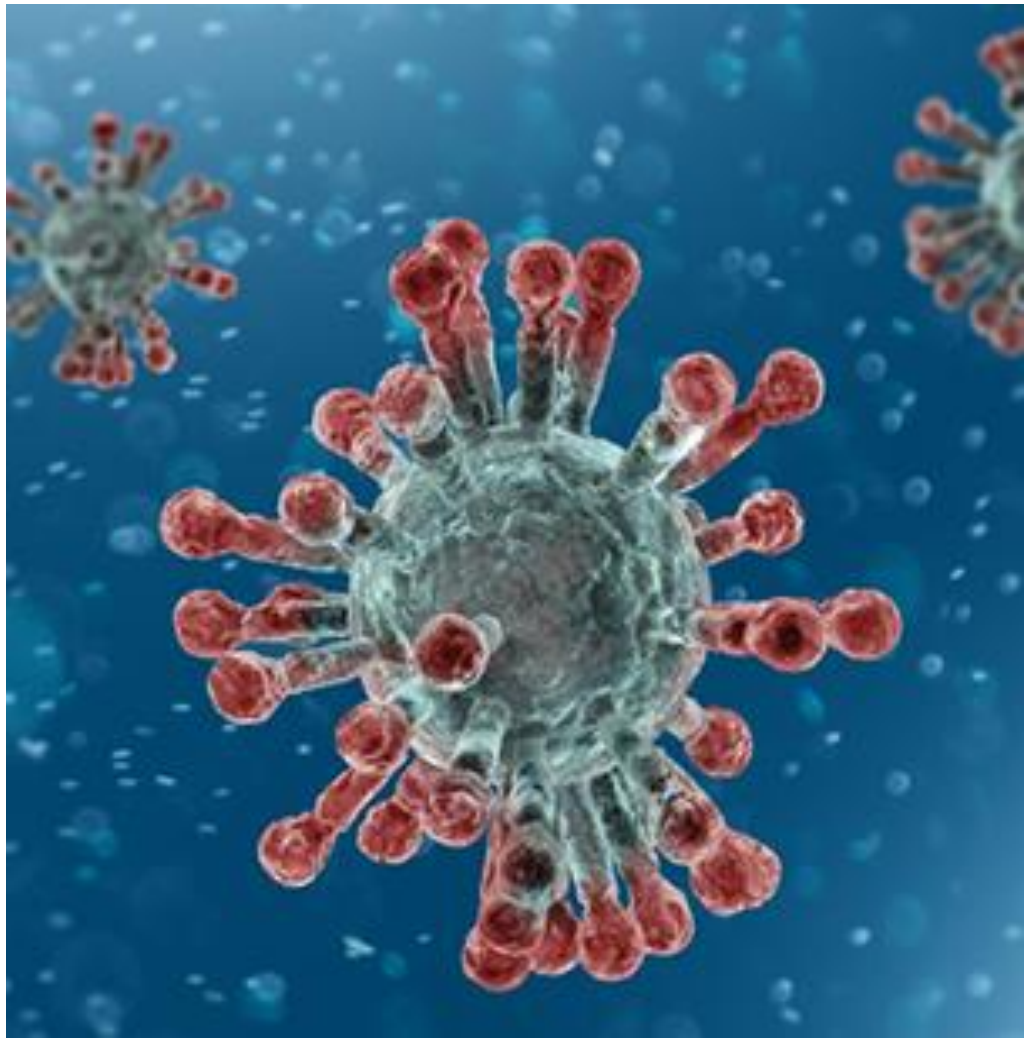
- Coronaviruses are an extremely common cause of colds and upper respiratory infections.

The flu kills more people than COVID-19, at least so far. Why are we so worried about COVID-19?

- There are currently no antiviral drugs available to treat COVID-19. Viruses are highly adaptive and because they reproduce so rapidly, they have plenty of opportunity to mutate developing resistance to whatever drugs or vaccines.
- COVID-19 also seems to be spreading at a quicker time period than the flu which could potentially overwhelm the medical community.

How long can the coronavirus that causes COVID-19 survive on surfaces?

- A recent study found that it can survive up to four hours on copper, up to 24 hours on cardboard, and up to two to three days on plastic and stainless steel.
- The virus can hang out as droplets in the air for up to three hours before they fall. But most often they will fall more quickly.



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COVID-19 Basics

What are the symptoms of COVID-19?

- Some people infected with the virus have no symptoms. When the virus does cause symptoms, common ones include low-grade fever, body aches, coughing, nasal congestion, runny nose, and sore throat. However, COVID-19 can occasionally cause more severe symptoms like high fever, severe cough, and shortness of breath, which often indicates pneumonia.

How long is it between when a person is exposed to the virus and when they start showing symptoms?

- Because this coronavirus has just been discovered, the time from exposure to symptom onset (known as the incubation period) for most people has yet to be determined. Based on current information, symptoms could appear as soon as three days after exposure to as long as **13** days later. Recently published research found that on average, the incubation period is about **5** days.

How does coronavirus spread?

- The coronavirus is thought to spread mainly from person to person. This can happen between people who are in close contact with one another. Droplets that are produced when an infected person coughs or sneezes may land in the mouths or noses of people who are nearby, or possibly be inhaled into their lungs.
- Coronavirus can also spread from contact with infected surfaces or objects. For example, a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes.

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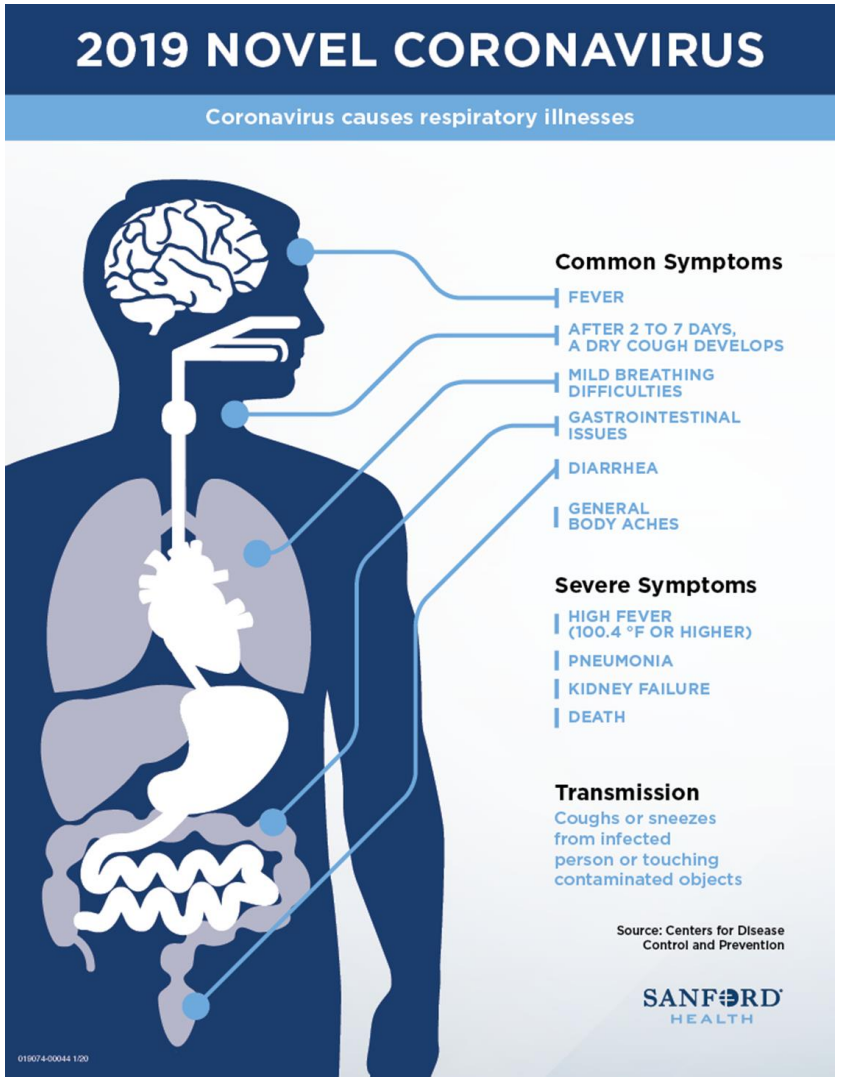
Best Hygiene Practices

Workplace safety precautions

- Actively encourage sick employees to stay home - Employees who have symptoms of acute respiratory illness are recommended to stay home and not come to work until they are free of fever
- Wash your hands frequently for at least 20 seconds.
- Avoid touching your eyes, nose, and mouth.
- Cover your coughs and sneezes with a tissue and throw the tissue away. If you don't have a tissue, use the elbow of your sleeve.
- Avoid close contact with people who are sick.
- Safety Minute updated to include reminders and information as we progress.



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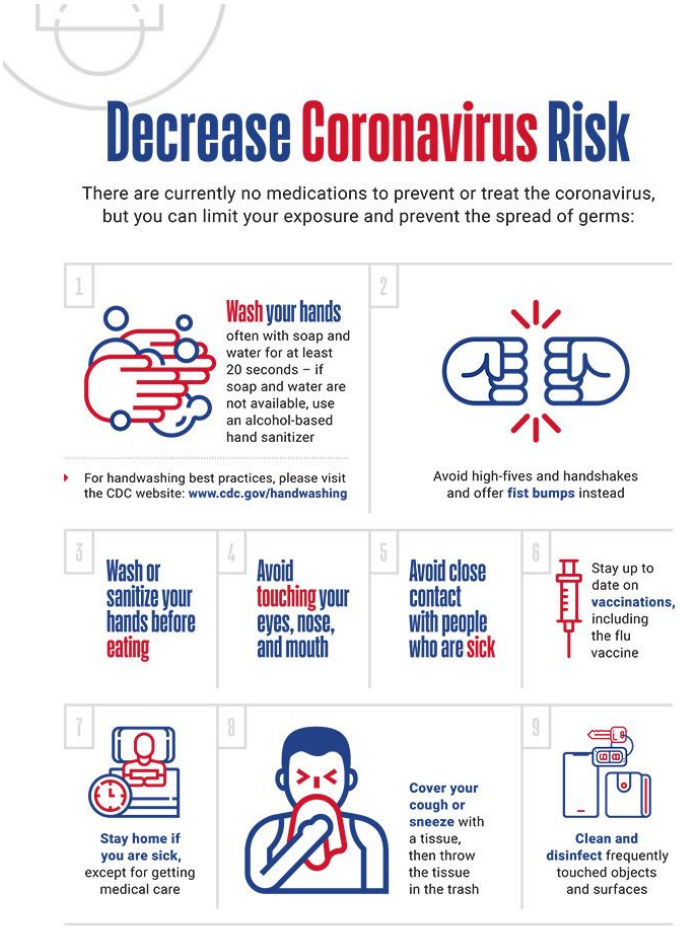
Office Management Practices



- Employee Health questionnaire
- Redundancy rotations
- Work from home options
- Employee Work Rotations
- Perform routine environmental cleaning -
  - Routinely clean all frequently touched surfaces in the workplace such as workstations, countertops, and doorknobs (3 x Daily)
- No large group meetings
- Cross train and back up

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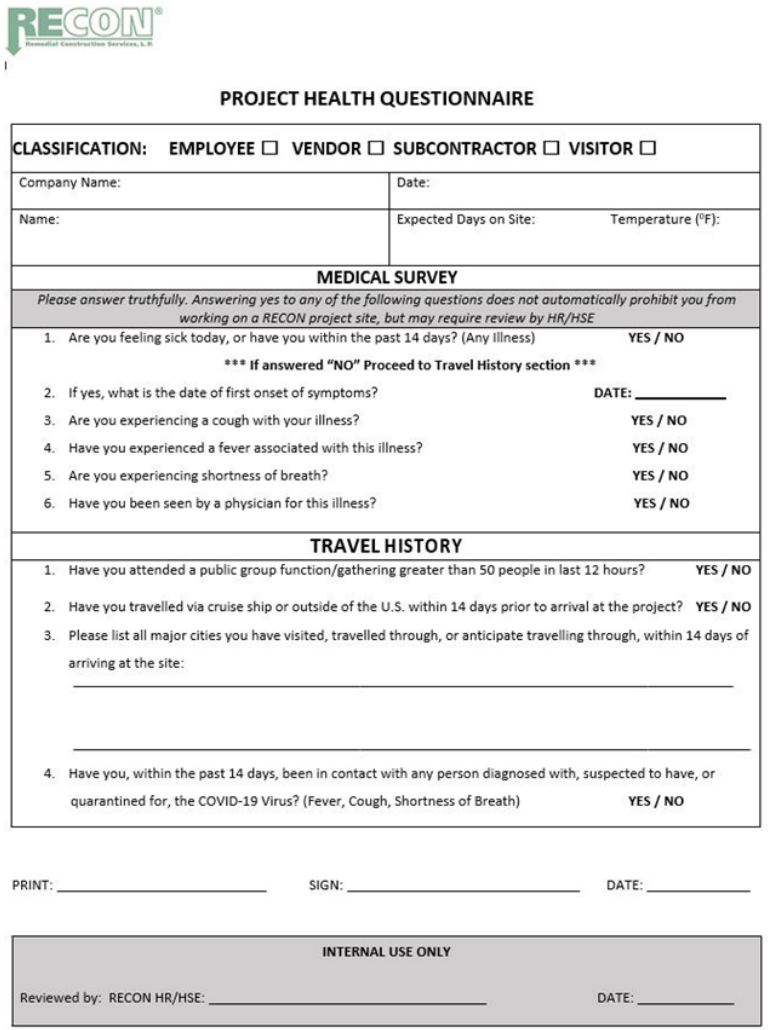
Field Management Practices



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PROJECT HEALTH QUESTIONNAIRE

CLASSIFICATION: EMPLOYEE ☐ VENDOR ☐ SUBCONTRACTOR ☐ VISITOR ☐

Company Name:	Date:
Name:	Expected Days on Site: Temperature (°F):

MEDICAL SURVEY

Please answer truthfully. Answering yes to any of the following questions does not automatically prohibit you from working on a RECON project site, but may require review by HR/HSE

1. Are you feeling sick today, or have you within the past 14 days? (Any Illness) **YES / NO**

***** If answered "NO" Proceed to Travel History section *****

2. If yes, what is the date of first onset of symptoms? **DATE:** _____
3. Are you experiencing a cough with your illness? **YES / NO**
4. Have you experienced a fever associated with this illness? **YES / NO**
5. Are you experiencing shortness of breath? **YES / NO**
6. Have you been seen by a physician for this illness? **YES / NO**

TRAVEL HISTORY

1. Have you attended a public group function/gathering greater than 50 people in last 12 hours? **YES / NO**
2. Have you travelled via cruise ship or outside of the U.S. within 14 days prior to arrival at the project? **YES / NO**
3. Please list all major cities you have visited, travelled through, or anticipate travelling through, within 14 days of arriving at the site:

_____

_____

4. Have you, within the past 14 days, been in contact with any person diagnosed with, suspected to have, or quarantined for, the COVID-19 Virus? (Fever, Cough, Shortness of Breath) **YES / NO**

PRINT: _____ SIGN: _____ DATE: _____

INTERNAL USE ONLY

Reviewed by: RECON HR/HSE: _____ DATE: _____

- Employee travel restrictions – drive when possible
- Daily Health Check Questionnaire for
- Digital infrared temporal thermometer measurement program.
- Daily sign-in and sign-out sheets have been updated to include fields to capture body temperature measurements for all personnel entering the site
- Twice daily temperature check
- Cleaning of field offices
- Same operator on same piece of equipment where possible. End of shift equipment cleaning – operator controls
- Stop work and isolation if onsite worker is identified as being ill as well as any personnel that had direct contact of the infected person.
- Smaller work groups/tailgates

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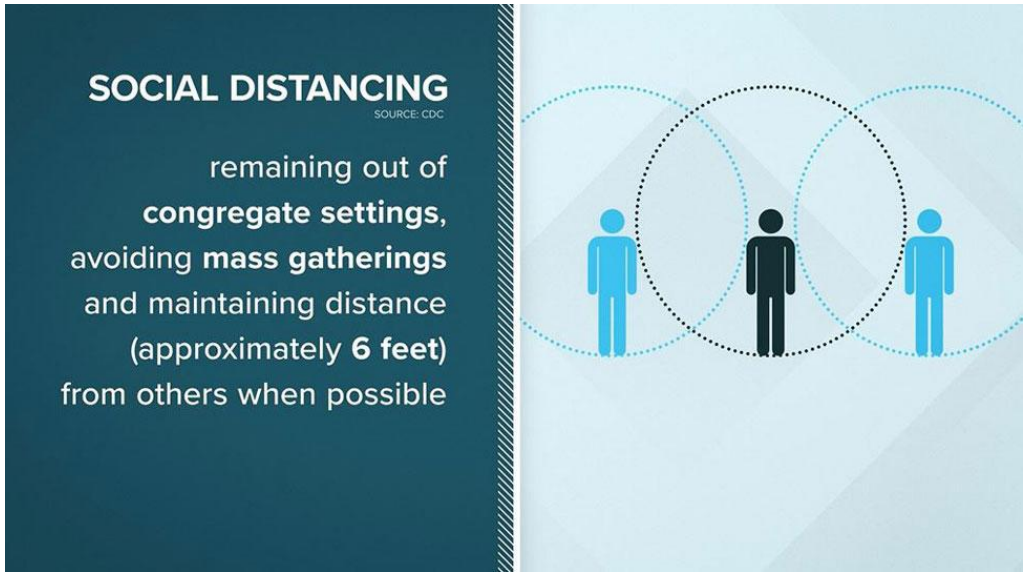
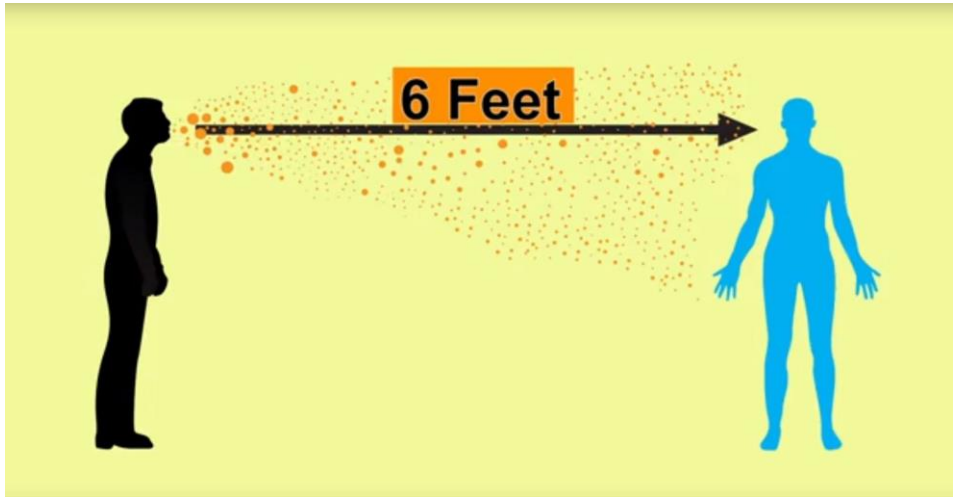
Social Distancing

- Social Distancing - people stay far enough away from each other so that the coronavirus – or any pathogen – cannot spread from one person to another! Roughly 6 feet.
- Defensive driving from a social standpoint. You know how to mange your exposure but do not know how others do and what their risk tolerance is!!!





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Remember – Do the Five

1. **HANDS –** Wash them often
2. **ELBOW –** Cough into it
3. **FACE –** Don’t touch it
4. **FEET –** Stay 6 feet apart
5. **FEEL –** sick? Stay home

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Attachment D: Site Specific Hazard Communication Program

Hazard Communications Program/Checklist

To ensure an understanding of and compliance with the Hazard Communication Standard, RECON will utilize this checklist/document (or similar document) in conjunction with the RECON's SP-16 (Hazard Communications Program) as a means of meeting site or location specific requirements. RECON's safety procedures are included on the RECON portal and in the RECON field office.

While responsibility for activities within this document references the RECON SSO, it is the responsibility of all personnel to effect compliance. Responsibilities under various conditions can be found within the RECON Hazard Communication Program.

To ensure that information about the dangers of all hazardous chemicals used by RECON is known by all affected employees, the following hazardous information program has been established. All affected personnel will participate in the hazard communication program. This written program as well as RECON's Hazard Communication Program will be available for review by any employee, employee representative, or governing agency representative or any affected employer/employee on a multi-employer site.

Site or Other Location Name or Address:	Ringwood Mines/Landfill Superfund Site, Operable Unit 2
Site/Project/Location Manager:	Larry Endicott
Site/Location Safety Officer:	Rodney Cockerel
List of Chemicals Compiled, Format:	☒ HASP ☐ Other
Location of SDS Files:	In Site Vehicle & Site Trailer
Training Conducted by (name and date):	PHSM (Brad Lockhart) SSO (Rodney Cockerel), SSups (Scott Sutton and Carl Walker), PM (Larry Endicott), SM (Doug Jumper). As needed prior to activities
Indicate format of training Documentation:	☐ Field Log ☒ Other: RECON Portal
Owner briefing conducted regarding hazard communication:	Site Specific Training
If multi-employer site, indicate name of affected companies:	
Other employer(s) notified of chemicals, labeling and SDS information:	
RECON notified of other employers or Owner's hazard communication program as necessary.	

List of Hazardous Chemicals

A list of known hazardous chemicals used by RECON personnel must be prepared and attached to this document or in a centrally identified location with the SDSs. Further information on each chemical may be obtained by reviewing the appropriate SDSs. The list will be arranged to enable cross reference with the SDS file and the label on the container. The SSO or SSup is responsible for ensuring the chemical listing remains up to date.

Container Labeling

The SSO will verify that all containers received from the chemical manufacturer, importer, or distributor for use on-site will be clearly labeled.

The SSO is responsible for assuring labels are placed where required and for comparing SDSs and other information with label information to ensure correctness.

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Safety Data Sheets

The SSO is responsible for establishing and monitoring RECON's SDS program for the location. The SSO will make sure procedures are developed to obtain the necessary SDSs and will review incoming SDSs for new or significant health and safety information. He/she will see that any new information is passed on to the project employees. If an SDS is not received at the time of initial shipment, the SSO will call the manufacturer and have an SDS delivered for that product in accordance with the requirements of RECON's Hazard Communication Program (SP-16).

A log for, and copies of, SDSs for all hazardous chemicals in use will be kept in the SDS folder at a location known to all site workers. SDSs will be readily available to all employees during each work shift. If an SDS is not available, immediately contact the SSO or designated alternate. When revised SDSs are received, the SSO will immediately replace the old SDSs.

Employee Training and Information

The SSO is responsible for the RECON site-specific personnel training program. The SSO will ensure that all program elements specified below are supplied to all affected employees.

At the time of initial assignment for employees to the work site or whenever a new hazard is introduced into the work area, employees will attend a health and safety meeting or briefing that includes the information indicated below.

- Hazardous chemicals present at the worksite
- Physical and health risks of the hazardous chemicals
- The signs and symptoms of overexposure
- Procedures to follow if employees are overexposed to hazardous chemicals
- Location of the SDS file and written hazard communication program
- How to determine the presence or release of hazardous chemicals in the employees work area
- How to read labels and review SDSs to obtain hazard information
- Steps RECON has taken to reduce or prevent exposure to hazardous chemicals
- How to reduce or prevent exposure to hazardous chemicals through use of controls, procedures, work practices and personal protective equipment
- Hazardous, non-routine tasks to be performed (if any)
- Chemicals with unlabeled piping (if any)

Hazardous Non-Routine Tasks

When employees are required to perform hazardous non-routine tasks, the affected employee(s) will be given information by the SSO about the hazardous chemicals he or she may utilize during such activity. This information will include specific chemical hazards, protective and safety measures the employee can use, and steps RECON is using to reduce the hazards. These steps include, but are not limited to, ventilation, respirators, presence of another employee, and emergency procedures.

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Multi-Employer Worksites

It is the responsibility of the SSO to provide other employers with information about hazardous chemicals imported by RECON to which their employees may be exposed, along with suggested safety precautions. It is also the responsibility of the SSO and the SM to obtain information about hazardous chemicals used by other employers to which RECON employees may be exposed. RECON's chemical listing will be made available to other employers as requested. SDSs will be available for viewing as necessary.

The location, format and/or procedures for accessing SDS information must be relayed to project employees.

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Attachment E: Instructions for Reporting Near Miss Accidents and Incidents

(Reference Section 3.8 of this HASP: SP-11 Attachment 4: Case Management Flow Chart and Attachment 5: Table of Responsibilities and SP-19 Attachment 2: Incident Investigation Flow Chart and Attachment 3: Table of Responsibilities for Incident Investigation Flow Chart. All RECON Safety Procedures (SPs) will be located on the RECON portal and on site in RECON's safety office.)

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Attachment F: Site Visitor Orientation Briefing Form

Forms within Attachment F are to be utilized when visitors or vendors visit the site. All visitors shall sign in with at the RECON field office and meet with either RECON's SM, SSup, or SSO to conduct visitor and vendor orientation using the following visitor and vendor forms.

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Visitor Orientation Briefing

Project: Ringwood Mines/Landfill Superfund Site

Site Address: *Ringwood Mines OU-2 Site – Ringwood, NJ*

RECON Project Manager: Larry Endicott
RECON Site Manager: Douglas Jumper
RECON Site Superintendent: Carl Walker
RECON Site Superintendent: Scott Sutton
RECON SSO: Rodney Cockerel

Site History: The overall Site known as the Ringwood Mines/Landfill Superfund Site is an approximately 500-acre parcel of land located in the Borough of Ringwood, Passaic County, New Jersey. The Site is located in an area of historic mining operations dating back to the 1700s. Current uses of the Site include parklands (Ringwood State Park), Borough of Ringwood facilities (recycling center and public works yard), open space (Borough of Ringwood property), privately owned residential properties, and utility corridors. The majority of the 500-acre Site is forested or otherwise overgrown with vegetation. The three land ACs that are the subject of the OU2 RA are contained within the overall Site and are summarized below. Additional background information on each of the three land ACs is presented in the RAWP.

CMP Area

The CMP Area is a former mine pit located in the southwestern portion of the Site and encompasses an area of approximately two acres, adjacent to the cul-de-sac at the end of Van Dunk Lane. The CMP Area has underground mine workings and a mine pit that was closed by blasting in the sides. The pit was filled to ground surface after it was initially closed, when it was used as a permitted landfill. The CMP Area is mostly an open field surrounded by a chain-link fence and includes areas such as access roads and rock piles and outcroppings.

OCDA

The OCDA is located in the north-central portion of the Site, just south of the PMP Area, and encompasses approximately 12 acres. The OCDA is a former aboveground mine process waste disposal area. There are no mines or underground workings associated with the OCDA. Fill materials were historically deposited on top of the mine tailings. Wetlands have been delineated within the OCDA and generally adjacent to Park Brook. This area is currently wooded and mostly overgrown with vegetation.

PMP Area

The PMP Area is located in the north-central portion of the Site at the end of Peters Mine Road. This area encompasses approximately three acres; a majority of the area is within Ringwood State Park. The terrain consists of a relatively flat area where the PMP mine pit is located. Groundwater in the PMP Area occurs in the overburden, shallow bedrock, and deeper bedrock. An approximately one-half acre pond, an expression of the groundwater table, is located within the approximate center of the PMP Area where a former soil cap has subsided thus enabling the pond to form. The PMP Area is otherwise forested and overgrown with vegetation.

A number of prior investigations have been performed in the CMP Area, OCDA, and PMP Area to complete the Remedial Investigation (RI) and as a part of prior waste removal actions. These included test pits and test trenches used to characterize soil/fill (e.g., soil classification, material types) and define lateral and vertical extent of fill and waste; laboratory

analytical testing of soil/fill/waste materials; and baseline human health and ecological risk assessments. Prior RI activities included characterization of groundwater and surface water; however, Site-related groundwater is being addressed separately under Operable Unit 3 (OU3) for the Site.

On June 30, 2014, the US Environmental Protection Agency (USEPA) issued the Record of Decision (ROD) for OU2. The ROD defined the components of the remedy selected by USEPA for each of the land ACs. Subsequently, an Administrative Order on Consent (AOC) for Remedial Design was entered with an effective date of October 1, 2014. The AOC governed the implementation of the remedial design (RD) for the Site. A Final Remedial Design Report (FRDR), dated February 2017, was subsequently approved by USEPA. A Consent Decree for the OU-2 RA was signed in March 2019, and the RA activities are described in the RAWP to which this Site-Specific HASP is appended.

Scope of Work: The overall project scope of work will include the execution of select scopes of work at three independent areas located at the Site. The three land ACs, as described above, are noted as the CMP Area, the OCDA, and the PMP Area. Each land AC is scheduled for scopes of work that differ in detail, but generally include excavation of existing soil, segregation of waste, reuse of excavated material deemed acceptable, and installation of an engineered cap. All necessary labor, equipment, and materials to conduct the overall scope of work will include but are not limited to:

- Prepare Job Safety Analyses (JSAs), this Site-Specific HASP including attachment sub-plans, and associated Site plans such as the Vibration Monitoring Plan (Appendix C to the RAWP); Community Air Monitoring Plan (CAMP; Appendix D to the RAWP); and Transportation & Disposal Plan (T&D Plan; Appendix H to the RAWP).
- Mobilize equipment, materials, and personnel to the Site.
- Once mobilized, RECON will conduct all training associated with the Site.
- Upon completing Site-specific training, RECON will start setting up the project site controls. These controls include installing signage, establishing temporary facilities, temporary utilities, staging areas and the Best Management Practice (BMP) controls along with soil erosion and sediment control (SESC) measures.
- Pre-construction survey to define Limit of Disturbance (LOD), remedial limits, wetland areas, known utilities, existing elevations, and establishment of control points/offsets.
- Installation of habitat protection devices and water treatment system.
- Clearing and grubbing.
- Cut/fill operations and waste/debris removal at three independent land ACs.
- Management of waste and transportation/disposal as necessary.
- Dewatering/water treatment.
- Installation of engineered cap systems.
- Construction of a new Recycling Center at the OCDA.
- Site restoration: seeding, wetland planting, riparian zone planting, and wildlife habitat construction.
- Demobilization.

Throughout the duration of the project, dust control measures along with visual and real time air monitoring practices will be completed to minimize exposure to known COPC.

All personnel must sign in and out (visitors and site personnel).

Stop Work Authority

All personnel and subcontractors working at the site have the right and authority to suspend work any time it is determined or suspected that the provisions of the Health & Safety Plan are not adequate, and the jobs being performed are unsafe or seem unsafe.

Current Work Activities:

1. All visitors will be escorted at all times to discuss work in progress.
2. Your escort is aware of the current field activities, but you may also reference the field board for information regarding assembly areas, traffic patterns, and first aid kit locations.
3. Stay with your escort at all times, and follow all instructions

PPE Requirements: Level D Minimum

Hard Hat, Safety Glasses w/side shields, Hard Toed Footwear, Gloves, Safety Vest, and long sleeve shirts are required to be worn at all times while on Reid Gardner Generating Station Property.

Motor Vehicle Safety (MVS):

1. Comply with the Transportation and Disposal Plan and all warning signals throughout the property. Operate your vehicle and/or equipment in a manner which is reasonable and prudent for existing conditions.
2. Wear seat belt at times while operating vehicle or equipment.
3. No cell phone or any other mobile device usage while driving, not even hands free. No texting while driving.
4. When traveling on the property obey all traffic signs.
5. All visitors shall have an escort at all times.
6. Only authorized person shall be permitted on haul roads, in loading and dumping areas. Notify RECON supervisor on radio before entering work zone.
7. Always park your vehicle and/or equipment out of the flow of traffic and in an area where it does not present a hazard to others. Always set your parking brake and chock your wheels when your vehicle and/or equipment is unattended. All ground engaging devices on equipment shall be lowered completely to the ground when parked and/or otherwise unattended.

Safe Work:

1. Permit to Work is required for all Hot Work, Working at Heights, Lifting and Rigging, Excavation and Trenching, Confined Space Entry, and Electrical Safe Work. No one shall work alone in any area where hazardous conditions exist.
2. No Smoking in any areas where “No Smoking” signs are posted.
3. Intoxicating liquids, drugs, firearms, and fixed open blade knifes are not permitted on the mine property at any time.
4. All accidents (regardless of whether injury, equipment damage, or near miss) shall be reported immediately to your supervisor and the Recon Safety Department on the same shift incident occurred.
5. If you do not understand any RECON Work Rules, Procedures, or Safe Work Practices, contact the Recon representative overseeing the work and/or service you are here to perform.
6. In order to achieve our goal of eliminating accidents at Recon and comply fully with all applicable company, Federal, and State Safety and Health Regulations, it is absolutely necessary that we have complete cooperation of all our visitors.

Site Orientation completed by: _____

Name: _____ **Company: _____**

Signature: _____ **Date: _____**

Visitor Quiz

NAME: _____ DATE: _____

1. What is the audible signal for an emergency on-site?
    a. One long horn blast (Air Horn) for 30 seconds or greater.
    b. A whistle blown by the superintendent.
    c. A crew member playing charge on a trumpet.
2. FRC's are required on site.
    a. True
    b. False
3. What is the site address?

4. Who has the authority to stop work on the site?
    a. The site safety and superintendent only.
    b. Employees
    c. Anybody on the site
    d. Chevron
5. It is important to know the site address in the event of an emergency at the site.
    a. True
    b. False
6. What PPE is required when you are outside of the green zone (work areas)?
    a. Hardhat / High Vis Vest
    b. Safety glasses
    c. Safety toe shoes
    d. All the above
7. Visitors are allowed to walk or drive the site unescorted one you have completed your visitor briefing.
    a. True
    b. False
8. We sign in and out of the site for tracking and time keeping purposes.
    a. True
    b. False
9. What is the highest physical hazard at the Northam Station site?
    a. Heavy equipment moving on site.
    b. Visitors
    c. Running on site.
    d. Uneven work surfaces.
10. List one physical and one biological hazard present on the site.

Physical _____ Biological _____

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Vendor Orientation

RECON Site Safety Requirements Acknowledgments

Delivery Truck / Equipment Drop-Off or Pick-Up

- All Drivers must report to the office prior to off-loading a delivery to the Ringwood Mine/Landfill Siteorie.
- Seat belts are to be worn at all times when vehicle is in motion.
- Only equipment drop off and loading are permitted to exit vehicle to load or off-load their delivery, ALL SAFETY REQUIRMENTS FOR THE SITE MUST BE FOLLOWED.
- The engine will be off, and the parking brake engaged before any person exits the vehicle. BEFORE EXITING VEHICLE. (Exception for this rule will be granted by need only.)
- YOU MUST BE ESCORTED AT ALL TIMES WHEN OUTSIDE THE OFFICE AREA.
- All personnel shall wear Safety toe safety foot wear (Must be laced and tied correctly), ANSI approved hard hat (cowboy hard hats ARE NOT ALLOWED), ANSI approved (Z-87.1) safety eye glasses, or prescription safety glasses with side shields, and hi-vis vest while onsite when outside the vehicle outside the safe zone. 100% glove policy while on site.
- The driver's employer shall provide all safety gear.
- The vehicle shall have a spill kit available for fuel and oil leaks and the driver shall be responsible for proper clean-up of spills and leaks. A leaking vehicle will NOT be allowed to return to the job site until corrections are made to the vehicle.
- Do not enter the site if you are using medications that may make you drowsy.
- Do NOT use cell phones while driving, or walking. You must find a safe location to send or receive a phone call, text message or email.
- Do not drive with equipment raised.
- Do not back-up with-out a spotter.
- Follow the instructions of SITE personnel at all times
- **Speed limit on SITE is 5 mph**
- No blocking other vehicles.

Company Name (print clearly) _____

Driver Name (print clearly) _____

Driver Signature _____date_____/_____

Attachment G: HASP Comprehensive Quiz

Upon completion of the Site-Specific HASP orientation, RECON personnel and subcontractors assigned to the Site shall successfully pass the attached HASP quiz. This is designed to provide a general overview and understanding of site hazards, mitigations, policies, and procedures developed for the project. After the completion of the quiz, RECON's SSO will go over the answers with the test taker to ensure they understand the general hazards, mitigations, policies, and procedures developed for the Site. A copy of the quiz will be kept in a file on-site for the duration of the project.

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Name: _____ Date: _____

Circle the correct answer for each of the questions below. Each question will have only one correct answer.

1. What is the minimum level of Personal Protective Equipment (PPE) I wear when working on this project?
a. Level A
b. Level B
c. Level C
d. Level D

2. If I am involved in, or see an incident onsite, I must report the incident when?

3. Explain the STOP WORK AUTHORITY.

4. What document addresses the traffic concerns for this site?

5. Name the three documents that make up the Daily Work Packet?

6. What is a goal of this project?

_____

7. How do we conduct an HOF?

8. Who is primarily responsible for an individual's personal safety?
a. Site safety officer
b. Superintendent
c. The Individual
d. Project manager

9. What does the SDS tell me:
a. The hazards associated with using the chemical
b. First aid measures to use if I am exposed to the chemical
c. How I can become exposed to the chemical (Ingestion, injection, inhalation, absorption)
d. All of the above

10. The morning safety meetings are important because:
a. We discuss safety hazards associated with the work we are doing
b. Each employee has the opportunity to talk about concerns they have seen
c. It gives us time to "wake –up" and get paid for doing nothing
d. Only answers A & B above

11. What does the orange hard hat (or white with orange stripes) being worn by employees on the job site illustrate?
a. A veteran employee with many years of experience with the work task and more than 6 months employment with the company.
b. A Short Service Employee (SSE) with less than 6 months employment with the company.
c. A Supervisor.

12. After an HOF has been performed, when should the feedback session be conducted?
a. Whenever you feel like it.
b. The following day.
c. In a couple of weeks.
d. Within one hour of the observation but no later than the end of the day.

13. Which of the following is not a requirement for working on this project?
a. 40 hour HAZWOPER training
b. Medical monitoring program
c. Confined Space Entry
d. BBS System (behavior based safety)

14. Name at least two hazards inherent to this site by each type: (SSO will grade)
A. PHYSICAL
B. CHEMICAL
C. BIOLOGICAL

SCORE:
Graded by:

Attachment H: Journey Management Plan

Purpose

The purpose of this Journey Management Plan (JMP) is to prevent losses associated with motor vehicle related incidents including injuries to drivers, passengers and pedestrians, damage to motor vehicles and damage to third party property. By communicating potential safety risks before mobilizing to a site, a motor vehicle operator will be able to prepare for and avoid potential hazards.

Scope

This JMP applies to all vehicles assigned for the support of site operations, including company owned and personal use vehicles. This JMP does not apply to vendors (such as UPS, FedEx, etc.) not under contract with RECON. This JMP does not address hazards that are external to the site access/egress and on the onsite project operations.

Special Note

Because the site, weather and traffic conditions may change frequently, the JMP shall be maintained and updated separately from the Site-Specific HASP.

Responsibilities

RECON's Project Manager: The contract project manager is responsible to ensure that the site has a current JMP.

RECON's Site Manager: The field manager is responsible to create and keep current a JMP that is appropriate for the site conditions. It is also the field manager's role to ensure each vehicle operator has a JMP that describes the conditions for his vehicle and equipment prior to mobilizing to the site. A common JMP may be used for several vehicles or as conditions dictate a separate JMP may be specific or unique to an individual vehicle.

Vehicle Operator: The assigned vehicle operator shall not mobilize to the site without first receiving the JMP. It is also the vehicle operator's responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing to the site. DO NOT mobilize to the site to get clarification to the JMP. Because driving conditions may vary, vehicle operators shall also notify the SM, SSup, or SSO of any hazards not identified on the JMP so that the JMP can be updated. Because traffic conditions may change frequently on a project, the JMP shall be maintained and updated separate from the Site-Specific HASP.

See additional JMP requirements in RECON's COVID 19 Action Plan located in Attachment C of this HASP.

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Scope of this JMP

Describe the types of vehicles and equipment that are within the scope of this JMP.

Personal vehicles, Over the Road Trucks

General Hazards

Describe the conditions/hazards that are more general such as those related to weather or time of day, lighting and the use of headlights and vehicle emergency flashers, the use of private services to manage traffic signs and barricades. You may want to describe the preferred walking routes for site workers. Due to the hazards, travel should be completed in daylight hours if possible and drivers carry a reliable method of communication (cell phone, radio) in case of emergency. Drivers need to take rest breaks to prevent fatigue of if feeling tired.

Traveling during normal business hours:

- Always wear installed safety restraint, travel with headlamps on. Utilize appropriate signaling device approximately 200 feet prior to making any turns. Maintain at an absolute minimum, a 4-second following distance.
- Before leaving on a trip, ensure that weather conditions are safe for driving. Ensure the vehicle being used is adequate for the weather conditions. Make sure emergency supplies are in the vehicle. In particularly harsh conditions, consider canceling or rescheduling the trip.
- Before taking a trip to an unfamiliar location ensure that you have printed driving directions available. Do not plan to read directions from a smartphone while driving. A GPS device may be used, but printed directions should be kept as a back-up.

Site Specific Hazards

Describe the conditions/hazards that are site specific such as those related to pedestrian traffic, bus stops, school zones, local traffic conditions, train tracks, and other local conditions. You may want to describe the preferred walking routes for site workers.

Personnel / Pedestrians – Area restricted to personnel on foot
Railroad Crossings – N/A
School – No Schools or bus stops in this route.

Missed Turn or Get Lost

Should you miss a turn in your Journey, pull into a SAFE Zone off the road / out of traffic and contact a Supervisor for further direction / instruction:

Directions: Access to the Site

Describe the recommended safe direction to gain access to the site and recommended direction to leave the site. This description shall take into consideration conditions and limitations caused by local traffic conditions, road conditions, presence or lack of curb and gutter, bus stops, school zones, pedestrian walkways, traffic lights, train tracks, etc. Specific directions may vary depending on the time of day if there are specific hazards such as school recesses, or local business traffic due to shift changes.
Site-related vehicular traffic, including trucks and heavy equipment transporters, will use Peters Mine Road to access the work areas for the PMP Area and the OCDA. The CMP Area will be accessed from Horseshoe Bend Road

Directions: Leaving the Site

Describe the recommended safe direction to leave the site. This description shall take into consideration conditions and limitations caused by local traffic conditions, road conditions, bus stops, pedestrian walkways, traffic lights, etc.

Trucks exiting any of the land ACs will be assisted by traffic control/spotters, if necessary, to allow for safely entering the highway.
Personal vehicles need to follow road rules and conditions to safely enter the highway.

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Site Specific Restrictions and Controls

Directions to reference attached site sketch. Describe any site conditions that might be relevant such as height restrictions due to the business canopy, overhead power/phone lines. Describe any parking limitations or the number and size of vehicle restrictions. Describe the procedures used for positioning/backing vehicles and equipment such as: All vehicles with limited vision shall not be positioned into place or backed without a spotter to assist the vehicle operator. If relevant describe how 3rd party pedestrian walkways will be used and maintained. Describe as appropriate the roles and responsibilities of maintaining exclusion zone barricades, traffic control signs and markers, etc.

The traffic plan for trucks is included in the T&D Plan included in Appendix H of the OU-2 RAWP..

This Journey Management Plan is approved for use:

From:	Time:	To:	Time:

Journey Management Plan Created and Maintained by:

Site Safety Officer:	
Construction Manager:	
Contract Project Manager:	

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

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Attachment I: Decontamination Plan

RECON will establish designated personal decontamination (decon) stations at select locations along the perimeter of the exclusion zone (EZ). These locations will be selected by RECON's Site Manager and Site Safety Officer. Each decon station will consist of a boot wash, brush and a receptacle to dispose of any spent PPE or decontamination equipment or materials. The decon stations will be adequately maintained throughout the project to ensure that contamination is not migrating out of the EZ. In general, RECON personnel leaving the EZ will exit through the designated areas and perform their own decontamination. Unless the personnel had direct exposure to contaminants or grossly contaminated debris is visible, RECON personnel will perform a dry decontamination consisting of brushing off loose soil from their boots or clothing. If wet decontamination is needed, then the personnel will be instructed to use the available boot wash.

Personal Decontamination

The levels of protection required for personnel assisting with decontamination will be:

☐ Level B	☐ Level C	☒ Level D-Modified
Modifications Include: Level D PPE, Face-shield, Rain Gear (Wet)		

PPE and Monitoring Equipment Decontamination

Decontamination procedure required for site personnel:

☒ Dry Decon

☐ Wet Decon (If needed based on exposure to contaminants of concern)

- ☐ Wash Boots and Gloves
- ☐ Remove Outer Boots
- ☐ Remove Outer Gloves
- ☐ Remove Chemical Coverall
- ☐ Remove Respiratory Protection
- ☐ Remove Inner Gloves

Sampling Equipment Decontamination

Sampling equipment will be decontaminated in accordance with the following procedure:

☐ Wash with Soap and Water

☐ Rise with Distilled Water

☐ Rinse with Isopropanol

☐ Rinse with Methanol

☐ Rinse with Hexane

☐ Rinse with Nitric Acid

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☐ Rinse with DI Water

☒ Air Dry

Disposition of Decontaminated Wastes

All wastes will be disposed of in accordance with the OU-2 RA design and waste profiles generated for the Site.

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Attachment J: Environmental Compliance Considerations

☐ Generation of Hazardous Waste*	☐ Waste Identification & Manifesting - Marking, Placarding, Labeling*
☐ Generation of Investigation Derived Waste*	☐ Training & Licensing for Use of Radioactive Materials/Sources
☐ Treatment, Storage, or Disposal of Hazardous Waste*	☐ Containers: dated, labeled, closed, full, stored less than 90 days
☐ Contingency to prevent or contain hazardous materials or oil spills or discharges to drains, body of water, soil*	☐ Risk of explosion or catastrophic release due to chemical storage or processing involving reactivity, flammables, solvents or explosives*
☐ Disturbing of Asbestos Containing Materials (ACM)*	☐ Training & Licensing for Asbestos Remediation Activities
☐ Application of Pesticides or Herbicides*	
☐ Work on Above or Under-ground Storage Tanks*	
☐ Transportation, Storage or Disposal of Radioactive Material*	
☐ Activities producing or generating Air Emissions (or fugitive "fence-line" emissions) requiring either monitoring and/or permit*	
☐ Excavations, Drilling, Probing or other activities that could impact underground utilities, pipelines, sewer or treatment systems.	
☐ Shipment of Hazardous Waste off-site*	

* Requires additional permits, plans, and training

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Attachment K: Equipment Inspections

Equipment Inspections

The heavy equipment operator is required to perform a daily pre-use inspection of the equipment he/she will be operating. If an unsafe condition is identified, either the SM, SSup, or SSO shall be notified immediately of the condition, and the equipment will not be operated until adequate repairs have been made. Most equipment operation and maintenance manuals contain inspection checklists that can be used as a guide for the inspection. All manufacturer-recommended procedures shall be followed during inspection.

Standard Heavy Equipment Features

The use of standard safety features is an important factor in safe heavy equipment operation. There are some mandated safety features that are required to be in all company owned or operated equipment. These required safety features include:

- Backup alarm
- Portable fire extinguisher
- Horn
- Seat belt
- Spill Kit

Maintenance

Only authorized personnel shall perform maintenance or repair activities on heavy equipment. Guidelines for the maintenance of equipment are contained in the operations and maintenance manual developed for the specific make and model of a particular piece of equipment being maintained. All work shall be done in accordance with manufacturer's guidelines. Because heavy equipment is typically used every day, it is particularly important for personnel to follow these manufacturer-established maintenance, lubrication, and inspection schedules.

Expectation Provisions

Variances and exceptions to this procedure may be requested by contacting the VP HSE.

Equipment Inspection Report

An Equipment Inspection Report to be filled out prior to the use of any equipment. Equipment inspection forms will be available on the RECON portal and on site in RECON's field office. Completed forms will be filed on site in the RECON field office.

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Attachment L: Site Specific HSE Document Retention Guidelines

Safety meeting agenda – Kept on file for the duration of the project

Job Safety Analysis – Kept on file for the duration of the project and a year after completion

Job Safety Analysis forms – Kept on file for the duration of the project

Work permit – Kept on file for the duration of the project; Confined Space Entry Permits for one year AFTER completion of the project

Health & safety inspection form - Kept on file for the duration of the project

Visitor briefing forms – Kept on file for the duration of the project

Hazard observation cards – Kept on file for the duration of the project

Stop work cards – Kept on file for the duration of the project

Lockout/Tag out forms - Kept on file for the duration of the project and two years after completion

Rope, cable & sling inspection form – Kept on file for the duration of the project

Fall protection form - Kept on file for the duration of the project

Ladder inspection form – Kept on file for the duration of the project

Noise conservation forms – Kept on file for the duration of the project and two years after completion

Air monitoring forms – Kept on file for the duration of the project and two years after completion

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Attachment M: Site Safety Officer's Project Safety Workbook

RECON's SSO will generate a project safety workbook to track all the following. The workbook will be kept in RECON's field safety trailer.

- Tracking RECON and subcontractor HSE performance metrics
- Tracking and trends of injuries, incidents, and near misses
- Training records of site personnel
- Inspection records
- Metrics/Key Performance Indicators to be used

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Attachment N: Safety Incentives

The PM and the SM are responsible for setting goals for the incentive awards program and the type of awards for the project. The SSO is responsible to monitor the project for incentive criteria and recommend employees for awards as goals are met. Management and supervision are responsible to see that the program is administered and that all employees are rewarded for their participation. RECON promotes a unified safety culture on-site that is reflective of our safety program. It is important to get the support of all field employees.

For this project, RECON management will determine the safety incentive plan prior to mobilization. As an example, RECON management could choose from the best hazard find or observation from each week. A chosen craft employee recipient may receive a $25 gift card. Of the weekly awarded cards, a monthly drawing will be held for an additional $100 gift card. At the end of the project, each of the monthly winner submissions will be reviewed and one will be selected for an award of a $500 gift card. Through this initiative, crew members are awarded for performing a safety act above-and-beyond what is expected, providing on-site activity observations, intervention or stop work notifications, and supporting the health and safety program by recommending alternate methods to work safely.

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Attachment O: Communicating HSE Information

Health and Safety Meeting Procedure

RECON will utilize four types of health and safety meetings to distribute information to employees: initial (or job briefing), weekly, daily, and monthly meetings.

Initial, weekly, daily, and monthly meetings are intended to:

- Provide safety education (informational programs) and motivation
- Define the necessary safety equipment and personnel
- Review pertinent aspects of appropriate activity or job hazard analyses
- Introduce a new program or procedure and appropriate safety measures
- Discuss a procedural or operational change in the scope of work
- Review workplace accidents and activities
- Discuss employee concerns

Employees are required to attend scheduled safety meetings, participate in discussions and exercises, and ask questions to clarify or enhance their learning.

All meetings shall be documented, including the date, attendance, subjects discussed, and the names of individuals who conducted the meeting. Documentation shall be maintained, and copies furnished to the designated personnel.

Initial or Job Safety Briefing

Initial or Job Safety Briefings consist of two meetings, with the same purpose "To identify potential hazards before work begins and have the appropriate safety equipment and knowledge onsite to address the issue". An effective health and safety program will only result from adequate planning, education, and communication to all personnel concerned with the program.

Project Planning Meeting

This meeting should include, at a minimum, the PM, CM/SSup, and SSO. During this meeting, the Safety Management Checklist needs to be completed. The objective of the meeting is to:

- Ensure purchase and delivery of specific job equipment and tools, including protective equipment
- Review regulatory requirements and applicable health and safety procedures

Site Orientation Meeting

Once all project employees have been identified, the CM/SSup and SSO, will conduct a meeting at the project site. This meeting is to define the project, including:

- Type of work
- Types of hazards expected
- Actual work zone locations

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- Emergency response actions, locations of phones, extinguishers, first aid kits, etc.
- Review of Site-Specific HASP, and JHA
- Coordinate with any other onsite health and safety departments
- Attend any onsite site-specific training

All new employees shall be given a general health and safety orientation prior to starting work and will be given specific instructions as needed by their immediate supervisors.

Weekly Safety Meeting

Each week, ideally on Mondays, the SSO and CM/SSup shall hold a safety meeting with everyone entering the exclusion or work zones. Health and safety problems of the previous week and conditions to be expected in the coming week shall be discussed along with first aid, reporting of accidents, and other general safety topics. The meeting will review the following:

- Any injuries or near misses the crew has had during the past week: what it was, how it happened, and how it could have been prevented.
- Any health and safety violations noted during the past week: the nature of the violation, the danger involved, and constructive criticism.
- Work planned for the week ahead: hazards to be expected, safety equipment to be used, and procedures to be followed.

Daily Toolbox Meetings

A five-minute informal toolbox meeting shall be given at the project each morning. The CM/SSup shall conduct this meeting. Subjects may include:

- Daily work activities and proper protective equipment needed
- Unsafe or changed site conditions
- Scheduled tasks, and how to perform them safely
- Comments and suggestions from employees
- Chemical and physical hazards associated with the day's activities
- Emergency response procedures, including first aid, excavation routes, and emergency phone numbers
- Slip, trip, fall, and pinch hazards associated with onsite equipment
- Housekeeping activities to be performed

Monthly Safety Meetings

Monthly safety meetings ideally will be held the second week of each month as part of the morning safety meeting. Subjects will include a review of the SSO Project Workbook with focus on:

- HSE performance metrics for the past month
- Trends of injuries, incidents and near misses
- Inspection findings

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Attachment P: Onsite Interactive Communication - Simultaneous Operations (SIMOPS)

Purpose and Summary

This procedure (SP-50) describes the requirements for the facilitation of safe operations during Simultaneous Operations (SIMOPS) to verify that hazards resulting from SIMOPS shall be identified and risks shall be managed.

Scope

This procedure has been prepared for the RECON employees and applies to work carried out by and on behalf of RECON at RECON premises. It is the responsibility of those carrying out RECON work to understand and comply with legal and regulatory requirements and RECON policies and procedures.

Contractors who provide services to RECON are required to meet the requirements in this procedure. Contractors may use their own policies and procedures to meet the requirements in this procedure if, prior to commencing work, they obtain written approval from RECON to do so. Such approval shall be granted when the Contractor provides RECON with documentation or other information demonstrating that the Contractor's own policies and procedures meet or exceed the requirements in this procedure.

If any requirements or recommendations in this procedure would conflict with applicable legal and regulatory requirements, it is necessary to comply with the legal and regulatory requirements. If this procedure creates a higher obligation, it shall be followed, as long as full compliance with applicable legal and regulatory requirements is achieved.

Consideration shall also be given by the RECON employees to the requirements of specific sites, jobs and clients. This procedure may be superseded by equivalent or more stringent site, job or Owner requirements through an agreed and documented Management of Change (MoC) process. If this procedure creates a higher obligation, it shall be followed, as long as conformance with the site-, job- or Owner-specific requirements is achieved.

Acronyms, Definitions and Language

The terms in this section are specific to this procedure.

Acronyms	
SM	Site Manager
VP HSE	Corporate Director of Health and Safety
HASP	Health and Safety Plan
JSA	Job Safety Analysis
JSAP	Job Safety Analysis Plan
MoC	Management of Change
MUTCD	Manual on Uniform Traffic Control Devices
PHSM	Program Health and Safety Manager
OSHA	Occupational Safety and Health Administration
PA	Performing authority (properly trained and authorized site foreman/ employee/ subcontractor)
PgM	Program Manager
PM	Project Manager
PPE	Personal Protective Equipment
RECON	Remedial Construction Services, L.P.
SIMOPS	Simultaneous Operations
SSup	Site Superintendent

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TBTRA	Task-By-Task Risk Assessment
Definitions	
Competent	Capable, through acquired knowledge, demonstrated skills and experience of identifying existing and predictable hazards in surroundings, working conditions or behaviors; and having the authorization to take prompt corrective measures to eliminate those hazards.
Contractor	An individual under a contractual relationship to supply RECON or one of its subsidiary companies with goods and/or services. ▪ A contractual relationship covers: ▪ All individuals contracted directly or sub-contracted. ▪ Al employees of companies contracted directly or sub-contracted. ▪ All situations where a contract has not been raised but RECON's procurement policy would normally expect there to be a contract in place. This applies to all levels, including sub-contracted relationships.
Employee	People directly employed by a company. These can be RECON employees if they are working directly for RECON or contractor employees if they are working directly for a contractor.
Job Safety Analysis (JSA)	Systematic method of analyzing a task to identify hazards, evaluate and prioritize risk for each hazard, identify who is exposed to risk, identify suitable controls, verify risks are reduced to an acceptable level and document risk assessment results.
Job Safety Analysis Plan (JSAP)	A daily and task orientated systematic method of analyzing a task to continue to identify hazards (that change daily), evaluate and prioritize risk for each hazard, identify who is exposed to risk, identify mitigation controls, verify risks are reduced to an acceptable level and document risk assessment results prior to starting that task.
Legal and Regulatory Requirements	Applicable obligations established by applicable legislation, regulation, administrative order or notice, permit, consent decree or any other similar instrument and any legally binding commitment entered into by RECON, where failure to comply by RECON is unlawful and enforceable by a court of law in the relevant jurisdiction
Memorandum of Understanding (MoU)	A document that records the agreement between two or more operations in which work relationships, resolution of one or more issues, commitments or purpose of each party, intra-organization communication, intra-organization escalation or other matters are addressed.
Non-RECON Operations	Operations conducted by Owner or third parties not directly or indirectly contracted to RECON, including, but not limited to, oil or gas well production and maintenance, construction, pipeline operation and maintenance, terminal operations and maintenance, refinery operations and maintenance, chemical plant operations and maintenance or retail gasoline station operations.
RECON Employees	All RECON employees and all Contractor employees working at or for RECON.
RECON Operations	Activity conducted by or on behalf of the RECON organization including, but not limited to, site assessment, monitoring or recovery of well installation, vapor migration or intrusion sampling, remedial system installation, excavation, construction, operation and maintenance of RECON facilities, decommissioning and demolition.
RECON Premises	Any site where RECON has a contractual or other legal right to enter to perform remediation construction services.
RECON Workforce	All RECON employees and all Contractor employees working at or for RECON.
Simultaneous Operations (SIMOPS)	One or more activities (e.g., tasks, jobs, projects) or work taking place at the same time, with the potential to affect one another. (Refer to the Permit-To-Work Procedure SP-49.) Specifically, SIMOPS is multiple RECON operations or RECON operations and non-RECON operations occurring concurrently in sufficient proximity that one operation creates a hazard for another, or new hazards are created.

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Simultaneous Operations Plan (SIMOPS)	A plan that is developed to detail the activities that are be conducted on a site or project, identify any conflicts that might exist and establish the order of work to be conducted.

Language
Throughout RECON Procedures, when used in the context of actions by RECON or others, the following words have specific meanings: ▪ "Shall" is used where a provision is mandatory. ▪ "Should" is used where a provision is preferred. ▪ "May" is used where alternatives are equally acceptable.

Roles and Responsibilities

Project Manager and Site Manager

In the scope of this practice, the PM and SM shall:

- Carry out all duties specified in the Permit-To-Work Procedure SP-49.
- Where a RECON operation occurs on a site controlled by a non-RECON operation, coordinate, with representatives of the non-RECON operation, the schedule, plan, SSup) and agreement on terms and methods for safe operations.
- Where a RECON operation occurs on a site controlled by RECON, establish communications as needed with neighboring non- RECON operations.
- Verify that the SIMOPS work plan is prepared, reviewed and agreed upon with affected non- RECON stakeholders.
- Where a site is controlled by RECON, designate the Site Superintendent for site activities.

Note: The PM/CM's responsibilities, as indicated in the Permit-To-Work Procedure SP-49, can be delegated to the Site Superintendent.

Site Superintendent

The Site Superintendent is responsible for coordinating SIMOPS to confirm safe, responsible and reliable delivery of all of RECON's work activities. The Site Superintendent shall have knowledge of all work activities being performed by all groups/personnel working on location.

In the scope of this practice, the Site Superintendent shall:

- Facilitate communication between stakeholders with the objective of safe operations
- Coordinate among multiple Site Superintendents/Foremen and PAs.
- Coordinate among multiple operations at the site to confirm safe delivery of all work activities.
- Identify and verify all SIMOPS, including all other potential interactions with other permits being issued.
- Determine if conflicts exist between permits or work and, after consultation with all affected parties, decide the order of RECON's work to be performed in consideration of and with agreement of the affected parties.
- As delegated by the PM/CM, verify compliance with policies, practices and procedures for RECON's work.
- Cooperate fully with other Site Superintendents.

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- Communicate with PAs regarding the presence of other operations on site.
- Identify and manage the risks associated with the host operations and the additional risks associated with RECON and any other work.

Note: It is understood that the Site Superintendent's authority does not extend to third parties. The RECON Site Superintendent uses influence and negotiation to establish safe coordination of SIMOPS with third parties. Where safe mitigation of SIMOPS risk cannot be achieved, Stop Work authority shall be used.

Performing Authority

In the scope of this practice, the Performing Authority (PA) is responsible for communicating with the Site Superintendent and fellow employees.

Description and Requirements

Site Phase Planning

The PM/CM and Site Superintendent are responsible for early identification and planning for RECON operations with SIMOPS at the following locations:

- Sites with client operations
- Sites with non-client operations
- Off-site activities affecting the public (e.g., roads, sidewalks, utilities, homes, businesses)
- Sites with neighbors who can affect RECON employees during normal operations or emergencies

Where a RECON operation occurs on a site controlled by another entity, the PM/CM is responsible for preparing a bridging document that reconciles the requirements of the RECON's operation, the client operations and the client's Contractor operations. Issues should be resolved by adopting the most protective requirements while minimizing duplication. The bridging document shall be signed by the PgM, PM/SM, and Program Health and Safety Manager (PHSM) or Vice President of Health Safety and Environment (VP HSE.).

Hazard Identification

Hazards of SIMOPS shall be identified on project risk registers and risk assessments throughout projects. Appropriate mitigations shall be planned and implemented to eliminate or minimize the risks to persons, property, environment or reputation (refer to Health and Safety Plan Procedure SP-12, Hazard Assessment Procedure SP-17 and Job Safety Analysis Procedure SP-18).

Mitigation Strategies

Activities to mitigate the risks of SIMOPS include, but are not limited to:

- Eliminating the SIMOPS via the scheduling or permitting process.
- Substituting work processes with less hazardous processes.
- Separating the SIMOPS by distance.
- Separating the SIMOPS by barricades, signage, isolation or engineering controls.
- Implementing controls such as:
    - Integrated schedules.

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- Training or practicing the planned work in a controlled environment.
- Communicating effectively.
- Utilizing personal protective equipment. (Refer to the Personal Protective Procedures SP-25.)
- Invoking ‘Stop Work’ authority (e.g., unexpected events).

Planning

Planning, scheduling, cooperation and communication among all work groups at SIMOPS sites are crucial to safe operations. Training should cover the status of cooperation and communication with other operations and the appropriate response (up to and including ‘Stop Work’) if an unexpected event occurs. Any conflicts of management systems, rules, PPE requirements or other matters are to be resolved in a manner that addresses the hazards and risks of all operations. Resolutions of conflicts are to be recorded in the Site-Specific HASP or SIMOPS work plan and communicated to all parties. (Refer to the Health and Safety Plan Procedure SP-12.)

A permit shall be required if the JSA conducted classifies the residual risk as ‘substantial’ risk level or higher. (Refer to the Hazard Assessment Procedure SP-17 and Job Safety Analysis SP-18.)

Field Communication

Communication is the key to excellent health, safety, security and environment performance and safe SIMOPS. Every work group shall be aware of other groups’ activities.

Communication measures shall include at a minimum:

- Coordination meetings, which shall be held prior to scheduled multiple operations occurring on the property or as agreed upon by the representatives of the affected operations. The meetings shall be used to communicate plans and integrate schedules to prevent potential work conflicts among the various groups, which could create unacceptable residual risks. (Refer to the Hazard Assessment Procedure SP-17 and Job Safety Analysis SP-18.)
- Verification of contact information.
- Communication of information from coordination meetings by meeting participants to the affected PM/SM, Site Superintendent and workforce in their respective operations.
- Where required, placement of warning signage indicating the presence of workers.
- Identification of additional mitigation measures in the risk assessment and SIMOPS work plan when formal communication meetings cannot be arranged (e.g., unattended operation).

Work Permits

The Permit-To-Work Procedure SP-49 and associated work permits will normally be used for RECON work (refer to the Permit-To-Work Procedure SP-49). On sites operated by others, the PM/SM shall make an agreement establishing the required roles in the work permit process. The Site Superintendent shall be competent in identifying and managing the risks associated with the client operations and the additional risks associated with RECON and any other work. The SSup shall determine if conflicts exist among permits or work and, after consultation with all affected parties, shall decide the sequence of work to be performed.

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Simultaneous Operations Work Plans

SIMOPS within the scope of RECON operations that do not affect any non-RECON operations shall be coordinated through work planning and work risk assessment at project, job and task phases.

SIMOPS work plans shall be developed for any client or contractor's activity that directly or indirectly affects RECON operations. The SIMOPS plan shall be in place and agreed upon prior to starting any SIMOPS work. The PM/SM shall verify that the SIMOPS work plan is prepared, reviewed and agreed upon with affected non-RECON stakeholders.

The SIMOPS work plan shall include, but is not limited to, the following key points:

- A description of the job, project, operation or activity to be conducted, including the number of personnel involved, equipment involved, and site resources required.
- Contact details for the selected representatives of each stakeholder operation.
- Agreement on site access and egress.
- Expected duration of the work.
- Hazard analysis profile for the job and agreed mitigations.
- Work permit plan for the given job or jobs.
- Agreements for security arrangements.
- Clear identification of activities that cannot occur simultaneously or that require special controls if they are to take place simultaneously.

Note: SIMOPS plans shall be documented in the HASP and JSA. If an unanticipated SIMOP is encountered in the field, after implementation of this procedure, the SIMOPS work plan shall be amended and implemented in the HASP.

Emergency Preparedness and Response

Emergency preparedness and response plans included in the HASP shall reflect scenarios that could result from SIMOPS, including events or emergencies originating in neighboring operations. Alarm and warning systems should be arranged to give crews adequate warning before they experience adverse consequences.

When applicable, plans shall include arrangements and communication with response organizations such as police and fire departments.

Stop Work Authority

RECON employees have the duty to stop the job at any time the SIMOPS plan is not, or cannot be followed, if the SIMOPS plan is not clear or if unanticipated SIMOPS occur which have not been accounted for in planning. The stop work authority applies to work that may be unsafe (including health and security) or which could result in a loss of containment resulting in environmental damage. Instances of work being stopped shall be investigated, records kept of the instance and investigation results and lessons learned shared.

Supporting Documents

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The documents in this section support the implementation of the requirements in this procedure. An equivalent document may be used.

Associated Documents

The documents in this section are related to this procedure and should be consulted to support the implementation of the procedure requirements. All of RECON's safety procedures and forms will be available in RECON's onsite safety office.

- Stop Work Authority SP-7
- Health and Safety Plan Procedure SP-12
- Hazard Communications Procedure SP-16
- Hazard Assessment Procedure SP-17
- Job Safety Analysis Procedure SP-18
- Accident/Incident Reporting SP-19
- Site Control Procedure SP-22
- Personal Protective Procedures SP-25
- Respiratory Protection Procedures SP-26
- Fire Safety Procedure SP-32
- Heavy Equipment Procedure SP-33
- Management of Change SP-39
- Health and Safety Emergency Response Training SP-43
- Emergency Action Plan (EAP)

References

The following standards are relevant to the implementation of this procedure.

- RECON Daily Process Training (New Employee Orientation)
- Permit-To-Work Training and Competence

Records

The following table identifies the required management of records generated under the procedure and identifies all the records resulting from the procedure's implementation.

Records management, including archive location definition, shall be located with the project management files.

	Type of Record*
SIMOPS Work Plan (included in the HASP)	H
Bridging Document	H

*H – hardcopy (paper) S – softcopy (digital archive) H&S – hardcopy and softcopy

Competence Requirements

Competence requirements are addressed in the Site-Specific HASP, Permit-To-Work, JSA, JSAP, New Employee Orientation Training (General Safety Rules SP-1, Behavioral Based Safety SP-6, Stop Work

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Authority SP-7, Short Service Employee SP-9, Health and Safety Plan Procedure SP-12, Health and Safety Training Procedure SP-14, Hazard Communication Procedure SP-16, Hazard Assessment Procedure SP-17, Job Safety Analysis SP-18, and Heavy Equipment Procedure SP-33).

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Attachment Q: Audits and Inspections

To make safety inspections effective, the following guidelines should be observed:

- Develop a checklist for each site, listing the items that should be inspected
- Review the results of these inspections with all individuals who will use it
- Re-inspect any identified problems to ensure that they have been corrected before the equipment is put back in service
- Document all inspections and subsequent follow-up actions

Site Health and Safety Officer

At a minimum of once a week, the SSO shall conduct an inspection to assure that operations are being performed in accordance with regulations and contract requirements. Results of the inspections will be documented on the SSO Inspection Form which will be available in RECON's onsite safety office . Some of the items to be inspected include:

- Housekeeping and sanitation
- Safety warning signs, labels, and barricades
- Security
- Scaffolding and ladders
- Excavation, trenching, and shoring
- Potential fire hazards and fire extinguishers
- First aid equipment
- Spill containment and control supplies
- Employees wearing the PPE
- General site conditions

If violations are found, the SSO has the authority to stop work and correct the problem. He should also notify the Foreman or SM/SSup and corrective measures.

Management

The CM/SSup, Project Manager, and members of senior management will conduct periodic, announced, and unannounced, inspections. They will meet with the SSO to review findings, correct deficiencies, and discipline employees, if necessary.

Peer Inspection Procedures

To avoid the "not seeing the forest for the trees" dilemma, peers will be used randomly to conduct inspections. These peers will be a fresh set of eyes on an often-mundane work routine. The peer inspection will be done using the same inspection form used by management and the safety team. The SSO should address any observations made by the peer review.

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Follow-Up Procedures

In most incidences, the SSO will verbally inform the employee of the safety violation. Minor violations shall be corrected at this time. If the violation warrants a stop in work, the SSO will do so and notify the Construction Manager of the situation. This work stoppage will need to be documented on the SSO Inspection Form prepared by the SSO.

If proper engineering controls or additional PPE does not fix the situation, a meeting will be held to find a solution. Work will not be allowed to continue until the problem is rectified.

If proper equipment, tools, and training are employed in the work and the accident/incident is a personal factor of lack of motivation the employee may be subject to disciplinary actions, up to the point of termination. The progressive disciplinary action program allows for written documentation of the violation placed in the employee's file, with a copy submitted to the NSM, VP of HSE and PM. After the second written notice, the employee could be suspended without pay or terminated. A major or willful violation could result in immediate termination.

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Attachment R: HASP Approval Sign Off Form

Site Name:	Ringwood Mines/Landfill Superfund Site, Operable Unit 2	Job # 02-4053
Address:	Ringwood, NJ	
I understand, agree to and will conform to the information set forth in this Site-Specific Health and Safety Plan (and attachments) and discussed in the personnel Health and Safety briefing(s).		

Disclaimer: This HASP was prepared solely for specific work assigned to RECON and its subcontractors under the guidelines of Project/Contract number 02-4053 Use of this HASP by RECON and its subcontractors is intended to fulfill OSHA requirements as found in 29 CFR 1910.120. Items not specifically covered within this HASP or its attachments are included by reference to 29 CFR 1910 and 29 CFR 1926 in lieu of citing applicable ISO or EU like standards. To the extent other parties wish to rely on this HASP, they should review its contents and satisfy themselves that it meets requirements for their work assignments.

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Appendix C

VIBRATION MONITORING PLAN

Remedial Construction Services, L.P.
950 West Valley Rd. Suite 2802
Wayne, PA 19087
www.reconservices.com

Vibration Monitoring Plan

Ringwood Mines/Landfill Superfund Site

Ringwood, Passaic County, NJ

Prepared for:

FORD MOTOR COMPANY

December 2020

Version Control

Date	Author	Version	Brief Summary of Changes	Reviewed and/or Approval By

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Figures

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Attachments

Attachment A Vibra-Tech Qualifications
Attachment B Vibration Monitor Manufacturers Data Sheet
Attachment C Weekly Vibration Monitoring Report

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Acronyms/Abbreviations	Definition
AC	Area of Concern
Borough	Borough of Ringwood
CMP	Cannon Mine Pit
cps	Cycle Per Second
FRDR	Final Remedial Design Report
GPS	Global Positioning System
Hz	Hertz
in/sec	Inches per Second
OCDA	O'Connor Disposal Area
OU2	Operable Unit Two
PLS	Professional Land Surveyor
PM	Project Manager
PMP	Peters Mine Pit
QC Manager/PE	Quality Control Manager/Project Engineer
RA	Remedial Action
RAWP	Remedial Action Work Plan
RECON	Remedial Construction Services, L.P.
Site	Ringwood Mines/Landfill Superfund Site
USBM	US Bureau of Mines
Vibra-Tech	Vibra-Tech Engineers, Inc.
VMP	Vibration Monitoring Plan

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1.0 Introduction

This Vibration Monitoring Plan (VMP) presents the proposed work scope, methods and procedures for the construction surveys, vibration monitoring, and vibration mitigation to be implemented as part of the Remedial Action (RA) construction activities to be performed by Remedial Construction Services, L.P. (RECON), the RAC, for Operable Unit Two (OU2) of the Ringwood Mines Landfill/Superfund Site (Site), located in the Borough of Ringwood (Borough), Passaic County, New Jersey. A Site location map is provided as Figure 1. OU2 for the Site covers the land areas of concern (ACs) known as the Cannon Mine Pit (CMP) Area, the O'Connor Disposal Area (OCDA), and the Peters Mine Pit (PMP) Area. Background information on each of the three land ACs is presented in the Remedial Action Work Plan (RAWP; December 2020) to which this VMP is appended.

Completion of the RA construction activities will involve a number of activities including:

- Clearing and grubbing
- Excavation and/or regrading of in-place soils
- Placement and compaction of backfill materials
- Dewatering/management of water, as required, to completion excavation, grading, and backfill activities
- Construction of Engineered Caps
- Site restoration and replanting

A variety of heavy equipment will be utilized to complete these activities such as bull dozers, excavators, dump trucks, front end loaders, and compactors. When in operation, this equipment may produce vibrations at areas adjacent to each of the three land AC work areas.

This VMP details the activities and personnel responsibilities during the performance of vibration-inducing activities to address potential impacts to the areas in the immediate vicinity of the construction activities, including adjacent structures. It also sets forth warning and action criteria for construction-related vibrations, provides details on the implementation of the monitoring program, describes communications plans, and describes the approach to corrective measures. These activities will be performed in accordance with Technical Specification 31 20 00 (Excavation, Fill, and Grading).

Technical Specification 31 20 00 references the use of the frequency-dependent vibration limit found in the US Bureau of Mines (USBM), Office of Surface Mining Standards. At a minimum, all vibration data collected will ultimately be compared to this vibration criterion. Since this referenced criterion is associated with blasting, and there will be no blasting taking place during this project, Vibra-Tech Engineers, Inc. (Vibra-Tech) will conduct analysis to determine the appropriate Site-specific vibration criteria for this project.

In order to ensure use of the appropriate vibration criteria, Vibra-Tech will conduct pre-construction inspections of the surrounding area as well as adjacent residential structures (Section 4), analyze the soil and geotechnical data found in the Final Remedial Design Report, Ringwood Mines/Landfill Superfund

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Site, Operable Unit Two (FRDR), prepared by Cornerstone Engineering Group, LLC, dated October 2017, and analyze the energy rating of the vibration inducing equipment to be utilized during the remediation activities. From this information, Vibra-Tech will develop the Site-specific vibration criteria for the project. These criteria may be more restrictive or more lenient when compared to the USBM vibration criterion referenced in the Technical Specifications, but this approach will ensure the appropriate vibration criteria are being utilized. In order to develop the Site-specific vibration criteria, the pre-construction inspections must first be completed and the information reviewed and evaluated by Vibra-Tech's Professional Engineer, as further described in Section 4.0 of this VMP.

2.0 Roles, Responsibilities, Qualifications and Chain of Communication

RECON has retained the services of Vibra-Tech for the performance of full-time vibration monitoring during implementation of the OU2 RA construction activities. A qualification packet for Vibra-Tech is provided in Attachment A.

The personnel that will be responsible for implementation of this VMP and related communications during performance of the work include:

- Douglas Rudenko, P.G. - Principal, Vibra-Tech (38 years experience)
  Overseeing all Vibra-Tech operations

- Mohammad Sharifinasaab, P.E. - Professional Engineer, Vibra-Tech (40 years experience)
  Site-specific vibration criteria development and consultation

- Mark Edwards - Project Manager, Vibra-Tech (13 years experience)
  Project coordination, scheduling, analysis, report review

- Ryan Walz - Inspector/Instrumentation Specialist, Vibra-Tech (13 years experience)
  Pre-construction and post-construction inspections; instrumentation installation and analysis

- Brad Miller - Field Technician, Vibra-Tech (13 years experience)
  Instrumentation installation and analysis

- Gregorio Juanites - Field Technician, Vibra-Tech (15 years experience)
  Instrumentation installation

- Larry Endicott – Project Manager (PM), RECON
  Receives initial notification of warning and action levels from Vibra-Tech and provides notification to the RECON Quality Control Manager/Project Engineer (QC Manager/PE), Site Manager, and On-Site Superintendent(s).
  Has stop work authority.

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- Brad Houston – QC Manager/PE, RECON
  Receives notification of warning and action levels from the RECON PM; primary contact to provide notification to Owner's Representative.
  Has stop work authority.

- Douglas Jumper – Site Manager, RECON
  Receives notification of warning and action levels from the RECON PM.
  Evaluation of means/methods for mitigation in response to warning and/or action level trigger.
  Has stop work authority.

- Scott Sutton/Carl Walker – On-Site Superintendents, RECON
  Receives notification of warning and action levels from the RECON PM.
  Evaluation of means/methods for mitigation in response to warning and/or action level trigger.
  Has stop work authority.

As further discussed in Section 9.0 if a vibration criteria notification/stop work event occurs, RECON will immediately consult with the Owner's Representative (*de maximis, inc.*) to discuss mitigation measures to be taken before re-starting work. Although there is redundancy regarding personnel notification to ensure receipt of the message, the RECON QC Manager/PE will be considered the primary person who will notify the Owner's Representative of the event.

3.0 OU2 Remediation Areas

There are three (3) land ACs included in the OU2 RA work scope. The land ACs include the CMP Area; OCDA; and PMP Area. The following sections summarize AC-specific information as related to this VMP; additional background information on each of the three land ACs is presented in the RAWP.

3.1 CMP Area

The CMP Area is located in the southwestern portion of the Site and encompasses an area of approximately two acres. The CMP is a former iron ore mine, and capping of the former pit is the focus of the OU2 RA construction activities. This land AC is situated adjacent to the Van Dunk Lane cul-de-sac. The CMP Area is mostly an open field surrounded by a chain-link fence. There are rock piles and rock outcroppings as well as an access road within the CMP Area.

There is a privately owned residential property located less than 100 feet from the limits of work in the CMP Area and areas where subsidence has historically occurred in the general vicinity of the CMP which pose a potential concern with respect to vibration-inducing RA construction activities. The area(s) will be identified on a site plan as part of the pre-construction survey described in Section 4.0. While most of the vibration-inducing equipment to be used in the CMP Area will be in operation at a distance from the limit of work, a portion of the cul-de-sac will be removed to access subgrade waste material for waste consolidation under the Engineered Cap. Soil compaction and resurfacing of the cul-de-sac is part of the OU2 work scope for this land AC. The residential property and the location of historic subsidence will therefore be evaluated as part of the pre-construction survey as further discussed in Section 4.0.

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3.2 OCDA

The OCDA is located in the north-central portion of the Site, just south of the PMP Area. The OCDA encompasses approximately 12 acres and is located adjacent to and extends along Peters Mine Road. The ground surface in the ODCA slopes to the east toward Park Brook. Wetlands have been delineated within the OCDA and generally adjacent to Park Brook. This area's historic use was as a settling pond for mine tailings from the wet ore processing operations. Consolidation and capping of the former settling pond is the focus of the OU2 RA activities for the OCDA, followed by construction of a new Borough Recycling Center. This area is currently wooded and mostly overgrown with vegetation.

While the privately owned residential properties in the vicinity of the OCDA are not as close as in the case of the CMP Area, they pose a possible concern with respect to vibration-inducing RA construction activities. In addition, there has historically been subsidence in this area, specifically adjacent to Peters Mine Road; however, the road separates the OCDA from the nearest residential properties and the areas of historic subsidence. The area(s) will be identified on a site plan as part of the pre-construction survey described in Section 4.0. The areas of historic subsidence and the private residential properties in the vicinity of the OCDA will be evaluated as part of the pre-construction survey as discussed in Section 4.0 of this VMP.

3.3 PMP

The PMP Area is located in the north-central portion of the Site. This area encompasses approximately three acres and is located such that the majority of the area is within Ringwood State Park with the remaining area located on Borough of Ringwood property. An approximately one-half acre pond, an expression of the groundwater table, is located within the approximate center of the PMP Area where a former soil cap has subsided thus enabling the pond to form.

There are privately owned residential properties located approximately 300 feet from the limits of work in the PMP Area. While most of the vibration-inducing equipment will be farther than 300 feet from the nearest residential properties, they will be evaluated as part of the pre-construction survey as further discussed in Section 4.0. There are also areas of historic subsidence in the vicinity of the PMP that will be mapped and also evaluated as part of the pre-construction survey.

4.0 Pre-Construction Inspections and Site-Specific Vibration Criteria Development

Vibra-Tech field representatives with at least five (5) years of experience will perform pre-construction inspections of the areas surrounding work zones where vibration-inducing activities will be performed. This may include residential structures and other above ground infrastructure (e.g., garage, shed, etc.) which may be considered sensitive receptors. The purpose of the inspections is to document pre-construction conditions of the structures and other sensitive receptors. The inspections are intended to include all exterior conditions as well as interior conditions when access has been granted and entry into

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the structure is permissible, including with respect to restrictions related to the COVID-19 pandemic, if still applicable.

Documentation of the pre-construction inspections will consist of a recorded verbal narrative and digital color photographs and/or video. A written report presenting the findings of the pre-construction inspection will be prepared by Vibra-Tech and submitted by RECON to the Principal Engineer (Tetra Tech, Inc.) and the Owner's Representative (*de maximis, inc.*) as well as to the Borough for review. This report will be submitted at least two weeks in advance of the start of any vibration-inducing RA construction activities at the Site.

Vibra-Tech will utilize the pre-construction inspections documentation to develop a Site-specific vibration criterion for each AC or receptor of concern. The report will present a summary of the identified sensitive receptors in the vicinity of each of the three OU2 land ACs, determine the appropriate vibration criteria, and determine the number and location of vibration monitoring stations and/or, in the event of an area of historic subsidence, the settlement plate. The report will also include the data and calculations used to develop the site-specific warning and action level vibration criteria for each of the three OU2 land ACs along with a scaled site plan showing the planned monitoring system and settlement plate locations. Upon submittal of the report, the vibration monitoring systems and settlement plates will be installed as outlined in Section 8.0 of this VMP.

5.0 Vibration Monitoring Criteria

Vibration monitoring criteria will be protective of structures and other above ground infrastructure adjacent to the three land ACs and as determined by the pre-construction inspection. The vibration monitoring program will include all vibration-inducing activities performed within the three ACs, including any operation of earth moving equipment and associated material trucking within the land AC work areas.

As required by Technical Specification 31 20 00 (Excavation, Fill, and Grading), the vibration criteria shall not exceed those allowed by the USBM, Office of Surface Mining Standards within 100 feet of the OU2 work areas or at any adjacent structure, in the event it is closer than 100 feet. At a minimum, all vibration data collected will ultimately be compared to the USBM vibration criterion. However, as previously discussed in Sections 1.0 and 4.0, vibration criteria specific to each OU2 land AC will be developed based on the results of the pre-construction inspection. If appropriate based on the results of the inspection, more stringent vibration criteria may be utilized. The vibration criteria will be determined utilizing a combination of existing construction-induced vibration criteria standards and Site-specific calculations. The appropriate vibration monitoring locations will be determined. The Site-specific calculations will take into consideration the soil and geotechnical characteristics at each land AC location, the projected vibration levels based on the distance of sensitive receptor(s) from the vibration-inducing equipment, the energy rating of equipment to be used, and the pre-construction condition of the sensitive receptors, among other factors. The calculated Site-specific vibration criteria may be different for each of the land ACs given that the sensitive receptors and other factors are different for each AC.

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6.0 Vibration Monitoring Equipment

Each vibration monitoring station will consist of a seismograph, triaxial geophone, and cellular modem that will be housed in a secure enclosure and equipped with a solar panel and a backup battery system. The equipment to be utilized for this project will include Instantel™/Vibra-Tech MultiSeis Plus seismographs equipped with standard triaxial geophones. The triaxial geophone sensors are capable of monitoring particle velocity in three mutually perpendicular directions.

The Instantel™/Vibra-Tech seismographs are factory calibrated on an annual basis and the units will conduct, record, and report an automated internal calibration check at the end of each vibration period to ensure the sensors were functioning properly. Once the instruments are deployed, a required yearly certified calibration certificate will be provided. The product specification sheet is provided in Attachment B of this VMP.

As required by Technical Specification 31 20 00 (Excavation, Fill, and Grading), vibration monitors will be placed at a distance within 100 feet from the defined limit of work at each AC. The defined limits of work for each AC are presented on Figures 6-1 (PMP & OCDA) and 6-2 (CMP). The vibration monitors will be placed in line with the existing sensitive receptor, for example a residential structure, located between the RA work area and the receptor. If a sensitive receptor (residential structure) is located closer than 100 feet to the limit of work, the vibration sensor will be placed at the receptor (residential structure).

The seismographs directly measure particle velocity in three mutually perpendicular planes of motion and have a dynamic range up to 10 inches per second (in/sec) and a sample rate of 1,024 samples per second per channel. The entire system is calibrated internally after each recording in addition to an annual shake table calibration.

The seismographs will be programmed to monitor and record the highest peak particle velocity at fifteen (15) second intervals, and also record a three (3) second time history waveform event if the vibration levels reach the warning and action levels.

The measurement of vibration involves quantifying the rate and amount of oscillation occurring in a vibrating body. The rate of motion, or the number of vibrations occurring in a given time frame, usually one second, is called the frequency of the motion, which is described as the number of cycles per second (cps) or Hertz (Hz).

The amount of movement associated with a vibration event can be measured in terms of displacement, velocity, or acceleration. Displacement is a measure of the physical distance traveled from a position of equilibrium or base line. Velocity is a measure of the speed at which the displacement occurred, and acceleration is a measure of the change in velocity occurring during the vibration event. The relationships between displacement, velocity, and acceleration are also dependent upon the frequency of the motions measured. The criteria for vibration intensities on this project require peak particle velocity measurements.

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In order to completely describe the ground motion, three perpendicular components of the motion must be measured. The longitudinal component (L) is a measurement in a direct line from the source to the monitoring location. The remaining components are vertical (V) and transverse (T), which is perpendicular to the longitudinal component.

If at any point a vibration level exceeds the vibration warning levels, the PM will be immediately notified by way of an automated text message and/or email that is transmitted by the remote seismograph, which will be equipped with a cellular modem provided by Vibra-Tech. Upon receipt of an automated message from the seismograph a plot is generated by the Vibra-Tech system looking at PPV peak particle velocity versus frequency data on the USBM Z-curve. The USBM Z-curve is a frequency (x-axis) versus amplitude (y-axis) graph in which the vibration waveform data collected during a vibration warning event is plotted. If the vibration warning waveform data plots below the frequency specific limits on the USBM Z-curve graph, then the vibration event is in compliance. Vibra-Tech will also compare the data to the Site-specific vibration criteria for that land AC. If the peak particle velocity exceeds either the USMB or the Site-specific criterion, work will cease, and the *de maximis, inc.* Construction Manager (Tom Perkins) will be consulted prior to restarting work. A plan will be developed to alter the means and methods of the remediation process to reduce the vibration levels to acceptable levels prior to restarting work.

7.0 Construction Monitoring Procedures

Remote vibration monitoring stations will be installed by a Vibra-Tech Field Technician with at least five (5) years of experience in such installations. As previously stated, each station will consist of a seismograph, triaxial geophone, and cellular modem, and will be housed in a secure enclosure, equipped with a solar panel and a backup battery system. Each geophone will be spiked and buried in the soil at a minimum depth of eight (8) inches. Each remote system will record vibration levels while vibration-inducing activities are being performed. The instruments will measure vibration data for each component at the sample rate of 1,024 samples per second per channel and record the peak particle velocity for each component every 15 seconds.

The stations will be programmed to alert the RECON PM, and any additional project personnel, as necessary, via text message and/or email notification if the vibration levels exceed the established vibration warning levels. Vibra-Tech will also contact on-site personnel following any alert notification to determine the source of the event. All vibration monitoring data will be transmitted via cellular IP modem from the seismograph location to a computer server that will be backed up in a minimum of two (2) locations, housed in separate locations.

8.0 Settlement Monitoring

RECON will perform settlement monitoring to address areas within or surrounding the land ACs that have historically exhibited subsidence associated with former mine activities and/or mine structures. Prior to the initiation of the OU2 RA construction activities, these areas will be clearly identified on a scaled site plan and evaluated as part of the pre-construction survey described in Section 4.0. A settlement

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monitoring plate will be installed, by RECON, in each of these area(s) and an initial baseline elevation will be surveyed by a New Jersey-licensed Professional Land Surveyor (PLS) and the plate elevation recorded.

As the OU2 RA construction activities progress, each settlement plate will be resurveyed on a daily basis by RECON personnel using a Global Positioning System (GPS) rover and weekly by the New Jersey-licensed PLS. The elevations recorded will be compared to the baseline pre-construction elevation on a daily basis. Any vertical movement of the ground surface outside the allowable tolerance of the surveying equipment will be documented. Should this movement be detected, RECON will immediately notify the Owner's Representative, and work being conducted in the vicinity of the settlement monitoring area will be evaluated to determine if mitigative measures should be implemented.

9.0 Mitigative Measures

Upon receiving the text message/email notification that a vibration warning or action level has been reached or upon determination that a change in the elevation of a settlement plate has been documented, RECON will immediately notify the Owner's Representative, and work operations that are causing such notifications will immediately stop. The means and methods of performing the work will be evaluated for the determination of an alternative approach that will result in a reduced disturbance. The evaluation will include the consideration of equipment size, attachments, location, truck routes, and any requirements to perform the work in the manner to meet project specifications.

RECON will work collaboratively with *de maximis, inc.* and Tetra Tech, Inc. to evaluate the feasible alternate means and methods and determine the best approach to achieve compliance with the VMP requirements. Work in the land AC where the RA activities resulted in a triggering event (i.e., a vibration warning criterion exceedance and/or settlement at an area of historic subsidence), will resume upon development of appropriate mitigative measures.

10.0 Weekly Reports

A weekly report on the findings of the vibration and settlement monitoring outlined in this VMP will be submitted by RECON to the Owner's Representative. Each weekly report will describe the vibration and settlement monitoring processes, show the monitoring location(s), and summarize the maximum particle velocity and any change in settlement plate elevation recorded during the weekly monitoring period.

Any data collected which exceeds the vibration monitoring criteria or indicates movement of one or more settlement plates will be summarized in a separate table displaying the location of the vibration monitor, the date/time of the vibration event, the time and duration of work stoppage, the peak particle velocity of the event, the mitigation measures taken, and the date and time that work resumed along with notes associated with the source of the event.

The event reports displaying the vibration monitoring histogram and/or waveform events for the week will be provided along with the survey data for each settlement plate.

A weekly report template has been provided as **Attachment C**.

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11.0 Post-Construction Completion

Upon completion of vibration-inducing construction activities in each OU2 land AC, post-construction inspections will be performed for all locations where pre-construction inspections were completed. The purpose of the post-construction inspection is to document any change or lack thereof from the pre-construction condition at each location. A formal report presenting the findings for each structure will be provided to the Owner's Representative in digital format. All original photographs and files will be stored and maintained for future use.

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Figures

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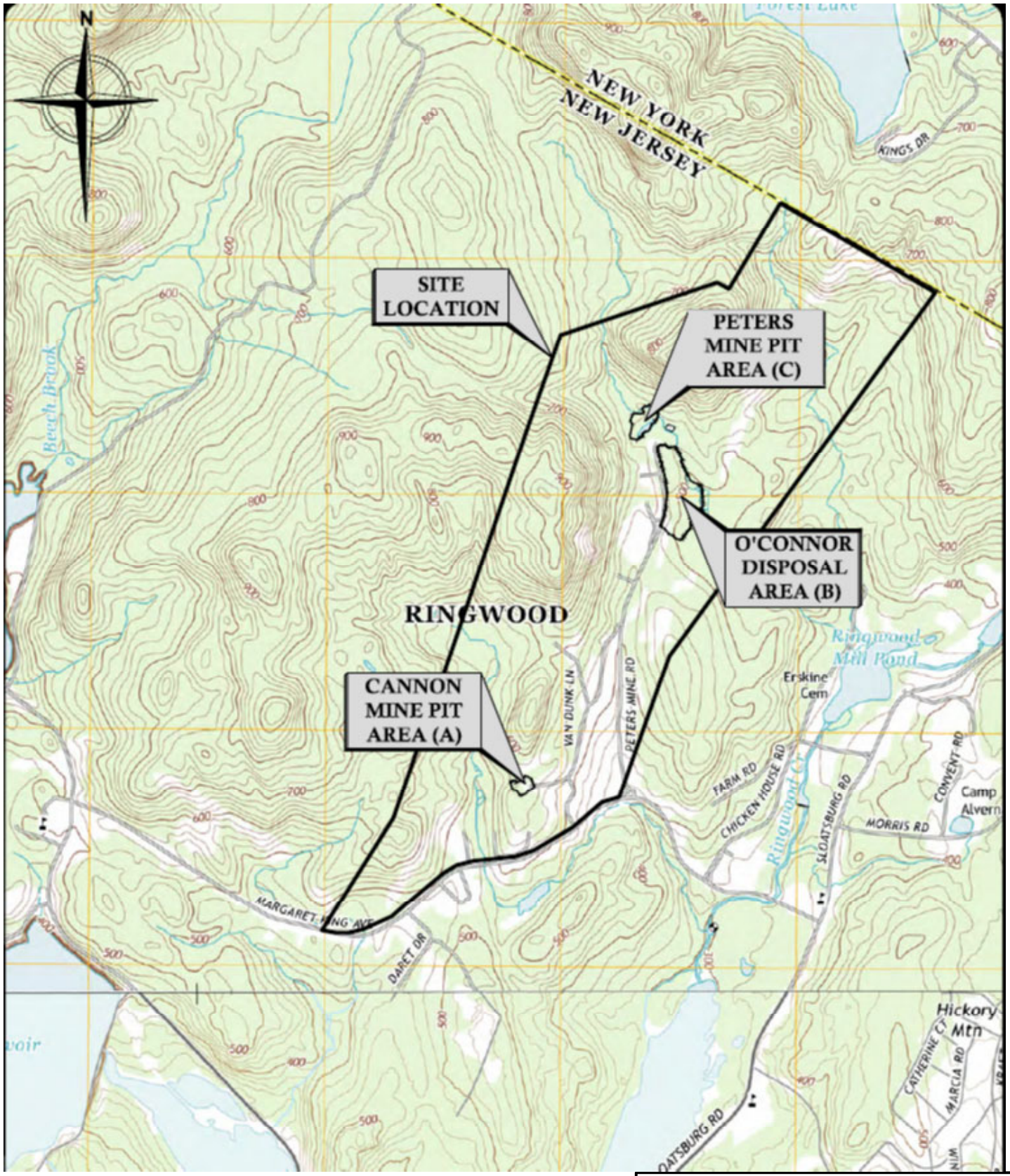
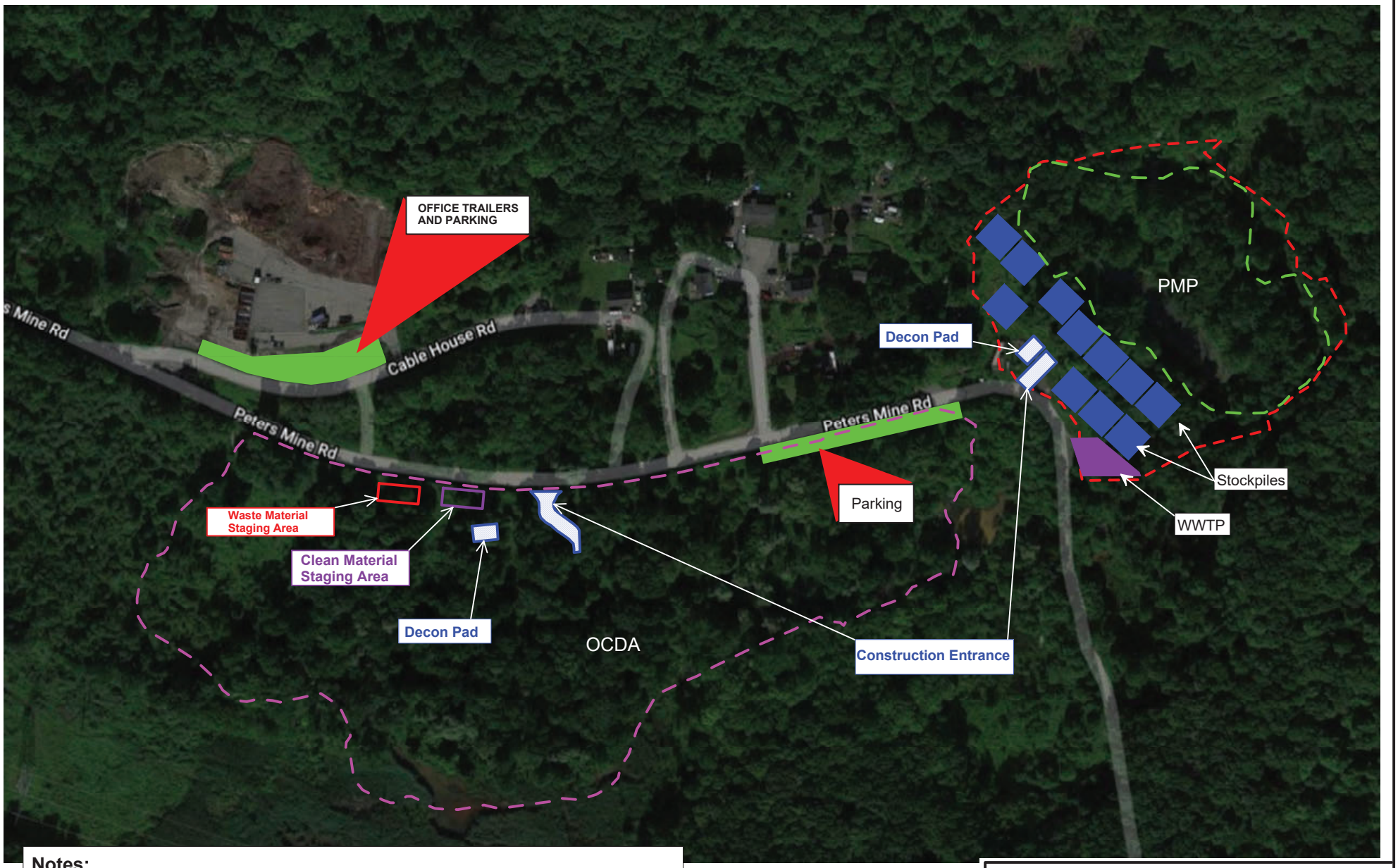


RECON®
Remedial Construction Services, L.P.

RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LOCATION MAP

Figure: 1	**Date: 11/18/20**



Notes:

Not To Scale - Site features are approximate
Final Site Layout will be field determined by RECON Site Management

RECON®
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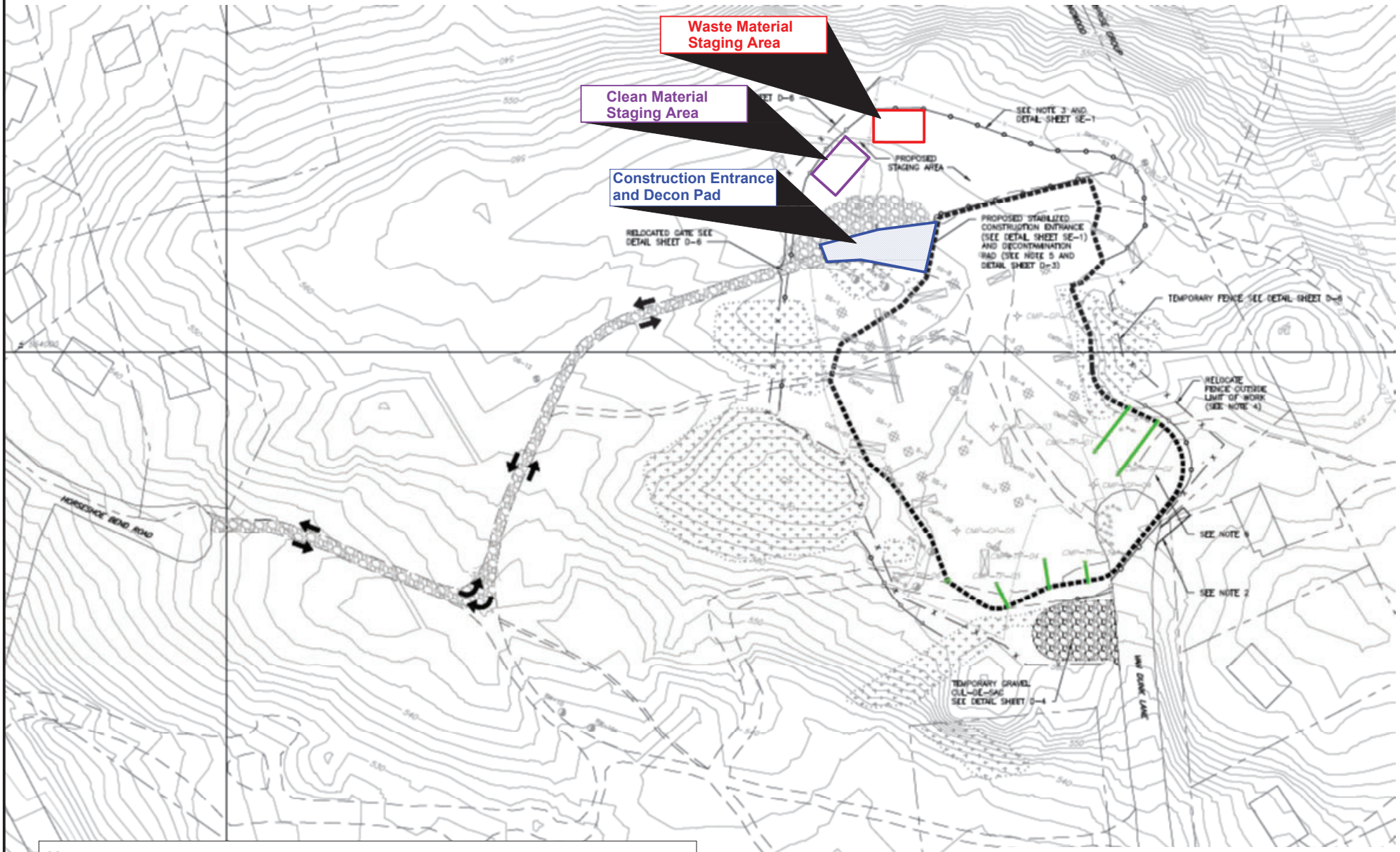
PMP & OCDA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LAYOUT PLAN

Figure 6-1 | **Date: 12/16/20**



Notes:

Not To Scale
Final Site Layout will be field determined by RECON Site Management

RECON®
Remedial Construction Services, L.P.

CANNON MINE PIT AREA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LAYOUT PLAN

Figure 6-2 | **Date: 11/18/20**

Attachment A

Vibra-Tech Qualifications

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APPENDIX A

Vibra-Tech

QUALIFICATIONS

MONITORING · ANALYSIS · REPORTING

Helping You Meet Your Project Needs

Vibra-Tech Engineers, Inc. has been in the vibration consulting business for over 60 years.

The company began in 1949 as a partnership under the name of Vibration Engineering Company in Hazleton, Pennsylvania. Located in the anthracite coal regions of Pennsylvania, this region of the country used more explosives than anywhere in the world. The Vibration Engineering Company was created in response to a rise of complaints about blasting vibrations from property owners.

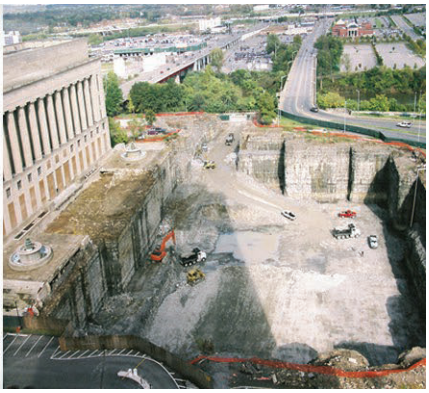
One of the original partners was Dr. L. Don Leet, a noted Harvard University seismologist who developed a blasting seismograph in the late 1930's. The first notable use of this instrument was during the first atomic test blast in Alamorgordo, New Mexico on July 16, 1945. The company used the Leet seismograph during the early consulting days. The Vibration Engineering Company was incorporated in 1955. Our name became Vibra-Tech Engineers, Inc. in 1960 following a dispute concerning similar names with Vibration Measurement Engineers, Inc. Vibra-Tech Engineers would later buy this company and take over their office. In 1995, Vibra-Tech Engineers, Inc. joined forces with GeoSonics, Inc. Our sister company, GeoSonics, was started by Phillip R. Berger, one of Dr. Leet's assistants at Harvard University.

Together Vibra-Tech and GeoSonics employ over 100 people in 18 offices throughout the United States. We maintain over 25 distributors worldwide. This combination of engineers, geologists, geophysicists and other professionals have worked on a variety of projects for clients located globally.

Today GeoSonics/Vibra-Tech provides Re:mote™ Monitoring Technology, the industry's first fully automated monitoring system with web-based data access. Our Re:mote instrumentation operates without an onsite operator. This technology automatically converts your site data into valuable engineering information that is stored in our encrypted database. GeoSonics/Vibra-Tech sets up a customized, password-protected website for each client—so accessing data is as simple as logging on to the Internet. Whether you need vibration, noise, dust, geotechnical or environmental monitoring, water level depth measurements or continuous noise level measurements, our Re:mote monitoring capabilities bring the field to you—saving you operational time and resources. In addition, we also offer inspections, damage claim investigations, expert testimony, project criteria development, geophysical surveys, vibration control plans and seismograph manufacturing and service to meet our client's needs.

Helping You Meet Your Project Needs

GeoSonics/Vibra-Tech has over 80 years combined experience providing vibration consulting services. Let us show you how we can customize your project monitoring needs and save you operational time and resources.



Inspections: GeoSonics/Vibra-Tech has conducted thousands of inspections for our clients over the years. Thorough building inspections can be a key component of your risk management program.

Vibration Monitoring: Our Re:mote™ Monitoring Technology continuously collects the vibration data you need, while keeping your project personnel up to date through email or text messaging.

Geotechnical Monitoring: If your project has the potential to impact adjacent structures, we offer geotechnical monitoring solutions, tailored to your project needs.

Blast Consulting: Using our Iso-Seis and Vibra-Map technologies we understand structural response and can help minimize complaints by developing a customized plan for your project.

Sound Monitoring: Our monitors collect results to help you address community noise issues, show relative change and establish compliance with project criteria or local ordinances.

Dust Monitoring: Let us record PM10 or PM2.5 concentrations and correlate wind speed and wind direction to help you and your neighbors identify a solution to keep the peace.

Expert Testimony: We not only provide the data you need, we can back that data up with expert testimony for litigation, public meetings or hearings.

Structural Dynamic Engineering: Do you have a unique structure that requires additional monitoring? We have developed criteria for historical landmarks, pipelines, dams and landfills.

Consultant Projects – Client List

The following list contains companies Vibra-Tech has worked for in the capacity of vibration consultants. Services we have performed include Structural Inspections, Damage Claim Investigations, Water Well Investigations, Vibration Monitoring, Vibration Prediction and Control and Legal Testimony.

Mines and Quarries

3M
Aggregate Industries
Alpha Natural Resources
Anderson Columbia
APAC Quarries, Inc.
Arch Coal, Inc.
Arch Materials, LLC
Austin Powder Company
BHP Billiton
BMC Stone
Beechwood Coal
Boxley Materials Company
Brauntex Materials
Buckley Powder Company
Buffalo Crushed Stone, Inc.
Bussen Quarries
Buzzi Unicem
Caldwell Stone
Capitol Aggregates
Carmeuse Lime and Stone
Catenary Coal Company, LLC
CEMEX USA
Cliffs Natural Resources
CONSOL Energy, Inc.
Damon Pursell
Dolese Brothers
Dolomite Products
Dyno Nobel
Edward C. Levy Company
Elmhurst-Chicago Stone
Essroc Italcementi
Explosive Contractors
Fairmount Santrol
Frazier Quarries
Fred Weber Inc.
Georgia Pacific
Graymont Dolime, Inc.
Halquist Stone
Hanson Aggregates
Holcim, Inc.
INCO Limited
J.M. Huber Corporation
Knife River
Kraemer Mining & Materials
Lafarge, Inc.
Lehigh Cement Company
Luck Stone Corporation
Ludwig Explosives
MCC
Martin Marietta Materials
Milestone Materials
Miller Blasting
Miller Springs Materials
Mountain Materials
National Lime and Stone Company
National Quarry Services, Inc.
Oldcastle Industrial Minerals, Inc.
Olson Explosives
Orica
P&K Stone
Payne & Dolan
Peabody Energy
Pennsy Supply, Inc.
Premier Silica
Pritchard Mining Company
Quality Aggregates
RK Hall
Rockydale Quarries
Rogers Group, Inc.
Sandusky Crushed Stone
Stoneco, Inc.
Summit Materials
Texas Crushed Stone
Texas Lehigh Cement
Tilcon Connecticut Inc.
Tilcon New York
U.S. Silica
Unimin Corporation
Vulcan Materials Company
Wadley Crushed Stone

Construction and Engineering Companies

AECOM Technology Corp.
Alexander Building Construction Co.
Allan A. Myers, Inc.
American Bridge Company
AMEC
Anderzack-Pitzen Construction, Inc.
Arcadis
ATC Associates Inc.
Austin Industries, Inc.
Barton Malow Co.
Balfour Beatty Construction
Black & Veatch
Bloomsdale Excavating Co.
Boeing Services Co.
Brasfield & Gorrie, LLC
BRH – Garger Construction LP
Brunalli Construction Co.
Burns & McDonnell
Callahan & Nannini Excavating
Callanan Industries, Inc.
Carolina Sunrock LLC
Clark Construction Group, LLC
Clark/McCarthy
Clayco, Inc.
Clearwater Excavating Corp.
Clough Harbour & Associates
CH2M HILL
Creamer Environmental, Inc.
Damon-Purcell Construction
Edward Kraemer & Sons, Inc.
Engineering & Testing Services, Inc.
Explosives Experts, Inc.
F.H. Paschen, S.N. Nielsen
Flatiron Construction Corp.
Flintco, LLC
Fluor Corporation
Foth
Fred Weber, Inc.
Furgo (USA), Inc.
G. Donaldson Construction Company, Inc.
Gannett Fleming, Inc.
GEI Consultants, Inc.
Gilbane Building Company
Hatch Mott MacDonald
HDR, Inc.
Hensel Phelps Construction Co.
Holder Construction Company
Hunter Roberts Construction Group
Independence Excavating
INTECH Construction
Jones Lang LaSalle
Kelly/Maiello, Inc.
Kenny Construction
Kiewit Corporation
Kokosing Construction Company, Inc.
Lend Lease
Manafort Brothers, Inc.
McCarthy Holdings, Inc.
McCormick Taylor, Inc.
McKissack & McKissack
Michels Corporation
Mid-South Drilling, Inc.
Miller Bros Construction, Inc.
Morgan Corp.
Mosser Construction, Inc.
MWH Global, Inc.
Parsons Brinckerhoff
PCL Construction Enterprises, Inc.
Pepper Construction Group
PJ Dick, Trumbull, and Lindy Paving
P.J. Keating Company
Posen Construction, Inc.
Power Construction Company
Professional Service Industries, Inc.
QORE, Inc.
Rise International LLC
Robert Silman Associates
R.G. Johnson Company, Inc.
S&ME, Inc.
Skanska
Structure Tone
Sundt Construction, Inc.
Tectonic Engineering & Surveying Consultants P.C.
Terracon Consultants, Inc.
The Turner Corporation
The Kleinfelder Group, Inc.
The Lane Construction Corporation
The LiRo Group
The Shaw Group, Inc.
The Walsh Group Ltd.
The Whiting-Turner Contracting Co.
URS Corporation
W. E. O'Neil Construction Co.
Wagman, Inc.
Webber LLC
Weeks Marine, Inc.
Wood Group Mustang
WorleyParsons Group, Inc.
Zachry Holdings, Inc.

YOUR PROJECT MONITORING SOLUTION

When INTECH Construction, Inc. needed to demolish the existing Locust Club building in Philadelphia, Pennsylvania to make room for the Curtis Institute of Music, they called GeoSonics/Vibra-Tech to monitor the situation.

Not only did the Locust Club need to be demolished, but two adjacent buildings also had to be torn down—while preserving the historic stone facades of all three buildings that shared party-walls. Re:mote™ seismograph stations were installed in the basements of surrounding structures to measure vibrations. Biaxial tilt monitoring devices were installed on both facades and party-walls at the second and fourth floor levels to monitor the movement of the building. These monitors were programmed to send an email alarm notification to project personnel if movement neared or exceeded the design criteria. The project was a success and the site is now home to the Curtis Institute of Music.

"We engaged Vibra-Tech to help us through the documentation and monitoring effort to ensure that our construction operations did not negatively impact the rail line or any neighboring properties. As usual, Vibra-Tech brought the technical expertise required to thoroughly and efficiently document all existing conditions, and offered creative solutions for monitoring the facades and party walls for any vibration, settlement or deflection during demolition of the existing building, excavation of the hole and underpinning the adjacent foundations, and installation of the new structure. Their efforts were key to the ultimate success of the project."

– Phil Moses,
LEED AP, Principal, Vice President INTECH Construction, Inc.

Re:mote™

Helping You Meet Your Project Needs

Let us show you how our Re:mote Monitoring System allows you to get the data to project personnel without requiring them to spend hours in the field, saving you operational time and resources.

American Museum of Natural History: Gilder Center: New York, New York

Client: American Museum of Natural History
200 Central Park W, New York, NY 10024

Description: To create the new Richard Gilder Center for Science, Education and Innovation, demolition and construction was needed to develop the 230,000-gross-square-foot project site into exhibits, classrooms, an immersive theater, redesigned library as well as create a space that could link 10 museum buildings to improve flow throughout the American Museum of Natural History campus. Prior to demolition and construction activity, Vibra-Tech conducted pre-construction vibration testing and analysis for the development of appropriate site-specific vibration criteria. This study reviewed the type and location of equipment that would be utilized relative to sensitive exhibits. Based upon the operating energy and frequency of the equipment, Vibra-Tech established vibration limits and a site-specific vibration control plan. Re:mote vibration monitoring systems were installed to monitor vibration during the duration of the demolition and construction activities. In addition to vibration concerns, the museum was also cautious about its noise impact, so Vibra-Tech conducted a study to establish baseline noise levels and determine the transmissibility of noise from the proposed construction into the adjacent museum spaces. Based on these studies, noise criteria were developed and recommendations for noise mitigation methods were outlined. Re:mote noise monitoring systems were installed. Both vibration and noise data were available via a project specific website. Data from monitoring each unit was downloaded and reviewed on a daily basis. Monitoring reports were compiled on a weekly basis. Additionally, each monitoring station was programmed to alert the necessary project personnel via text and/or email notification when vibration or noise levels meet or exceed the limits for their respective monitoring locations.

Design/Build for the Historic Center Building, Phase 2 for the Consolidation of the U.S. Department of Homeland Security at St. Elizabeths West Campus: Washington, D.C.

Client: Grunley Construction Company, Inc.
15020 Shady Grove Road, Suite 500, Rockville, MD 20850

Description: The purpose of the project was to renovate the historic St. Elizabeth's building. Vibra-Tech conducted pre-construction inspections of structures adjacent to the West campus prior to construction activity. Vibration monitors were installed to detect movement during the underpinning and demolition activity.

Philadelphia Museum of Art: Philadelphia, Pennsylvania

Client: Kelly Maiello, Inc. - Architects and Planners
1420 Walnut Street, 15th Floor, Philadelphia, PA 19102

Description: Vibra-Tech developed a vibration monitoring and control plan to determine the magnitude of vibration that could safely be experienced within the museum as a result of excavation, demolition and construction activities associated with the Phase I expansion of the museum. The plan also established vibration criteria for construction and blasting to protect the building and artifacts and recommend standoff distances for construction equipment inside and outside of the museum. Vibra-Tech also developed a vibration monitoring system and monitored all sensitive areas and artifacts during the construction and blasting activities.

Metro Courthouse: Nashville, Tennessee

Client: Barge, Waggoner, Sumner & Cannon
211 Commerce Street, Suite 600, Nashville, TN 37201

Description: A below ground parking garage was planned for this project and rock excavation would occur within 60 feet of the courthouse to a depth of 50 feet. Vibra-Tech developed criteria to protect historic paintings, stained glass and marble façades located in the lobby of the courthouse. Seismic attenuation equations and single-hole analysis were also performed to determine proper blast designs to control vibration effects. Vibra-Tech was also requested by the architect to review blast plans and participate in discussions with the contractor relative to controlling vibrations. Vibra-Tech developed a vibration monitoring plan and implemented a monitoring system to record vibrations during the blasting activity.

Art Institute of Chicago - New North Wing: Chicago, Illinois

Client: Turner Construction Company
55 East Monroe Street, Suite 3100, Chicago, IL 60603

Description: The expansion of the Art Institute of Chicago required vibration producing construction activities such as, demolition, excavation, underpinning of adjacent structural foundation and pile driving for the new structure. Several museum structures were located immediately adjacent to the planned construction activities. These structures were home to rare museum artifacts from all over the world. Vibra-Tech Engineers provided and programmed a series of seismic recorders to analyze the time history and compare the results to the frequency dependent vibration criteria developed for the project. The recorders monitored structural vibration continuously. If vibration levels exceeded a vibration amplitude warning level, the system would immediately notify project management via phone and alarm system. This system was successfully utilized during the entire expansion of the museum over a two year period. In addition Vibra-Tech developed vibration criteria based upon attenuation for each piece of construction equipment to be utilized on the project. This information was used to select proper equipment for each phase of the project and also to set restrictions on how close each piece of equipment could operate adjacent to the nearby structures.

East Hill Removal Project: Juncos, Puerto Rico

Client: Amgen Manufacturing Limited/Blasting Analysis International
Juncos, Puerto Rico

Description: Supervised the planning, drilling and loading of blasts to facilitate the removal of a granite hill adjacent to a waste water treatment plant. The waste water treatment plant was located within 90 feet of blasting area. We were also charged with the installation and maintenance of an array of seismographs and responsible for the analysis and reporting of all vibration data for the project.

Saluda Dam Remediation Project: Columbia, South Carolina

Client: Paul C. Rizzo Associates, Inc.
500 Penn Center Blvd., Suite 100, Pittsburgh, PA 15235

Description: Collected ground vibration and air overpressure data from over 175 seismometer locations surrounding proposed project. Vibra-Tech provided recommendations for blasting parameters to control ground vibration and air overpressure effects. We also developed vibration criteria for existing pipeline in close proximity to blasting.

City of Seattle Water Main Project: Seattle, Washington

Client: Converse Consultants
18 W. Mercer Street, Seattle, WA 98119

Description: Vibra-Tech conducted a dynamic stress analysis of highly pressurized steel water line. The City of Seattle needed to construct additional water mains adjacent to their existing line. The pipe needed to be buried at least 5 feet below ground level. Blasting was the only economical solution to excavate the hard igneous rock. There was concern that damage to the existing line would occur, since it was the only water line that would transmit water to the city of Seattle. The dynamic response of the pipe was measured with a series of weldable strain gages and velocity transducers. Also, a computer modal analysis of the pipe was developed to show the stress distribution. This information assisted the contractor to excavate the trench for the new pipe without any damage to the existing pipe.

Como Park Quarry: Cheektowaga, New York

Client: Buffalo Crushed Stone
500 Como Park Blvd., Buffalo, NY 14227

Description: Collected ground vibration and air overpressure data from over 175 seismometer locations within the surrounding residential community. Vibra-Tech provided recommendations for blasting parameters to control ground vibration and air overpressure effects. Vibra-Tech also assisted the operation with public relation efforts with response to local media, public officials, and concerned citizens.

Rumpke Sanitary Landfill Project: Cincinnati, Ohio

Client: RUMPKE
10795 Hughes Road, Cincinnati, OH 45251

Description: Rumpke Sanitary Landfill planned to open a new cell in their landfill. The expansion of the new cell required rock blasting. The 36" LCP water main of Southwestern Ohio Water Company is located near the proposed cell. The vibration induced by rock blasting at the proposed cell may generate excessive stress on the pipe. Vibra-Tech developed multiple deflection models of the pipe based on application of the blast load. The maximum allowable deflection of each model was calculated based on the pipe properties. A proper safety factor was included in the calculated allowable deflection. Based on this information a peak vibration velocity frequency dependent was developed to monitor the pipe response to ground vibration.

Transco Gas Pipeline Project: Lincoln & Mecklenburg Counties, North Carolina

Client: PENTZIEN INC, Engineers and Contractors
Mark 70 Building, 6969 Grove Street, Omaha, NE 68106

Description: Pentzien, Inc Engineering and Contractors hired Vibra-Tech to evaluate the effects of blast induced vibration on a 36" main gas pipeline. The line belonged to Transco Gas Pipeline Corporation and crossed the Catawba River in Lincoln and Mecklenburg counties in North Carolina. Vibra-Tech conducted the pipe stress analysis caused by blast induced ground vibration. In this analysis, the maximum allowable pipe stress was calculated. Then, the existing stress induced by internal pressure was evaluated. Finally, the maximum stresses that can be applied by the blast without exceeding the allowable stress were calculated. A blast was simulated by applying a uniform load to the different modes of the pipe. Then, the allowable deflection of each mode was calculated. A safety factor of two was used in application of maximum allowable stress induced by blast. Based on the results of this study, a vibration monitoring procedure and vibration criteria was developed for the pipe.

Swampscott Quarry: Swampscott, Massachesetts

Client: Aggregate Industries, Inc.
30 Danvers Rd., Swampscott, MA 01907

Description: Vibra-Tech was retained to perform a blasting audit to investigate a flyrock incident after quarry management was suspect of report submitted by contract blaster. A site investigation was performed along with interviews of quarry management and personnel who witnessed the event. The source of the flyrock was determined based upon field observations, blast plan review, air overpressure data and geologic evidence from the ejecta.

TPPF Building Construction: Austin, Texas

Client: Texas Public Policy Foundation
900 Congress, Suite 400, Austin, TX 78701

Description: Vibra-Tech was retained by Texas Public Policy Foundation under the direction of the American Realty Corporation to establish a vibration monitoring program during planned demolition and construction activities. An existing two story building needed to be demolished, with the exception of the northern wall which was shared by the adjacent building. Demolition was to be completed before construction could begin on a new six story building at 9th Street and Congress Avenue. Prior to the start of the project, Vibra-Tech reviewed the soil profile for the site, measured the sonic velocity of the wall and determined construction induced ground vibration effects on the soil and structure. In addition, Vibra-Tech also conducted a pre-construction survey of the adjoining structure. Based on this information, Vibra-Tech developed vibration criteria for the project. Ground vibration levels were calculated for planned construction activities and safe standoff distances were established. Vibration monitors measured and collected data during all construction activities and key personnel were instantly notified when project thresholds were approached.

CTA Red and Purple Modernization (RPM) Phase One: Chicago, Illinois

Client: Walsh-Fluor Design-Build Team
190 S. LaSalle St., Suite 2200, Chicago, IL 60603

Description: Vibra-Tech provided both noise and vibration monitoring and consulting services for the Red and Purple Modernization Program (RPM) which is the largest capital improvement project in Chicago Transit Authority (CTA) history. This major initiative will completely rebuild the nearly century-old North Red Line from Belmont to Howard and the Purple Line from Belmont to Linden in Wilmette. This massive, multi-stage project is scheduled to be completed in phases. For each phase of the project, Vibra-Tech will develop noise and vibration monitoring and control plans. These plans include the prediction of expected noise and vibration levels resulting from proposed construction equipment. Noise level projection analysis for each phase of the project provides a comparison of expected noise levels relative to the project criteria, effectiveness of proposed noise mitigation, and allows for the design and implementation of Re:mote noise monitoring equipment deployment to demonstrate compliance to the project noise limits.

51 Central Demolition – The Newark Museum: Newark, New Jersey

Client: Regan Associates
P. O. Box 1884, Herndon, VA, 20172

Description: Vibra-Tech installed vibration monitoring and geotechnical monitoring equipment to include tilt and crack sensors in the Polhemus House (c. 1860) located at 49 Washington Street, adjacent to the demolition activity. Vibra-Tech provided vibration and geotechnical monitoring for this project via a web-based monitoring and alarm notification system.

The University of Maryland Medical Center: Baltimore, Maryland

Client: The University of Maryland Medical Center
22 S. Greene Street, Baltimore, MD 21201

Description: The University of Maryland Medical Center needed to demolish an existing loading dock and adjacent room in order to construct a new loading dock for the facility. Vibra-Tech was retained by The University of Maryland Medical Center to conduct preconstruction surveys to evaluate baseline conditions. A vibration monitoring and control plan was developed for the project. Due to the sensitivity of some of the medical equipment, separate criteria were developed for these locations. Re:mote vibration monitoring equipment was installed throughout the medical center to measure velocity and acceleration. Tilt and crack gauge monitoring devices were installed along the perimeter of the building and inside the structure where cracks were visible. Re:mote sound level meters were installed in the center's specialized care units. Measurements were collected continuously and results were posted to a customized project website where project personnel could access the data. When the equipment measured a reading that was near or exceeded the criteria, project personnel were notified by text and email.

Dry Comal Creek Flood Retarding Structure: New Braunfels, Texas

Client: Capitol Aggregates, Inc.
2330 N. Loop 1604 W., San Antonio, TX 78248

Description: Capitol Aggregates planned to develop a new rock quarry near the Dry Comal Creek Flood Retarding Structure (DCCFRS). The DCCFRS contained a roller compacted concrete gravity dam and deep concrete cut off wall. Blasting was to be used for rock excavation and there was concern that the ground vibration induced by rock blasting may induce excessive stress in adjacent structures. Capitol Aggregates hired Vibra-Tech to calculate the blast induced ground vibration effects on the structural integrity of DCCFRS and the deep concrete cut off wall. Vibra-Tech also developed a vibration-monitoring plan and criteria to prevent structural damage during production blast induced ground vibration. Additionally, the results of a site attenuation and VibraMap study were used for meeting production goals safely.

2013 Northeast Supply Link Expansion Project: Pennsylvania & New Jersey

Client: Williams-Transcontinental Gas Pipe Line Co.
95 Highland Avenue, Suite 150, Bethlehem, PA 18017

Description: The 2013 Northeast Supply Link Expansion Project involved the construction of three separate 42" gas lines with the purpose of connecting existing gas supply lines. For each of the lines, Vibra-Tech conducted pre-construction inspections of structures and collected water quality samples of private wells adjacent to the project site. During construction, Vibra-Tech monitored ground vibration from pipeline construction activities at the adjacent structures and utilities. Post-construction inspections and well water tests were performed upon completion of the project.

FEDERAL GOVERNMENT – RESEARCH

1982 - United States Department of Interior

Mining Research Contract - U. S. Bureau of Mines

The goal of this research was to determine the effects of surface mine blasting on water quality or quantity in a 300 foot deep test well. The well was subjected to increasing particle velocities over an 18 month period as mining advanced toward the water well.

1985 - United States Department of Interior

Mining Research Contract - U. S. Bureau of Mines

The aim of this research was to determine the effect of local geology on ground vibration and test methods of choosing the proper delay interval such that blast vibrations would destructively interfere minimizing vibrations effects on surrounding structures.

1987 - United States Department of Interior

Office of Surface Mining Reclamation and Enforcement

Contract to write the Blasting Guidance Manual which was distributed to all surface coal mines in the United States to help guide blasters in following federal regulations.

1987 - United States Department of Interior

Mining Research Contract - U. S. Bureau of Mines

The goal of this research was to develop a geophysical method that could assess the condition of the subsurface prior to a subsidence event and use this relationship to understand the reaction of the subsurface preceding the subsidence. Seismic techniques were judged to be the most insensitive due to the urban nature of the sites and most closely related to the physical and material properties of the subsurface.

FEDERAL GOVERNMENT – PROJECTS

1993 - United States Department of Defense

Navel Air Warfare Center (Warminster, PA)

Measure vibrations produced by horizontal accelerator and design an isolation system for base of accelerator to reduce vibrations to surrounding equipment.

1993 - United States Department of Energy

Savannah River Nuclear Waste Facility (Aiken, SC)

Monitored vibrations produced by dynamic compaction using 50 digital seismometers for a six week period. The seismometers were deployed in the cap containment area of a low level radioactive waste landfill.

1994 - United States Department of Health & Human Services

Center for Disease Control (Atlanta, GA)

Perform structural inspections of building interior prior to construction activity. Monitor vibrations from pile driving and blasting operations to assure adherence to vibration limits.

1994 - United States Department of Defense

Pentagon Renovation Project (Washington, DC)

Perform structural inspections of building interior prior to construction activity. Monitor vibrations from pile driving operations being performed interior to the structure.

1995 - United States Department of Interior

National Park Service - Lincoln Memorial (Washington, DC)

Measure ambient vibrations from airport and vehicular traffic and develop vibration criteria for proposed construction activity near the memorial.

1996 - United States Department of Energy

Savannah River Nuclear Waste Facility (Aiken, SC)

Deployed an array of accelerometers to measure the vibration from the direct impact of a collapsed 300 foot tall smokestack onto the array. Data was used to determine the vibration effects on buried utilities located throughout the facility.

STATE GOVERNMENT – PROJECTS

Michigan Department of Transportation

I-75 Bridge over Zilwaukee River (Saginaw, MI)

Perform dynamic analysis of collapsed bridge structure to establish vibration levels to ensure worker safety. Monitor vibrations from construction activity to assure adherence to established criteria.

Georgia Department of Transportation

Decatur Belt Railway Upgrade (Decatur, GA)

Performed vibration impact study for residential structures located along proposed train alignment. The study involved predicting what vibration levels could be expected from the new alignment and their effects on structures.

Texas Department of Transportation

Highway 1604 New Construction Project (San Antonio, TX)

Performed structural inspections of residential and commercial buildings prior to blasting and construction activity. Monitored operations to ensure compliance with established vibration criteria.

Pennsylvania Department of Transportation

S.R. 0095, Section CCA (Philadelphia, PA)

Performed vibration impact study for residential and commercial structures located along the proposed alignment of this urban highway. During the construction phase of the project, structural inspections were performed on hundreds of buildings to document their existing condition prior to construction activity. Vibration monitoring was performed for blasting and pile driving activity to assure compliance to recommended vibration criteria.

State of Texas

Old Spanish Missions (San Antonio Area)

Performed vibration and air overpressure monitoring of military aircraft flying over the old Spanish Missions in order to determine the possible effects on these structures.

FORTUNE 500 COMPANIES – PROJECTS

AT&T Corporation

Fiber Optic Cable Division

Retained as vibration consultant for blasting near fiber optic cables on nationwide basis. Employed by hundreds of contractors on various projects to measure vibrations and maintain Bell Laboratories criteria for the cable.

Bethlehem Steel Corporation

Sparrows Point, MD and Bethlehem, PA Plants

Measure effects of vibration on concrete platforms due to pouring of molten steel. Measure vibration produced by pile driving operations and develop criteria for protection of brick furnaces.

Merck Pharmaceutical Corporation

Allentown, PA Facility

Measure ambient vibrations resulting from day to day operations and design isolation system for injection molding equipment.

Toyota Motor Manufacturing Corporation

Georgetown, KY Facility

Measure ambient vibrations from day to day operations and determine dynamic characteristics of floor system.

Hershey Food Corporation

Laboratory & Science Building, Hershey, PA

Prediction of dynamic floor response due to vibration loading using modal analysis techniques.

E. I. Dupont Corporation Spruance Facility

Wilmington, DE

Measure vibrations produced by construction activity and establish vibration criteria for sensitive equipment located within the facility.

PROJECT MONITORING TEAM

Douglas Rudenko, P.G.

Vice President & Northeast Regional Manager
Vibra-Tech Engineers, Inc.

Education

- B.S. - Geophysics, Pennsylvania State University, 1984

Continuing Education Programs

- Short Course in Shallow Seismic Reflection Methods
  EG & G Geometrics, Sunnyvale, CA (June 1988)
- Short Course in Ground Penetrating Radar,
  SoftEarth Associates, Inc., Downers Grove, IL (Sept. 1990)
- Research Workshop - Geophysical Characteristics of Contaminants in the Subsurface, Society of Exploration Geophysicists Annual Meeting, Houston, TX (Nov, 1991)
- Short Course - Introduction to Engineering & Environmental Geophysics, Bell West Geoservices, Inc., Hazleton, PA (July, 1992)
- Short Course – Controlled Blasting for Rock Slopes,
  Blast Dynamics, Inc., Reno, NV (Oct., 1999)
- Certification Program - Practical Blasting Fundamentals, International Society of Explosive Engineers, Allentown, PA (April, 2000)
- Short Course – Geotechnical Instrumentation for Field Measurements
  University of Florida, Cocoa Beach, FL (March, 2001)
- Short Course – Air Quality Dispersion Modeling, NSSGA Environmental Health & Safety Forum, Phoenix, AZ (Sept., 2003)
- Short Course - Structural Vibration Analysis, ASCE,
  St. Louis, MO (Oct., 2004)
- Applied Mechanics: Statics & Strength of Materials,
  Penn State University (April – May, 2006)
- Geotechnical Instrumentation and Monitoring Bootcamp,
  ASCE, Cincinnati, OH (Feb., 2010)
- Structural Condition Assessment of Existing Structures,
  ASCE, Orlando, FL (Feb., 2011)
- 5th Soil Dynamics Short Course, Missouri University of Science & Technology, Wheeling, IL (Apr., 2013)
- Structural NDE Methods for Concrete, Masonry & Wood, Olson Instruments, Inc., Wheat Ridge, CO (Oct., 2018)

- Quality Assurance & Forensic NDE Methods for Pavements, Olson Instruments, Inc. Wheat Ridge, CO (Oct. 2018)
- Slope Stabilization and Landslide Prevention, HalfMoon Education, Inc. Scranton, PA (Oct., 2019)

Professional Registration

• Certified Professional Geologist	American Institute of Professional Geologist	CPG-8690
• Registered Geologist	Commonwealth of Pennsylvania	PG-730-G
• Registered Geologist	Commonwealth of Kentucky	PG-856
• Registered Geologist	State of Missouri	RG-0540
• Registered Geologist	State of Illinois	196-000198
• Registered Geoscientist	State of Texas	3744
• Registered Geoscientist	State of Louisiana	945
• Registered Geologist	State of New York	000653-1
• Licensed Blaster	Commonwealth of Pennsylvania	BL-0338
• OSHA 29 CFR 1910.120	40 Hr. Hazardous Waste Training	

Professional Societies

- American Institute of Professional Geologists
- American Society of Civil Engineers
- Association of Engineering Geologists
- Environmental and Engineering Geophysical Society (Founding Member)
- National Fire Protection Association
  Member of the Technical Committee on Explosives
- Pennsylvania Council of Professional Geologists
- Society of Exploration Geophysicists
  Member of the Executive Committee, Engineering and Groundwater 1988-1992
  Member of the Near-Surface Geophysical Committee, 1993-2004
- Society of Explosive Engineers
  Member of the Blast Vibration and Seismograph Section
  Member of the Standards Committee
- Society of Mining Engineers

Professional Background

July, 1998 to Present
Vibra-Tech Engineers, Inc. - Hazleton, Pennsylvania
Present Position – Vice President & Northeast Regional Manager

Mr. Rudenko is currently Vice President and Northeast Regional Manager for Vibra-Tech Engineers, Inc. He is responsible for the direction and supervision of Vibra-Tech's professional staff in six offices located in the Northeastern United States.

Mr. Rudenko has worked for thirty-five years in the field of engineering seismology, specializing in the analysis of seismic effects from blasting, pile driving, dynamic compaction, seismic operations, traffic and industrial vibrations. He has observed, recorded and analyzed the effects of vibrations on various types of structures throughout the United States and abroad. Mr. Rudenko has also completed many damage claim investigations regarding alleged damage to commercial and residential structures from various vibration sources as well as alleged damage to residential wells and aquifers resulting from blasting. He has provided expert testimony for environmental hearing boards, zoning boards, state and local regulatory agencies, and various courts in the field of blasting, geophysics, geology, and seismology with particular emphasis on blasting and vibration standards, the effects of vibration on structures and construction materials, and the effects of vibration on commercial and domestic water supplies.

Some examples of hallmark projects that Mr. Rudenko has managed include determining appropriate vibration criteria for frescos in the U.S. Capitol building utilizing ultra-sonic measurements and frequency response function techniques. Mr. Rudenko serves as the Principal Vibration Consultant for the Philadelphia Museum of Art and in this capacity has worked on several demolition and construction projects that involved vibration criteria development for existing exhibits that include paintings, sculptures, and other historic artifacts, developing and implementing vibration monitoring plans, and testing and qualifying construction equipment for use on the project. Mr. Rudenko also developed vibration criteria and implemented a monitoring plan for the historic lobby in the Alfred Smith Building such that demolition activity that included jack hammering of the upper floors in the structure could safely be completed. He also developed vibration criteria and implemented a monitoring plan for the historic Davidson County Courthouse in Nashville, TN such that blasting activity for an underground parking garage could safely be completed.

Mr. Rudenko has also been invited by MSHA, ISEE, Fire Marshalls Association, NSSGA, New York Department of Labor, West Virginia DEP, Ohio DNR and commercial explosive companies to lecture blasters, engineers, and regulators on fundamental seismology, the effects of ground vibration and air overpressure on structures, and vibration control through blast design. He has provided expert testimony for environmental hearing boards, state and local regulatory agencies, and various courts in the field of blasting, geophysics, geology, and seismology with particular emphasis on vibration standards and the effects of vibration on structures.

Mr. Rudenko serves on the Standards Committee for the International Society of Explosive Engineers. The Standards Committee was responsible for developing the performance specifications for blasting seismographs as well as field practice guidelines for blasting seismographs. Mr. Rudenko is also a member of the National Fire Protection Association Technical Committee on Explosives. This committee has the primary responsibility for documents on the manufacture, transportation, storage and use of explosives and related materials as found in the Explosive Materials Code (NFPA 495).

Mr. Rudenko has also performed investigations for several insurance companies regarding alleged damage to residential wells and aquifers resulting from blasting operations. In 1993, Mr. Rudenko provided testimony on behalf of the Pennsylvania Council of Professional Geologist at public hearings pertaining to Senate Bill 351 which provides for the conservation and management of water resources within the Commonwealth.

January, 1995 to Present
Vibra-Tech Engineers, Inc. - Hazleton, Pennsylvania
Present Position – Manager of Technical Services

Mr. Rudenko is a Senior Geophysicist and Manager of the Technical Services Group at the corporate headquarters of Vibra-Tech Engineers, Inc. in Hazleton, Pennsylvania. As manager of this group Mr. Rudenko directly oversees 4 full-time and 3 part time employees. His responsibilities include the management and planning of all geophysical investigations including budgetary monitoring, major technical decisions, scheduling and staff management. In addition he is responsible for a detailed review of technical calculations, drawings, figures, and maps; preparation of draft and final reports and client contact.

Mr. Rudenko is also responsible for the development and planning of all Iso-Seismic and Vibra-Map surveys performed by both Vibra-Tech. The Iso-Seismic system is an array of 170 digital seismometers deployed around a quarry site to measure blast vibrations. The data is used to pinpoint chronic vibration areas around the quarry that maybe related to the geology. Vibra-Map calculations are then employed to determine the proper firing time to use for a production blast in order to produce a vibration signal that minimizes structural response. Mr. Rudenko oversees the planning of these surveys, budgetary monitoring, scheduling and staff management, and review of final reports.

Mr. Rudenko also oversees the analysis and processing of analog tapes of vibration events from over one hundred clients nationwide. He is responsible for reviewing all final reports of the processed data before final delivery to the client.

September, 1984 to December, 1994
Vibra-Tech Engineers, Inc. - Hazleton, Pennsylvania
Position - Senior Geophysicist

Since joining Vibra-Tech, Mr. Rudenko has been primarily involved in the development and organization of the geophysical services department. For the past thirteen years Mr. Rudenko has been instrumental in introducing, developing and updating Vibra-Tech's geophysical capabilities. The new capabilities introduced at Vibra-Tech by Mr. Rudenko include ground penetrating radar, electromagnetic and magnetic methods, crosshole and downhole seismic techniques, and seismic tomography. Other tasks that he has been involved with include the development of a geophysical training program for geologists at Vibra-Tech and technical advisor for a senior level engineering design project at Wilkes University involving the development of a new crosshole source

Mr. Rudenko has used a wide variety of geophysical techniques on various environmental and geotechnical projects throughout the Northeast. Projects he has managed include the use of geophysical techniques in dam site investigations; foundation studies for power plant facilities; subsurface investigations for highway and utility alignments; geophysical and geological investigations for mining, quarrying, and dredging operations; investigations of subsurface conditions related to new and existing landfill facilities; delineation of contamination plumes; detection of buried waste, and the use of geophysical techniques in mine subsidence, sinkhole, and tunnel investigations.

Other projects Mr. Rudenko has been responsible for include the development of a recording system, procedures, and analysis for several environmental impact studies involving the measurement and prediction of traffic vibrations on structures adjacent to proposed highway alignments.

Mr. Rudenko has also been involved in two different research projects sponsored by the U.S. Bureau of Mines. In 1985 he assisted with the collection and reduction of geophysical data for a mining research contract entitled **"Geologic Factors Affecting Vibration from Surface Mine Blasting"**. The aim of this study was to determine the effect of local geology on ground vibration and test methods of choosing the proper delay interval such that blast vibrations would destructively interfere.

In 1987 he was responsible for the acquisition and reduction of all geophysical data collected for a three year research contract entitled **"Design and Implementation of a Monitoring System to Detect Imminent Subsidence in the Anthracite Region of North Eastern Pennsylvania"**. The goal of this study was to develop a geophysical method that could assess the condition of the subsurface prior to a subsidence event and use this relationship to understand the reaction of the subsurface preceding the subsidence. Seismic techniques were judged to be the most insensitive due to the urban nature of the sites and most closely related to the physical and material properties of the subsurface.

Publications

"Monitoring and Advanced Evaluation Techniques for Aggregate Mining in Urban Settings" with Jeffery Straw, Proceedings of the 2011 Society of Mining Engineers Annual Meeting, Denver, CO (2011).

"Particulate Matter as an Air Pollutant, Past, Present, and Future" with Jonathan Ferdinand, Proceedings of the 5th Biennial Blasting Vibration Technology Conference, Key West, FL (2004).

"The Court of Public Opinion: Winning Through Science" with Philip Berger, Jr., AggMan, Pages 47-49, February 2002.

"Blasting Near Domestic Water Supplies – Facts and Myths", Proceedings of the 4th Biennial Blasting Vibration Technology Conference, Key West, FL (2002).

"Airblast – An Often Overlooked Cause of Structural Response", Proceedings of the 10th Hi-Tech Seminar on Blasting Technology, Instrumentation and Explosives Applications, Nashville, TN (2001).

"Diagnosing and Solving Blasting Problems", Aggregates Manager, Pages 25-30, July 2000.

"An Analytical Approach for Diagnosing and Solving Blasting Complaints" Proceedings of the 9th Hi-Tech Seminar on Blasting Technology, Instrumentation and Explosives Applications, Orlando, FL (2001).

"Structural Response – The Primary Cause of Blasting Complaints", Proceedings of the 3rd Biennial Blasting Vibration Technology Conference, Key West, FL (2000).

"Understanding Blast Vibrations — A Key to Gaining Control", Proceedings of the 2nd Annual Blasting Vibration Technology Conference, Key West, FL (1998).

"Blast Vibrations — Planning for the Future", Proceedings of the 2nd Annual Blasting Vibration Technology Conference, Key West, FL (1998).

"Engineering Geophysics for the Mining and Construction Industries", Proceedings of 8th Hi-Tech Seminar on Blasting Technology, Instrumentation and Explosives Applications, Nashville, TN (1998).

"Optimizing Seismic Characterization of Longwall Coal Mine Overburden Using CAD and Computer-Enhanced Techniques: Case Study from Longwall Mining Operations, Western Maryland, USA" with K. Kluger Cohen and M.A. Trevits, Proceedings from the Third Canadian Conference on Computer Applications in the Mineral Industry, Montreal, Canada (1995).

"Concepts of Seismic Refraction Processing", Special Compilation for Bobby Timmons used in ``Prospecting for Natural Aggregates: An Update; Rock Products, Pages 32-33, January, 1995.

"Seismic Refraction Technique Applied to Highway Design in a Strip Mined Area of Southwestern Pennsylvania" with W.M. Lorence, H.D. Ackermann, Proceedings of the 42nd Annual Highway Geology Symposium, Albany, NY (1991).

"P-wave and S-wave Velocity Measurements Related to Subsidence Over a Longwall Mine" with J.S. Walker, A.M. Richardson, H.D. Ackermann, and J.W. Reil, Proceedings of the 59th Annual Meeting of the Society of Exploration Geophysicists, Dallas, TX (1989).

"Use of Geophysical Methods in a Geotechnical Investigation" with K.H. Early, Proceedings of the 2nd International Conference on Case Histories in Geotechnical Engineering, St. Louis, MO (1988).

Short Courses

Mr. Rudenko along with Mr. M. Sharifinassab developed and taught a short course for the Pennsylvania Council of Professional Geologists entitled "Vibration Measurement & Analysis". The course awarded 7.5 PDH's toward the annual continuing education requirements for licensure of professional geologists.

Technical Presentations

2020 Re:Con 2020, "Modified Seed Waveform Analysis for an Underground Mining Operation", Key West, FL

2020 Re:Con 2020, "Crack Displacement and Vibration Measurement of an Underground Portal", Key West, FL

2019 Pennsylvania State Drilling and Blasting Conference, "Modified Seed Waveform Analysis for an Underground Mining Operation", State College, PA

2017 Eastern Analytical Symposium, "A Blueprint for Managing Construction Vibration Risk Near Sensitive Strucutres", Plainsboro, NJ.

2016 AGG1 Accademy – NSSGA 2016 Annual Convention, "Why are my Neighbors Complaining about Blasting and What Can I do About it?", Nashville, TN.

2016 Re:Con 2016, "A Technical Look at the Influence of Geology on Ground Vibration and its Effect on Structural Response", Key West, FL.

2013 119th Annual Meeting, Exposition & Short Course for Northwest Mining Association, “Blasting-Finding Trouble Before It Finds You”, Reno, NV.

2013 39th Annual Conference on Explosives and Blasting Technique, “Blasting Near Buried Pipelines” , Blaster’s Weekend Short Course, Fort Worth, TX.

2013 Ohio Drilling and Blasting Conference, “Effects of Blasting on Water Wells”, Columbus, OH.

2013 AGG1 Academy – NSSGA 2013 Annual Convention, “Monitoring and Advanced Evaluation Designs for Aggregate Mining”, San Antonio, TX.

2012 20th Annual BME Drilling and Blasting Conference, “Data Storage for Mine Management”, Pretoria, South Africa.

2011 38th Annual Kentucky Blasting Conference, “Controlling Structure Response to Reduce Blasting Complaints”, Lexington, KY.

2011 Fifteenth Pennsylvania Blasting Conference, “The Development of a Blasting Vibration Criteria for a Sand Dyke in Suriname, South America”, University Park, PA.

2010 AGG1 Academy – NSSGA 2010 Annual Convention, “Public Perception Through Blast Design”, Cincinnati, OH.

2009 West Virginia Department of Environmental Protection Annual Blaster Refresher Training, “Controlling Ground Vibrations and Air Overpressure with Seismograph Measurements”, South Charleston, WV.

2008 35th Annual Kentucky Blasting Conference, “Controlling Ground Vibration and Air Overpressure with Seismograph Measurements”, Lexington, KY.

2007 6th Blasting Vibration Technology Conference, “New Electronic Detonator Applications”, Key Largo, FL.

2007 National Stone, Sand, and Gravel Association, Effective Drilling and Blasting Seminar, “Controlling the Effects of Blasting”, Chantilly, VA.

2007 15th Annual Conference Explosives, Drilling and Blasting Techniques, “Influencing the Court of Public Opinion - Dual Measurement Monitoring”, Johannesburg, South Africa.

2004 Symposium: State of the Art Techniques for Monitoring and Protecting Historic Structures, “Protecting Historic Structures During Construction Activity”, Columbia University, New York, NY.

2004 Risk Management Workshop, “Managing Risk through Public Perception”, New York Construction Materials Association, Albany, NY.

2003 Plant Operations Workshop, “Vibration Control Techniques”, Pennsylvania Aggregates and Concrete Association, Grantville, PA.

2001 Tenth Pennsylvania Blasting Conference, “Water Well Damage Claims – Facts and Fiction”, University Park, PA.

2001 Blasting Analysis International, Inc. Tenth High-Tech Seminar, “Airblast – An Often Overlooked Cause of Structural Response”, Nashville, TN.

2001 Mine Blasting Safety and Application Seminar, “An Analytical Approach for Diagnosing and Solving Blasting Complaints”, National Mine Health and Safety Academy, Beckley, WV.

2000 3rd Biannual Blasting Vibration Technology Conference, “Structural Response: The Primary Cause of Blasting Complaints’’, Key West, FL.

2000 Blasting Analysis International, Inc. Ninth High-Tech Seminar, “An Analytical Approach for Diagnosing and Solving Blasting Complaints”, Orlando, FL.

1999 National Stone Association, Effective Drilling and Blasting Seminar, “Vibration Control & Public Relations”, Philadelphia, PA.

1999 Georgia Crushed Stone Association – Technology Conference on Blast Vibrations: Structure & Human Response ``Diagnosing and Controlling Dynamic Geologic Response”, Atlanta, GA.

1998 2nd Annual Blasting Vibration Technology Conference, “Understanding Blast Vibrations — A Key to Gaining Control’’, Key West, FL.

1998 2nd Annual Blasting Vibration Technology Conference, “Blast Vibrations — Planning for the Future’’, Key West, FL.

1998 Blasting Analysis International, Inc. Eight High-Tech Seminar, “Engineering Geophysics for the Mining and Construction Industries”, Nashville, TN.

1998 Geological Society of America Annual Meeting, “A Multi-Media Field Laboratory and the Development of an Undergraduate Methods Training Course in Subsurface Hydrogeology”, Toronto, Ontario.

1997 Eighth Pennsylvania Blasting Conference, “Advancements in Vibration Prediction and Control”, University Park, PA.

1997 XXIII Convencion De Ingenieros De Minas Del Peru, “A Down to Earth Approach to Vibration Prediction and Control”, Arequipa, Peru.

1997 1st Annual Blasting Vibration Technology Conference, “Advancements in Vibration Prediction and Control”, Key West, FL.

1996 Society of Explosive Engineers - Great Plains Chapter, “Innovative Techniques for Understanding and Controlling Ground Vibrations from Production Blasting Operations”, St. Louis, MO.

1996 National Stone Association, Effective Drilling and Blasting Seminar, “Vibration Control & Public Relations”, Albany, NY.

1994 Society of Explosive Engineers - Potomac Chapter, “A Technique to Evaluate the Subsurface for Pre-Bid Estimating”, Sterling, VA.

1993 American Society of Civil Engineers - Knoxville Chapter, “Seismic Techniques for Civil Engineers”, Knoxville, TN.

1993 Sixth Pennsylvania Blasting Conference, “An Unconventional Technique to Eliminate Pre-Bid Guesswork”, University Park, PA.

1985 Second Pennsylvania Blasting Conference, “Prediction and Control of Blast-Induced Ground Vibration: A Scientific Approach”, University Park, PA.

PROJECT MONITORING TEAM

Mohamad Sharif, P.E.

Vice President, Senior Engineer
Vibra-Tech Engineers, Inc.

Education

- B.S. & M.Eng. – Civil Engineering, University of Louisville, 1981

Continuing Education Programs

- Computer Aided Vibration Design via Modal Analysis, University of Louisville, Louisville, KY
- Understanding Of Modal Analysis, Bruel & Kjaer Seminar, Dayton, OH
- Pile Integrity Test Workshop, Pile Dynamics, Inc., Cleveland, OH
- Contemporary Seismic Design Workshop, University of Louisville, Louisville, KY
- Predictive Maintenance, Machinery Diagnostics, Vibration Reduction and Vibration Signature Analysis, IRD Mechanalysis, Columbus, OH
- Vibration Control and Analysis, Pennsylvania State University, State College, PA

Professional Registrations

• Professional Engineer	Delaware	15582
• Professional Engineer	Florida	46292
• Professional Engineer	Illinois	062-045987
• Professional Engineer	Kentucky	15050
• Professional Engineer	Maryland	21550
• Professional Engineer	Michigan	6201055777
• Professional Engineer	New Jersey	24GE395800
• Professional Engineer	New York	072844-1
• Professional Engineer	North Carolina	16665
• Professional Engineer	Pennsylvania	PE077245
• Professional Engineer	South Carolina	23309
• Professional Engineer	Washington	47303
• Professional Engineer	Washington, D.C.	PE 906283
• Professional Engineer	National (NCEES) Registration	7885

Professional Memberships

- INCE (Institute of Noise Control Engineering)
- Chi Epsilon (National Civil Engineering Honor Society)
- ASCE (American Society of Civil Engineers)
- Vibration Institute (Vibration Society, IMOK Chapter, Indiana, Michigan, Ohio and Kentucky)

Professional Background

November 1984 to Present
Vibra-Tech Engineers, Inc. – Louisville, Kentucky
Present Position – Structural Dynamic Analyst

Conduct computer aided analysis of structures to determine dynamic response, including seismic response. Design isolation systems to reduce vibration transmissibility from or to machinery foundations. Responsible for preparation, scheduling and cost estimates for each project. Manage and supervise all projects, in addition to presenting written and oral reports to clients to demonstrate the company's ability to meet necessary objectives and goals in solving dynamic problems.

January 1983 to November 1984
VME-Nitro Consult (Division of Nitro Nobel) – Louisville, Kentucky
Position - Engineer

Primarily involved in the inspection and evaluation of structures subjected to ground vibrations produced by blasting, traffic, machinery and construction activity. Developed and implemented programs to eliminate or reduce the detrimental effects of noise and/or vibrations produced by equipment or products considered a probable harmful source to surrounding properties.

December 1981 to January 1983
University of Louisville, Civil Engineering Department – Louisville, Kentucky
Position – Research Associate

Developed a general dynamics analysis program for complex structural systems.

PROFESSIONAL QUALIFICATIONS

Mark Edwards

Project Manager

Education

- B.S. – Environmental Studies, East Stroudsburg University , 2008

Professional Memberships

- International Society of Explosives Engineers, Eastern Pennsylvania Chapter

Professional Background

August 2013 to Present
Vibra-Tech Engineers, Inc. – Hazleton, PA
Present Position – Project Manager

Mr. Edwards is responsible for client development. He works directly with clients from start to finish on vibration, noise and geotechnical projects. Mr. Edwards generates proposals from leads, attends planning meetings and installs equipment on site. Once the data is collected, he analyzes the measurements and develops reports for the client. Mr. Edwards also conducts blast consulting services such as VibraMap analysis, IsoSeis studies and site attenuation studies.

May 2008 to August 2013
Vibra-Tech Engineers, Inc. – Hazleton, PA
Position –Vibration and Sound Analyst

Mr. Edwards installed Re:mote monitoring stations to measure vibration, noise and geotechnical data. He developed proposals for clients and conducted the analysis and reporting of vibration induced by blasting, construction and demolition activity.

Professional Experience

TF CORNERSTONE - 606 WEST 57TH STREET PROJECT, New York, NY

- Attended preliminary planning meetings
- Assisted in the development of a vibration monitoring and control plan
- Installed Re:mote vibration monitoring equipment at the buildings located adjacent to the construction site
- Analysis and report vibration data to client on a daily basis

JOHN CIVETTA & SONS, INC. – NYU LANGONE MEDICAL CENTER, SCIENCE BUILDING, New York, NY

- Attended preliminary planning meetings
- Installed Re:mote vibration monitoring equipment at the buildings located adjacent to the construction site
- Analysis and report vibration data to client on a daily basis

STEVE P. RADOS – LONG BEACH MAIN PUMPING PLANT, Long Beach, CA

- Attended preliminary planning meetings
- Developed project specific website for hosting vibration data
- Installed Re:mote vibration monitoring equipment at the buildings located adjacent to the construction site
- Analysis and report vibration data to client on a daily basis

Three (3) project in the last five years where Vibra-Tech conducted vibration monitoring include:

- Broad and Spruce Project (Ongoing)
  Location: Philadelphia, PA
  Client: INTECH Construction (GC)
  Contact: Lee Anderson
  Email: LAnderson@intechconstruction.com
  Phone: 215.243.4956

- American Museum of Natural History Gilder Center Project (Ongoing)
  Location: New York, NY
  Client: American Museum of Natural History
  Contact: Steven Saccomanno - Project Manager (Zubatkin Owner Representation)
  Email: sjs@zubatkin.com
  Phone: 212.271.4845

- 2330 Broadway Project (Ongoing)
  Location: New York, NY
  Client: Hines
  Contact: Tyler Swiggett
  Email: tyler.swiggett@hines.com
  Phone: 203.415.1592

Attachment B

Vibration Monitor Manufacturers Data Sheet

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APPENDIX B

Minimate Plus™

Advanced Vibration and Overpressure Monitor

Range of Applications:

- Blast-monitoring for compliance
- Near-field blast analysis
- Pile driving
- Construction activity
- Demolition activity
- Heavy Transportation
- Bridge monitoring
- Structural analysis
- Underwater blast monitoring
- 4 or 8 channel data acquisition
- Remote monitoring - Auto Call Home™
- Structural monitoring - Flex™

When we asked what you wanted in a vibration monitor, you said "Everything." So, we designed the **Instantel® Minimate Plus™** vibration and overpressure monitor. Ever since, it has become a favourite of contractors, consultants, engineers and blasters, because it offers unrivalled features and versatility in a rugged and easy-to-use package.

Versatile

Use the **Minimate Plus** monitor with an **Instantel Standard Triaxial Geophone** (ISEE or DIN version) and an overpressure microphone (Linear or A Weight) to provide a rugged, reliable compliance monitoring system. Add the **Instantel 8-Channel** option and a single monitor may be used with two triaxial geophones and two microphones.

For more demanding monitoring applications, the **Instantel Blastware® Advanced Module** software provides the capability to monitor a broad selection of vibration and overpressure sensors, as well as sensors for structural and environmental measurements. Monitor vibration, ambient environmental conditions, and the movement of structural cracks, all at the same time, all using the same **Minimate Plus** monitor.

Intelligent

For remote installations, the **Instantel Auto Call Home™** feature will automatically transfer event files from field to office as they are recorded using a variety of wired or wireless modems. From there, the **Blastware Mail** feature of the **Blastware** software automatically distributes files or summary information to multiple e-mail or text messaging addresses.

Easy to use

Even with all of these features, the **Minimate Plus** system is still easy for anyone to use. A high-contrast LCD, eight-key tactile keypad, coupled with simple menu-driven operations, provides complete control and confidence.

Minimate Plus - everything you need and more.

Key Features

- **Instantel Histogram Combo™** mode allows capture of full waveform records while recording in histogram mode.
- **Auto Call Home** feature automates remote monitoring applications.
- Sample rates from 1,024 to 16,000 S/s, per channel with up to 65,000 S/s available on a single channel.
- Available **Instantel 8-channel** option allows for two standard geophones and two microphones to be operated from one **Minimate Plus** monitor.
- Non-volatile memory with standard 300-event storage capacity (optional 1,500-event capacity).
- Records waveform events up to 100 seconds long with standard setup, or up to 500 seconds with advanced setup.
- Continuous monitoring means zero dead time, even while the unit is processing.
- Any channel can be matched to a wide variety of sensors - geophones, accelerometers, or hydrophones.

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Minimate Plus™

General Specifications	Minimate Plus
Channels	Microphone and Triaxial Geophone or 4 independent user-configurable channels (two Microphones and two Triaxial Geophones or 8 independent channels with optional 8-channel upgrade)
Vibration Monitoring (with Standard Triaxial Geophone)	
Range	Up to 254 mm/s (10 in/s)
Resolution	0.127 mm/s (0.005 in/s) or 0.0159 mm/s (0.000625 in/s) with built-in preamp
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft^3)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)
Air Overpressure Monitoring	
Weighting Scales	Linear or A-weight
Linear Range	88 to 148 dB (500 Pa (0.072 PSI) Peak)
Linear Resolution	0.25 Pa (0.0000363 PSI)
Linear Accuracy	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
Linear Frequency Response	2 to 250 Hz between -3 dB roll off points
A-weight Range	50 to 110 dBA
A-weight Resolution	0.1 dBA

Waveform Recording

Record Modes	Manual, Single-shot, Continuous
Seismic Trigger	0.125 to 254 mm/s (0.005 to 10 in/s)
Acoustic Triggers	
Linear	100 to 148 dB
A-weight	55 to 110 dBA
Sample Rate	1,024 to 16,384 S/s per channel (independent of record time), up to 65,536 S/s in single-channel mode with advanced software (max 8,192 S/s per channel for 8 channels)
Record Stop Mode	Fixed record time, **Instantel® AutoRecord™** record stop mode
Record Time	1 to 100 seconds (programmable in one-second steps) or 500 seconds plus 0.25 seconds pre-trigger
AutoRecord Time	Auto window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled.
Cycle Time	Recording uninterrupted by event processing - no dead time
Storage Capacity	
Full Waveform Events	300 one-second events at 1,024 S/s sample rate (1,500 event capacity with optional memory upgrade)
Event Summaries	1,750 (8,750 event capacity with optional memory upgrade)

Histogram Recording

Record Modes	Histogram and **Instantel Histogram Combo™** (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	2, 5 or 15 seconds; 1, 5 or 15 minutes
Storage Capacity	46,656 intervals - 3 days at 5-second intervals or 102 days at 15-minute intervals (with memory upgrade - 15 days at 5-second intervals or 540 days at 15-minute intervals)

Physical Specifications

Dimensions	81 x 91 x 160 mm (3.2 x 3.6 x 6.3 in)
Weight	1.4 kg (3 lbs)
Battery	Rechargeable 6 V sealed gel cell - capacity for 210 hours of continuous monitoring
User Interface	8-key keypad with domed tactile keys
Display	4-line x 20-character, high-contrast, backlit LCD
PC Interface	RS-232
Auxillary Inputs and Outputs	External Trigger, Remote Alarm, coordinate download from GPS
Environmental	
LCD Operating Temperature	-10 to 50°C (14 to 122°F)
Electronics Operating Temperature	-20 to 60°C (-4 to 140°F)
Remote Communications	Compatible with Telephone, GSM, Cellular, RF, Satellite, Short-haul modems and Ethernet® device servers. Automatically transfers events when they occur through the **Instantel Auto Call Home™** feature.
Additional Features	Monitor start/stop timer

Corporate Office:
309 Legget Drive,
Ottawa, Ontario K2K 3A3
Canada

US Office:
808 Commerce Park Drive,
Ogdensburg, New York 13669
USA

Toll Free: (800) 267 9111
Telephone: (613) 592 4642
Facsimile: (613) 592 4296
Email: sales@instantel.com

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Instantel

The World's Most Trusted Vibration Monitors

MultiSeis Plus (MSP)

Specifications:

Seismic	Range	10 in/s (254 mm/s)
	Resolution	0.005 in/s to 0.000625 in/s with built-in preamp
	Trigger Levels	0.005 to 10 in/s in steps of .001 in/s
	Frequency Analysis	National and Local Standards for all countries
	Accuracy	3% at 15Hz
	Acceleration, Displacement	Calculated using entire waveform, not estimated at peak
Air Linear	Range	88-148 dB
	Resolution	0.1 dB above 120 dB
	Trigger Levels	100-148 dB in 1 dB steps
	Accuracy	0.2 dB at 30 Hertz and 127 dB
A weight (optional)	Range	50 to 110 dB in steps of 0.1 dB (Impulse Response – 35 milliseconds)
Sampling Rate		Standard 1024 samples per second per channel
Event Storage	Full Waveform Events	300 standard and 1500 optional at 1024 sample rate
	Summary Events	1750 standard and 8750 optional at 1024 sample rate
Frequency Response	2 to 300 Hz	Ground and Air, Independent of record time
Full Waveform Recording	Fixed Record Modes	Manual, single shot, continuous, and programmed start/stop
	Fixed Record Time	1 to 100, 300, or 500 sec plus 0.25 sec pre-trigger
	Auto Record Mode	1 to 100, 300, or 500 sec plus 0.25 sec pre-trigger
Strip Chart Recording	Record Method	Record to memory. Program interval 3, 5, 15, 60,300 or 900 sec
	Days Storage	2.8 or 14 days at 5 sec interval. 34 or 170 days at 1 minute interval
Histogram Combo Mode	Histogram Record Method	Record to memory. Program interval 2, 5, 15, 60, 300 or 900 sec
	Histogram Days Storage	2.4 or 12 days at 5 sec interval. 29 or 147 days at 60 sec interval
	Waveform Events	Up to 13 one-sec events (1024 sample rate)
	Waveform Record Times	1 to 13 sec plus 0.25 sec pre-trigger
Special Functions	Timer Operation	Programmed start/stop
	Self Check	Programmable daily check
	Scaled Distance	Weight and distance stored with event
	Monitor Log	History printout
	Automatic Download	Automatic downloading of data from a remote monitor with Call Home feature
	Measurement Units	Imperial or metric, dB or linear air pressure
	Location	Log GPS data into record
User Interface	Keyboard	8 domed tactile with separate keys for common functions

	Display	4 line by 20 character high contrast backlit display
Battery Life		10 days continuous recording, 25 days with timer
Dimensions		3.2” x 3.6” x 6.3”
Weight		3 lbs
Environmental	LCD	14 to 122 degrees F operating
	Electronics	-4 to 140 degrees F operating
	Humidity	5 – 90% RH non-condensing
	Storage	-4 to 160 degrees F

Attachment C

Weekly Vibration Monitoring Report

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VibraTechinc.com

109 E. First Street
Hazleton, PA 18201

Phone 570.455.5861
Fax 570.455.0626

Date

Mr.
Remedial Construction Services (RECON), LP
950 West Valley Road
Suite 2802
Wayne, PA 19087

Re: Vibration Monitoring
Project Name
Project Location

Dear Mr. ,

The following report is based upon the vibration monitoring results during construction activity from ____ through _____, at the above referenced project.

The vibration monitoring records obtained during this monitoring period were compared to the applicable vibration criteria, as stated in _____ *[NOTE: this will become a reference to the submittal prepared after completion of the pre-construction inspection]*.

All vibration events recorded during this monitoring period were in conformance with the aforementioned vibration criteria.

Please refer to our report with the individual seismograph records in the appendix for specific recording locations and intensities. Please do not hesitate to contact our office if we can be of any further assistance.

Sincerely,

VIBRA-TECH ENGINEERS INC.

Mark Edwards
Project Manager

Ethan Huff
Area Manager

Vibration Monitoring Report
Project Name
Project Location
___ through ___

Prepared for:

Mr.
Remedial Construction Services (RECON), LP
950 West Valley Road
Suite 2802
Wayne, PA 19087

Prepared by:

Vibra-Tech Engineers, Inc.
109 East First Street
Hazleton, Pennsylvania 18201
570.455.5861

Date

Vibration Monitoring Report
Project Name
Project Location

Introduction

Vibration monitoring authorized by Remedial Construction Services (RECON), LP was carried out by Vibra-Tech Engineers, Inc., for the _____ Project. Ground vibrations resulting from construction activities were monitored and recorded from ___ through ____. The recorded vibrations were compared to the applicable vibration criteria, as stated in _____ *[NOTE: this will become a reference to the submittal prepared after completion of the pre-construction inspection]*.

Scope and Conditions of Monitoring

Vibration Monitoring

___#__ remote seismograph systems equipped with triaxial geophones were utilized to monitor ground vibrations during this monitoring period.

Table 1 below provides the location, description, and serial number of the remote seismographs utilized during this monitoring period and Figure 1 displays an aerial view of the construction site showing the vibration monitoring locations.

Table 1: Location of the Remote Seismographs

Remote Seismograph Location	Description	Serial Number
VM#1		
VM#2		
VM#3		

Figure 1. Aerial View of Construction Site

Instrumentation

Results of the Monitoring

The results of the vibration monitoring are displayed in graphical format in the appendix of this report. Each sheet (event report) contains three plots representing vibration amplitudes for each plane of motion. A summary of the maximum vibration levels recorded during this monitoring period are

provided in Table 2, and a summary of vibration events exceeding the vibration trigger levels during this monitoring period are provided in Table 3.

Table 2: Maximum Vibration Levels Recorded During the Monitoring Period

Recording Location/Description	Monitoring Period	Maximum Particle Velocity Recorded (in/sec)
VM#1		
VM#2		
VM#3		

Table 3: Summary of Vibration Events Reaching 0.40 in/sec.

Recording Location	Date	Time	Maximum Particle Velocity Recorded (in/sec)	Notes
				No events exceeded the vibration trigger level.

Table 4: Elevation Monitoring Point Recorded During the Monitoring Period

Recording Location/Description	Monitoring Period	Elevation Reading
ELE#1		
ELE#2		
ELE#13		

Conclusion

All vibration events recorded during this monitoring period were in conformance with the applicable vibration criteria, as stated in _____ *[NOTE: this will become a reference to the submittal prepared after completion of the pre-construction inspection]*.

All elevation recordings are compared to the pre-construction values.

Please refer to our report with the individual seismograph records in the appendix for specific recording locations and intensities. Please do not hesitate to contact our office if we can be of any further assistance.

Sincerely,

VIBRA-TECH ENGINEERS, INC.

Mark Edwards
Project Manager

Ethan Huff
Area Manager

Appendix D

COMMUNITY AIR MONITORING PLAN

Remedial Construction Services, L.P.
950 West Valley Rd. Suite 2802
Wayne, PA 19087
www.reconservices.com

Community Air Monitoring Plan

Ringwood Mines/Landfill Superfund Site

Ringwood, Passaic County, NJ

Prepared for:

FORD MOTOR COMPANY

December 2020

Version Control

Date	Author	Version	Brief Summary of Changes	Reviewed and/or Approval By

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Attachments

Attachment A Action Level Tables

Attachment B Example Perimeter Air Monitoring Station Location Drawings

Acronyms/Abbreviations	Definition
AC	Area of Concern
AMT	
BMP	Best Management Practice
BTV	Below Threshold Values
CAMP	Community Air Monitoring Program
CMP	Cannon Mine Pit
COPC	Chemical of Potential Concern
H_2S	Hydrogen Sulfide

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RECON® Remedial Construction Services, L.P.

Acronyms/Abbreviations	Definition
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life and Health
LEL	Lower Explosive Limit
NAAQS	National Ambient Air Quality Standards
O_2	Oxygen
OCDA	O'Connor Disposal Area
OU2	Operable Unit Two
Owner	Ford Motor Company
PCB	Polychlorinated Biphenyl
PID	Photo-ionization Detector
PM_{10}	Particulate Level
PMP	Peters Mine Pit
PPE	Personal Protective Equipment
ppm	Parts per Million
RECON	Remedial Construction Services, L.P.
REL	Recommended Exposure Limit
Site	Ringwood Mines/Landfill Superfund Site
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
TLV	Threshold Limit Value
TWA	Time Weighted Average
TVOC	Total Volatile Organic Compound
UEL	Upper Explosive Limit
ug/m^3	Micro-gram per cubic meter
VOC	Volatile Organic Compound

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1.0 Introduction

This Community Air Monitoring Plan (CAMP) has been prepared by Remedial Construction Services, L.P. (RECON) on behalf of Ford Motor Company and the Borough of Ringwood (Client) for Operable Unit 2 (OU2) of the Ringwood Mines/Landfill Superfund Site (Site). OU2 for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area. Background information on each of the three land ACs is presented in the Remedial Action Work Plan (RAWP; December 2020) to which this CAMP is appended.

This CAMP was prepared to monitor air quality during RA construction activities for the protection of both on-site personnel and the surrounding community members. The monitoring program will consist of real-time monitoring of dust and particulates and volatile organic compounds (VOCs) in both the immediate work zone and along the perimeter of the ACs.

2.0 Objectives of Air Monitoring

The purpose of the CAMP is to ensure that on-site personnel and members of the Upper Ringwood and surrounding Borough of Ringwood community are not exposed to hazardous levels of airborne chemicals of potential concern (COPCs) due to implementation of the OU-2 RA construction activities at the Site. This includes any fugitive emissions from the RA activities, including dust and particulates or volatile organic compounds (VOCs). The objectives of the CAMP include the following:

- Protect on-site personnel and the community from exposure to COPCs resulting from RA construction activities performed at the Site
- Evaluate the need and effectiveness of Best Management Practices (BMPs) to suppress any fugitive dust and particulate and VOC emissions in the active work zones
- Monitor and document ambient air quality at work zone and RA construction area perimeter locations during RA construction activities

2.1 PROJECT APPROACH TO COMMUNITY MONITORING

This CAMP is being established to provide a mechanism by which the public is protected from fugitive emissions of dust and particulates and VOCs resulting from RA construction activities. The CAMP sets forth guidelines and requirements for air monitoring within the work zone and at the perimeter of each of the land ACs. Both work zone and perimeter monitoring will be performed during periods of RA construction activities to ensure that those activities do not adversely affect on-site personnel and/or the Upper Ringwood community or members of the surrounding Borough community.

RA construction activities will include the excavation and off-site disposal of excavated waste/debris and fill material, backfilling, capping, and site restoration. RECON's air monitoring approach will consist of two types of air monitoring. The first type of monitoring will be conducted within the active work zone during all excavation and waste handling activities. The work zone monitoring will be conducted in accordance with Section 8.0 of RECON's Site-Specific Health and Safety Plan (HASP) included in Appendix B of the RAWP using handheld real time monitors to detect the presence of dust and particulates, Total VOCs (TVOCs), oxygen, and explosive atmospheres. This monitoring will be used to determine the adequacy

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and /or necessity of BMPs, determine the ability and necessity of respiratory protection for personnel working within the land AC work zones, and determine worker exposure to COPCs. The work zone monitoring will also be used as a first level of detection to identify any potential fugitive dust and particulates or airborne VOC emissions within the work zone, so that action can be taken to protect workers as well as to minimize the potential for any work zone air quality issue to affect air quality in the downwind direction, or beyond the Site perimeters. Identifying airborne emissions within the AC work area will allow RECON's field management team to evaluate the effectiveness of the monitoring practices, or the need for additional BMPs to mitigate an airborne emission release prior to reaching the perimeter of the AC.

The second type of monitoring will occur at the perimeter of each land AC. The perimeter air monitoring system will be designed to detect and document if any airborne dust and particulates or TVOCs are reaching the perimeter of the ACs. RECON will setup stationary air monitoring stations at select upwind and downwind locations from the AC work zones to collect real-time data of dust and particulates and TVOC concentrations. The locations of the perimeter air monitoring stations will be chosen at the beginning of the work shift based on the direction of the wind as recorded by an on-site meteorological station. The location of monitoring stations may be adjusted if the project team determines that the sustained wind direction changes significantly during a work shift.

Both the work zone and perimeter monitoring will be conducted continuously during all field work activities. All air monitoring data collected will be recorded and reported daily.

2.2 BEST MANAGEMENT PRACTICES

Potential environmental impacts from the grading, excavation, and backfill operations include airborne dust, particulates and TVOC emissions. RECON will address the potential for these emissions to adversely affect on-site personnel and/or the Upper Ringwood/Borough community using BMPs that will include dust and particulate and TVOC suppression methods. Fugitive air emissions will not occur if (1) BMPs in the work zone are implemented routinely and (2) if BMPs in the downwind direction are maintained on a regular basis.

Water misting will be used to keep the ground surface and excavated materials moist and will be the primary dust and particulate suppression method for this project. All RECON personnel will be instructed to watch for visible airborne dust and particulates and to call for water whenever an activity is creating dust and particulates within the work zone that cannot be controlled by work method modification. These expectations extend to the Stop Work Authority extended to all personnel working in the land AC work zones. The goal is to mitigate dust, particulate, and VOC emissions within the work zone to the maximum extent practicable so that the potential for any downwind movement of dust/particulates or TVOC concentration in the ambient air is minimized.

A water truck will be present on-site during all invasive activities including excavation, regrading, and backfilling. Water will be applied, as needed, to maintain moist conditions to control visible dust and particulates. Unpaved roads and haul roadways will be maintained in a sufficiently moist condition to prevent dust and particulate generation. On-site vehicle and heavy equipment speeds will be established,

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marked, monitored and enforced to ensure that fugitive dust is not generated and, if it is, immediate action will be taken to stop the activity and initiate additional water misting. Action levels for particulates are defined in Section 4.2 below and will be strictly adhered to regarding initiation of dust control measures and work stoppage in response to any dust or particulate action level exceedance, as well as the selection of personal protective equipment (PPE).

If necessary, RECON will also be ready to mobilize and implement additional BMPs should they be required to mitigate airborne dust and particulates and/or TVOC emissions. These additional controls will include the use of odor suppressing foam and additional water misting systems. The odor suppressing foam can be used to cover exposed soil if elevated TVOC concentrations are detected in the work zone. Misting systems can be used to spray a fine mist of water into the air downwind of the active work area or near the perimeter of the active AC. The mist will remove any airborne dust particulates before they reach the perimeter of the work zone or the land AC.

3.0 Work Zone Monitoring

3.1 TARGET PARAMETERS

Since work zone monitoring is designed to evaluate the level of personal protection of our employees as well as to protect them from prolonged exposures to known and unknown contaminants, RECON will actively monitor the immediate work area for the presence of explosive atmospheres, hydrogen sulfide (H_2S), and oxygen (O_2) in addition to the particulates (PM10) and TVOC parameters that are also being monitored by the perimeter monitoring. The work zone air monitoring will be conducted by RECON's Site Safety Officer (SSO) in accordance with the HASP (Appendix B of the RAWP). This will include a full-time dedicated Air Monitoring Technician (AMT) in all active ACs to conduct downwind air monitoring of the same target parameters as the work zone monitoring. The AMT will collect data immediately downwind of the active ACs throughout the day on an hourly basis. If elevated concentrations are detected within the work zone, the AMT will continuously monitor the air immediately downwind of the recorded emission until it is controlled. Elevated dust, particulate, and/or VOC emissions will be controlled by a combination of changes to the means and methods of construction implementation and/or implementation of additional BMPs (such as misting system or foam).

3.2 REAL-TIME ACTION

RECON will monitor the parameters listed in Section 3.1 using real time monitoring equipment within the active work zone. To evaluate working conditions and PPE to protect workers directly exposed to the contaminants, RECON will compare the monitoring data with the Permissible Exposure Limit (PEL), Recommended Exposure Limit (REL), and Threshold Limit Value (TLV) action levels listed in RECON's HASP included as Appendix B of the RAWP.

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4.0 Perimeter Air Monitoring

4.1 TARGET PARAMETERS

COPCs for the Site as indicated by previous investigation data include metals, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), and VOCs. Action levels were calculated for particulates (PM_{10}) and VOCs. The basis of calculations of the real-time action levels are provided in **Attachment A**.

4.2 REAL-TIME ACTION LEVELS

Real-time action levels for the perimeter air monitoring are shown below. These action levels are calculated values based on data provided for both dust/particulates and VOCs; see **Attachment A**. The PM_{10} action level criteria were determined by evaluating calculated screening levels for the various metals, SVOCs, and PCBs found in the soil based on previous investigation results. For these parameters, the calculated real-time action levels are much greater than any dust/particulate levels that would realistically be encountered in typical field operations (refer to **Attachment A**). By comparison, the acute action level from the National Ambient Air Quality Standard (NAAQS) for PM_{10} is 150 micrograms per cubic meter ($\mu g/m^3$) as specified in 40 CFR Part 50. This value will be used as the PM_{10} action level for this CAMP.

Condition	Particulate Concentration (PM_{10}) *	Volatile Concentration (TVOC) *	Averaging
Alarm Level - Notification and observation of Site operations to be conducted. Evaluation of means/methods to determine if modifications are needed to reduce elevated levels.	100 $\mu g/m^3$	2.0 parts per million (ppm)	15-minute time-weighted average
Action Level - Operational action required, including possible work stoppage.	150 $\mu g/m^3$	4.0 ppm	15-minute time-weighted average

* Allowable concentration above upwind level for particulates and TVOC.

Notification of alarm level and action level exceedances will be provided in two ways. The user interface (on the monitoring device itself) will provide both an audible and visual response to each alarm condition. Exceedances displayed on the user interface will be highlighted yellow and flash on the screen. Additionally, multiple employees in the field will receive a text message and/or email with the exceedance value and station location. Redundancy for alarms is accomplished by providing notifications to multiple field personnel as well as personnel in the Site trailer to receive alarms. When an exceedance is sent out, an alarm icon will display on the air monitoring system dashboard. When the icon and alarm notification box is clicked, the exceedance is considered acknowledged and will no longer be highlighted.

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5.0 Instrumentation and Methods

5.1 WORK ZONE AIR MONITORING EQUIPMENT

RECON's SSO and AMT will utilize the following equipment to implement the work zone monitoring program.

- Personal particulate monitors will be used to detect concentrations of respirable particulate matter (PM_{10}). The monitor to be used will be a Real-Time Aerosol Monitor (RAM), or equivalent.
- Organic vapor monitoring will be conducted using photo-ionization detectors (PIDs) to monitor TVOC concentrations. The monitor to be used will be a RAE Systems MultiRAE multi-gas detector, or equivalent.
- Explosive atmospheres (upper explosive limit [UEL] and lower explosive limit [LEL]) and Oxygen will also be monitored using the RAE Systems MultiRAE multi-gas detector, or equivalent.

5.2 PERIMETER AIR MONITORING EQUIPMENT

The following monitoring instruments will be utilized by the AMT to implement the perimeter air monitoring program. Specific operational procedures are presented in Section 6.0.

- Particulate monitors will be used to detect concentrations of respirable particulate matter (PM_{10}). The monitor to be used will be a TSI DustTrak-II, Model 8530, or equivalent.
- Organic vapor monitors, specifically PIDs, will be used to monitor concentration of TVOCs (ppm). The monitor to be used will be a RAE Systems MiniRAE-3000, or equivalent.

A local weather station will be used to monitor wind direction, wind speed, ambient temperature, relative humidity, and barometric pressure.

These measurement instruments will be part of an integrated air-monitoring system transmitting data from the field instruments to a cloud server via wireless telemetry. The server will maintain the database for the project and will provide all end-user applications needed by the AMT, including presentation of live and historical data, notification of alarms, and generation of reports. These applications will be made available to the AMT via a secure internet interface and can be accessed via web-enabled devices such as personal computers/laptops, tablets and smart-phones. The system will also present real-time information about its own performance and status, eliminating the need for the AMT to traverse the jobsite to verify normal operation of the measurement instruments.

6.0 Operation Monitoring Program

This section describes the various project tasks and operational procedures to be performed to implement the provisions of this CAMP.

6.1 WORK ZONE MONITORING

Air-monitoring instruments will be operated, calibrated, and maintained in accordance with the manufacturer's specifications. A log will be kept on-site of calibration, inspections, and repairs of all

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instruments. Work zone monitoring will be conducted by RECON's SSO in accordance with the HASP (Appendix B to the RAWP). RECON will also provide a dedicated AMT positioned at each AC downwind of the excavation or ground disturbance.

The air in the work zone will be monitored:

- Regularly during operations to document site conditions
- When the possibility of an immediately dangerous to life and health (IDLH) condition, oxygen deficiency, or flammable atmosphere has developed or has the potential to develop (e.g., trenching or excavations)
- When contaminants other than those previously identified are encountered
- When a different type of operation is initiated
- During confined space work
- When the SSO requires it based upon previous knowledge and/or experience, or the lack of knowledge of Site conditions.

The health and safety of workers and the public must be protected concurrently. Direct reading air monitoring instruments provide an integral portion of the information necessary to determine how these requirements are being met.

Used correctly, these instruments provide data that assist employees at the Site to determine:

- Potential or real effects on the environment
- Immediate and long-term risks to public health, including the health of the workers
- Appropriate personal protection and respiratory equipment to be used onsite
- Actions to mitigate hazard(s) safely and effectively

If elevated levels are detected during active RA construction activities, the SSO and AMT will identify the source and document the downwind readings as a buffer between the work area and the perimeter of the Site. Elevated sustained levels of the parameters being monitored will be reported to the project team to evaluate the appropriate course of action necessary to mitigate the concern. If necessary, work will stop, and BMPs will be increased to ensure that the source of the airborne emission will not impact the surrounding community. Perimeter air monitoring, described further below, will also be utilized to ensure that elevated levels of particulates and/or TVOCs (if any) are identified and addressed.

6.2 PERIMETER AIR MONITORING (CAMP)

6.2.1 Location of Monitoring Stations

Three air monitoring stations will be designated to each active AC (e.g., six (6) stations in total if the PMP Area and OCDA remediations are running concurrently). Stations will be set up around current work areas with one (1) upwind and the other two (2) near the perimeter at downwind locations. Actual monitoring station arrangement will be reviewed and modified daily based on the location of work and wind direction. Example drawings showing the location of the monitoring stations relative to wind direction for each of the ACs are included in **Attachment B**. The monitoring station locations used each day will be recorded on a site map for reporting purposes.

Each air monitoring station will be configured with air intake ports at a height of approximately five feet above the ground surface to represent the breathing zone. Stations will be mobile and housed in a rugged

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fiber case mounted on a tripod to be located daily along the perimeter in support of the work being conducted. Each day, wind direction, current work location, and off-site sensitive receptor locations will be considered before locating stations around the work area at the Site perimeter. The mobile stations will move daily based on the above factors and will provide coverage for measurement of real-time particulates and VOCs.

A local meteorological station will be utilized for the project based on proximity to the Site.

6.2.2 Baseline Survey

Prior to the disturbance of soils and other dust or particulate generating activities at the Site, air monitoring will be conducted at the project perimeter to establish a baseline. The data will be used to develop "background threshold values" (BTVs), a statistical representation of local air quality background for the key parameters, e.g., PM_{10} and TVOCs. The BTVs from this baseline monitoring will be used for comparison to the perimeter readings obtained later during construction activities.

6.2.2.1 Real-Time

Baseline monitoring will identify the typical background concentrations of particulates and TVOC levels at the jobsite. This study will be conducted in advance of general mobilization by the contractor so as to avoid the effects of vehicular traffic and other non-intrusive construction activities. The survey shall entail at least three (3) days of real-time monitoring for approximately 10 hours each day to mimic a typical work shift. The full complement of nine (9) field stations will be utilized (three in each AC), positioned at their respective perimeter locations. The stations will be deployed each morning with locations dependent upon wind direction, work area, and sensitive receptors. The stations will be relocated if original conditions change.

6.2.2.2 Meteorological

The real-time monitoring efforts will be supplemented by real-time measurement of meteorological parameters. One meteorological station shall be utilized, located at one of the perimeter stations. The full-service station shall measure ambient temperature, barometric pressure, relative humidity, wind speed, and direction.

6.2.3 Monitoring During Project Activities

A comprehensive program of real-time monitoring will be conducted during each phase of RA activities.

6.2.3.1 Real-Time

PM_{10} concentrations, TVOC concentrations, and meteorological measurements will be recorded by the monitoring equipment along the perimeter of the applicable land AC. These data measurements will be transmitted continuously in real-time to the server database of the air monitoring system. The system will also correlate wind-speed and direction to the environmental measurements in real-time, so that the AMT will be aware of airflow patterns across the Site when responding to alarms or other incidents of interest.

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The total number of active field stations will be determined based upon AC activity, and the stations will be positioned at their respective perimeter locations. The stations will be deployed each morning dependent upon wind direction, work area, and sensitive receptors. The stations will be relocated if original conditions change.

Stations may be relocated based on current and historical weather conditions in conjunction with current work areas or processes. Movement of an individual station will be agreed upon with construction management prior to relocation and will be updated in the monitoring log.

The stations will commence operations 10 minutes before work starts, operate continuously during the work shift, and be shutdown 10 minutes after work has ceased for the day.

6.2.3.2 Meteorological

The real-time monitoring and analytical sampling efforts will be supplemented by real-time measurement of meteorological parameters. The local web-based station will be located in close proximity to the Site and will measure ambient temperature, barometric pressure, relative humidity, and wind speed and direction.

6.2.4 Alarm Condition Response Procedures

For all alarm and action-levels, the notification of an alarm condition shall be based on actual real-time measured values. Upwind readings will be taken into consideration to adjust alarm thresholds for exceedances.

6.2.4.1 Particulates

The following sequence will be followed to respond to particulate (PM_{10}) concentrations that exceed the established Alarm and Action Levels provided in the table in Section 4.2:

- If the perimeter PM_{10} 15-minute time weighted average (TWA) exceeds the PM_{10} Alarm Level at any of the monitoring stations, the AMT will immediately investigate. The AMT will observe PM_{10} concentrations for 15 minutes at the location of the exceedance and will make log entries of his observations of activities. The AMT and SSO will attempt to identify the source of the particulate emissions. The SSO will also prepare to address the source.
- If the perimeter PM_{10} concentration is sustained above the Action Level over a 15-minute TWA, the AMT will notify the SSO to implement the use of water spray (or other appropriate dust suppressant). The AMT will continue to observe PM_{10} concentrations on the real-time monitoring equipment at that location for another 15 minute period.
- If the perimeter PM_{10} concentration is sustained above the PM_{10} Action Level over any two consecutive 15-minute TWA periods, and it has been determined the source of the particulates is within the Site boundary, more extensive controls will be implemented, or activities shall cease. Real-time monitoring at the perimeter and particulate emissions control will continue until the action-level alarm condition is no longer present. Work procedures will be re-evaluated to lessen dust and particulate emissions, and if applicable, work procedures will be updated.

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- Normal work practices will resume when the perimeter PM_{10} concentration falls below the Action Level over a 15-minute TWA.

6.2.4.2 Volatiles

Similar procedures will be used to respond to TVOC concentrations that exceed the established Alarm and Action Levels:

- If the perimeter TVOC 15-minute TWA exceeds the TVOC Alarm Level at any monitoring station, the AMT will immediately investigate. The AMT will observe TVOC concentrations for 15 minutes at the location of the exceedance and will make log entries of his observations of activities. The AMT and SSO will attempt to identify the source of the vapor emissions. The SSO will also prepare to address the source.
- If the perimeter TVOC concentration is sustained above the TVOC Action Level over the 15-minute TWA, the AMT will notify the SSO to implement the use of appropriate vapor suppression techniques. The AMT will continue to observe TVOC concentrations on the real-time monitoring equipment at that location for another 15-minute period.
- If the perimeter TVOC concentration is sustained above the Action Level over any two consecutive 15-minute TWA periods, and it has been determined the source of the TVOC emission is within the active work area, more extensive controls will be implemented, or intrusive activities shall cease. Real-time monitoring at the perimeter and vapor suppression control will continue until the action-level alarm condition is no longer present. Work procedures will be re-evaluated to lessen vapor emissions, and if applicable, work procedures will be updated.
- Normal work practices will resume when the perimeter TVOC concentration falls below the Action Level over a 15-minute TWA.

7.0 Quality Assurance

7.1 OPERATION AND CALIBRATION OF EQUIPMENT

All instruments will be calibrated in accordance with the manufacturer's specifications. Instrument calibration shall be documented on calibration sheets. All particulate monitors will be "zeroed" daily before use. PIDs will be "bump tested" with low level calibration gas (10 ppm isobutylene) to determine accuracy, and then re-calibrated with the same calibration gas when bump tests are off by five percent. Calibration checks may be used during the day to confirm instrument accuracy. During calibration or bump testing, the device will be turned off so that the calibration value is not recorded as a real measurement in the database and alarmed against on the user interface. Once calibration or bump testing is complete, the device will be turned back on at the user interface. During the 10-minute startup before Site work begins, device readings should be compared to other device readings around the Site. This relative comparison will indicate monitoring instruments are within range of each other and will verify consistent background measurements.

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7.2 DOCUMENTATION

Reports on the air monitoring activities will be submitted to the RECON field management team daily. All alarms and subsequent emission source evaluations and corrective measures will be documented. In addition, the AMT will maintain a daily air monitoring log on the user interface that will include a general description of the Site activities, a detailed description of the Site activities during an alarm condition, and potential source(s) of emissions causing such alarms. The monitoring and meteorological data reports will be provided to the owner's representation the following morning.

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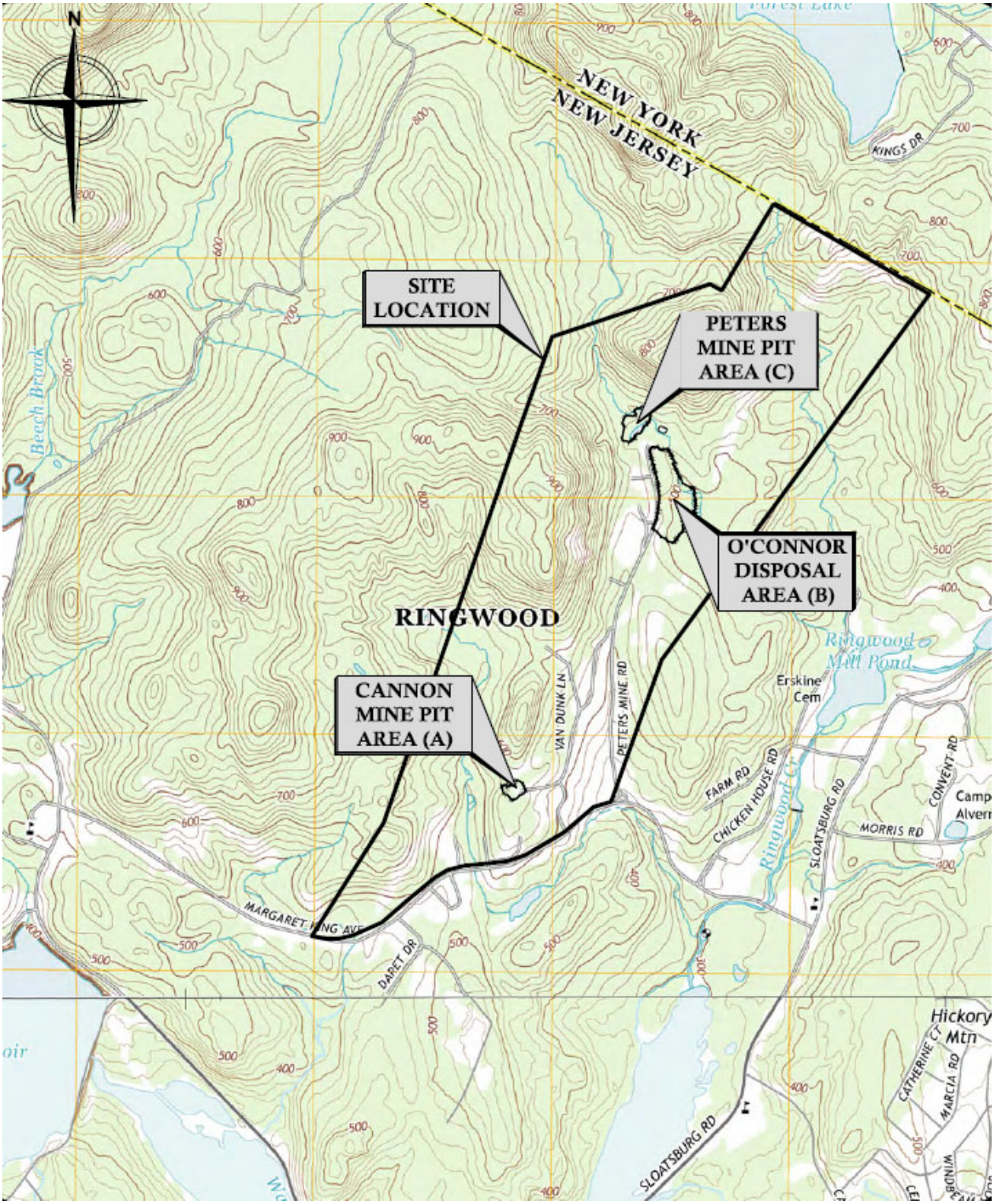
Figure 1: Site Map



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Attachment A

Action Level Tables

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Perimeter Air Monitoring Action Level Calculations: Ringwood Mines/Landfill Superfund Site, Operable Unit Two

EMILCOTT
environmental, health & safety experts

Table 1 PM_{10} Action Levels (Metals, PCBs, & SVOCs)

Based on the available data for contaminant screening levels, the adjusted PM_{10} 15-min time weighted average action levels, shown in the last column, are greater than the National Ambient Air Quality Standard of 150 µg/m^3 for particulates. A more restrictive 15-min action level of 150 µg/m^3 will be used for this project.

Parameter	Measured Concentration in Soil[a]		Cancer/Non-Cancer	EPA Regional Screening Level[b]	Site Specific Screening Level[c]	Calculated PM_{10} to reach Individual AL[d]	Adjusted PM-10 for 15-min TWA[e]
	mg/kg	µg/µg		µg/m^3	µg/m^3	µg/m^3	µg/m^3
Metals							
Aluminum	5.93E+03	5.93E-03	N/A	N/A	N/A	N/A	N/A
Antimony	9.53E+01	9.53E-05	NC	4.42E+00	1.96E+01	2.05E+05	3.38E+06
Arsenic	7.23E+00	7.23E-06	C	9.60E-02	4.25E-01	5.88E+04	9.69E+05
Barium	1.34E+04	1.34E-02	NC	2.21E+01	9.78E+01	7.28E+03	1.20E+05
Cadmium	2.73E+00	2.73E-06	C	2.29E-01	1.01E+00	3.72E+05	6.13E+06
Calcium	1.03E+04	1.03E-02	N/A	N/A	N/A	N/A	N/A
Chromium	3.06E+03	3.06E-03	N/A	N/A	N/A	N/A	N/A
Cobalt	1.17E+02	1.17E-04	C	4.59E-02	2.03E-01	1.74E+03	2.86E+04
Copper	1.53E+02	1.53E-04	N/A	N/A	N/A	N/A	N/A
Iron	6.06E+04	6.06E-02	N/A	N/A	N/A	N/A	N/A
Lead[f]	1.45E+04	1.45E-02	NC	1.50E-01	6.64E-01	4.56E+01	7.52E+02
Magnesium	2.00E+03	2.00E-03	N/A	N/A	N/A	N/A	N/A
Manganese	3.13E+02	3.13E-04	N/A	N/A	N/A	N/A	N/A
Mercury	1.02E-01	1.02E-07	NC	1.33E+00	5.88E+00	5.77E+07	9.51E+08
Nickel	7.95E+01	7.95E-05	C	1.59E+00	7.03E+00	8.85E+04	1.46E+06
Selenium	1.53E+00	1.53E-06	N/A	N/A	N/A	N/A	N/A
Sodium	1.54E+03	1.54E-03	N/A	N/A	N/A	N/A	N/A
Vanadium	9.80E+00	9.80E-06	N/A	N/A	N/A	N/A	N/A
Zinc	2.27E+03	2.27E-03	N/A	N/A	N/A	N/A	N/A
SVOCs							
Naphthalene	4.06E+02	4.06E-04	C	1.21E+01	5.35E+01	1.32E+05	2.17E+06
PCBs							
Aroclor 1242	1.68E-01	1.68E-07	C	7.23E-01	3.20E+00	1.90E+07	3.14E+08
Aroclor 1254	7.73E-01	7.73E-07	C	7.23E-01	3.20E+00	4.14E+06	6.82E+07
Aroclor 1260	1.61E-01	1.61E-07	C	7.23E-01	3.20E+00	1.98E+07	3.27E+08

Action levels are concentrations that initiate engineering controls or stop work orders for the contractor. They are put in place to restrict air quality impacts outside the construction work area. Since instrumentation cannot measure individual contaminants, calculations are made based on USEPA guidance that provide particulate levels in air. These action levels are calculated based on soil concentrations of individual contaminants. Typically, the higher the level of contamination for a particular contaminant, the lower or more restrictive the action level. Calculations found in Appendix A, with action levels in the last column, are based on soil sample results from the Ringwood Mines OU2 work areas, the duration of the possible exposures in hours per day, days per week, and days per year. The action levels in the last column are high based on realistic dust concentrations typically found at remediation sites, meaning that there are lower concentrations of contaminants in the soil. For this project, a more restrictive National Ambient Air Quality Standard (NAAQS) of 150 ug/m3 will be used instead of the higher (752 ug/m3) calculated action level for lead. The NAAQS is based on a 24 hour time weighted average but will be applied as a 15 minute time weighted average for an even greater level of safety.

(a) Based on soil sampling data provided by Recon Remedial Contstruction Services. Values used here for each parameter are the 95th percentile of detected samples.

(b) EPA Risk Based Screening Levels: "Regional Screening Levels for Chemical Contaminants at Superfund Sites", Calculator for Site-specific Resident/Worker Risk-Based Screening Levels for Ambient Air. https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

(c) Exposure Basis for this project: 5 days/week; 10 hours/day, 198 work days, 9 months

(d) Ratio of individual action level to soil concentration is used to calculate the PM_{10} concentration needed to reach the individual action levels of the parameters.

(e) Adjusted for 15-minute TWA, per Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised), Appendix D, U.S. Environmental Protection Agency (EPA-454/R-92-024). Adjustment coefficient for this project = 16.49, converting from annual basis for RLSs and 15-minute TWA field measurements.

(f) An EPA RSL is not available for lead. Instead, the National Ambient Air Quality Standard for lead is used, per the EPA's recommendation.

N/A - No screening level is available for this parameter.

Perimeter Air Monitoring Action Level Calculations: Ringwood Mines/Landfill Superfund Site, Operable Unit Two

Table 2 TVOC Action Levels

Based on this analysis, the indicated TVOC action level should be based on ethylbenzene

Parameter	Molec. Wt.	Measured Concentration in Soil [a]		Site Specific Screening Level [b,c]		Calculated TVOC to reach individual AL [d]	Adjusted TVOC for 15-min TWA [e]
		µg/kg	Normalized % of TVOC [d]	µg/m^3	ppb	ppm	ppm
Acetone	58	3.88E+03	0.01%	1.37E+05	5.77E+04	4.24E+05	6.99E+06
Benzene	78	6.76E+03	0.02%	5.29E+01	1.66E+01	6.99E+01	1.15E+03
Butylbenzene, n-	134	6.10E+04	0.21%	N/A	N/A	N/A	N/A
Butylbenzene, sec-	134	1.61E+04	0.06%	N/A	N/A	N/A	N/A
Butylbenzene, tert-	134	5.37E+01	0.00%	N/A	N/A	N/A	N/A
Ethylbenzene	106	4.44E+06	15.56%	1.65E+02	3.80E+01	2.44E-01	4.03E+00
Isopropylbenzene	120	1.02E+05	0.36%	3.98E+02	8.10E+01	2.26E+01	3.73E+02
Isopropyltoluene, p-	134	3.05E+04	0.11%	N/A	N/A	N/A	N/A
Propyl benzene	120	7.21E+04	0.25%	4.42E+03	8.99E+02	3.56E+02	5.87E+03
Tetrachloroethylene	166	8.45E+03	0.03%	1.80E+02	2.65E+01	8.96E+01	1.48E+03
Toluene	92	4.73E+06	16.57%	2.21E+04	5.86E+03	3.54E+01	5.84E+02
Trichloroethylene	131	1.23E+03	0.00%	9.51E+00	1.77E+00	4.10E+01	6.75E+02
Trimethylbenzene, 1,2,4-	120	4.19E+05	1.47%	8.85E+02	1.80E+02	1.23E+01	2.02E+02
Trimethylbenzene, 1,3,5-	120	1.62E+05	0.57%	8.85E+02	1.80E+02	3.17E+01	5.23E+02
Xylenes, total	106	6.91E+06	24.20%	1.77E+03	4.08E+02	1.68E+00	2.78E+01
Xylene, m-	106	4.67E+06	16.37%	N/A	N/A	N/A	N/A
Xylene, o-	106	2.23E+06	7.83%	N/A	N/A	N/A	N/A
Xylene, p-	106	4.67E+06	16.37%	N/A	N/A	N/A	N/A

Notes:

(a) Based on soil sampling data provided by Recon Remedial Contstruction Services. Values used here for each parameter are the 95th percentile of detected samples.

(b) EPA Risk Based Screening Levels: "Regional Screening Levels for Chemical Contaminants at Superfund Sites", Calculator for Site-specific Residential Risk-Based Screening Levels for Ambient Air
https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

(c) Exposure Basis for this project: 5 days/week; 10 hours/day, 198 work days, 9 months

(d) Normalized percentages of soil concentrations are used to calculate the TVOC values equal to the individual action levels of each parameter.

(e) Adjusted for 15-minute TWA, per Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised), Appendix D, U.S. Environmental Protection Agency (EPA-454/R-92-024).
Adjustment coefficient for this project = 16.49, converting from annual basis for RLSs and 15-minute TWA field measurements.

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Attachment B

Example Perimeter Air Monitoring Station Location Drawings

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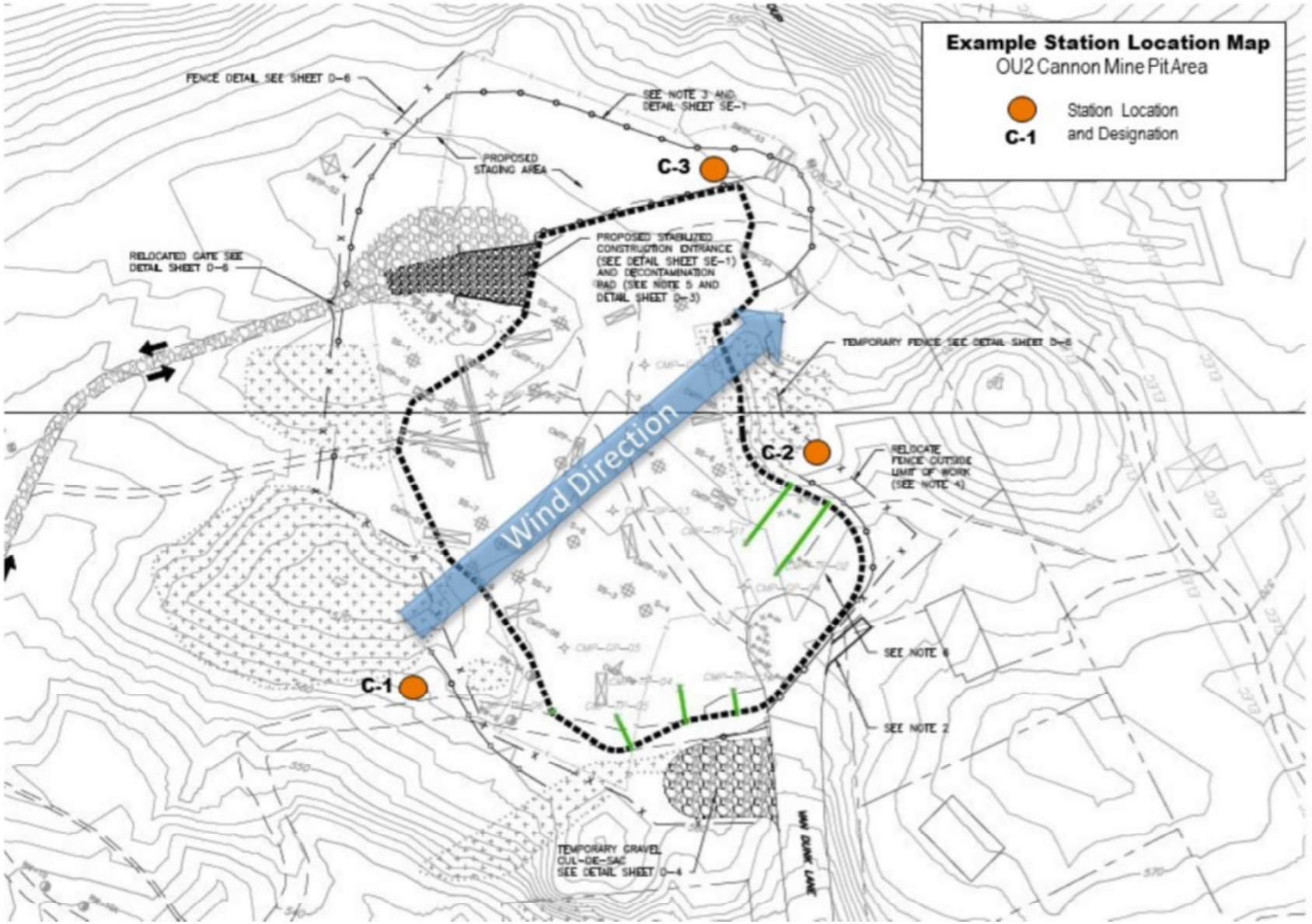

Notes:

Not To Scale
Actual air monitoring stations will be field determined based on wind direction

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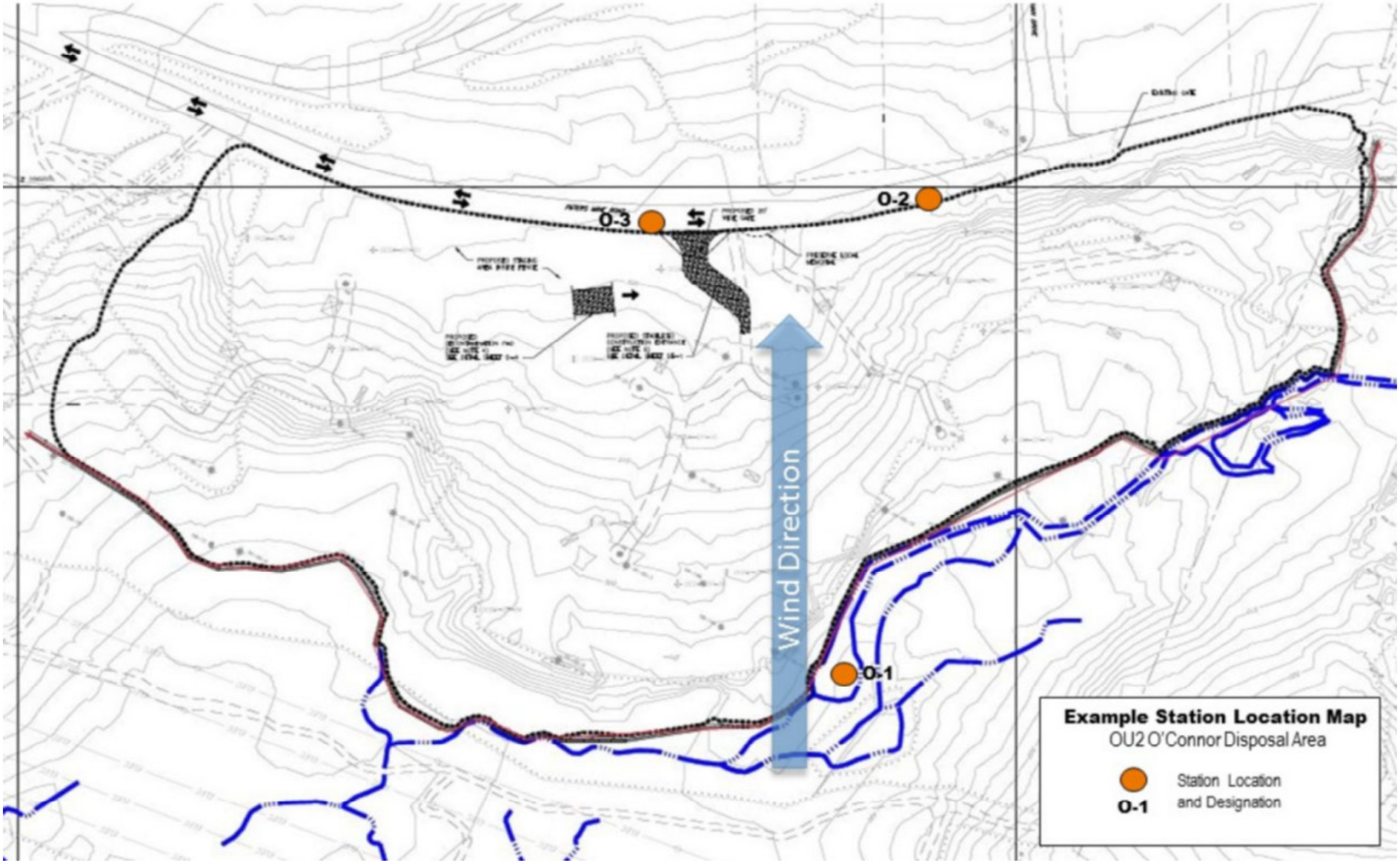
CANNON MINE PIT AREA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

EXAMPLE AIR MONITORING STATION LOCATION PLAN

Date: 12/06/20



Notes:

Not To Scale
Actual air monitoring stations will be field determined based on wind direction

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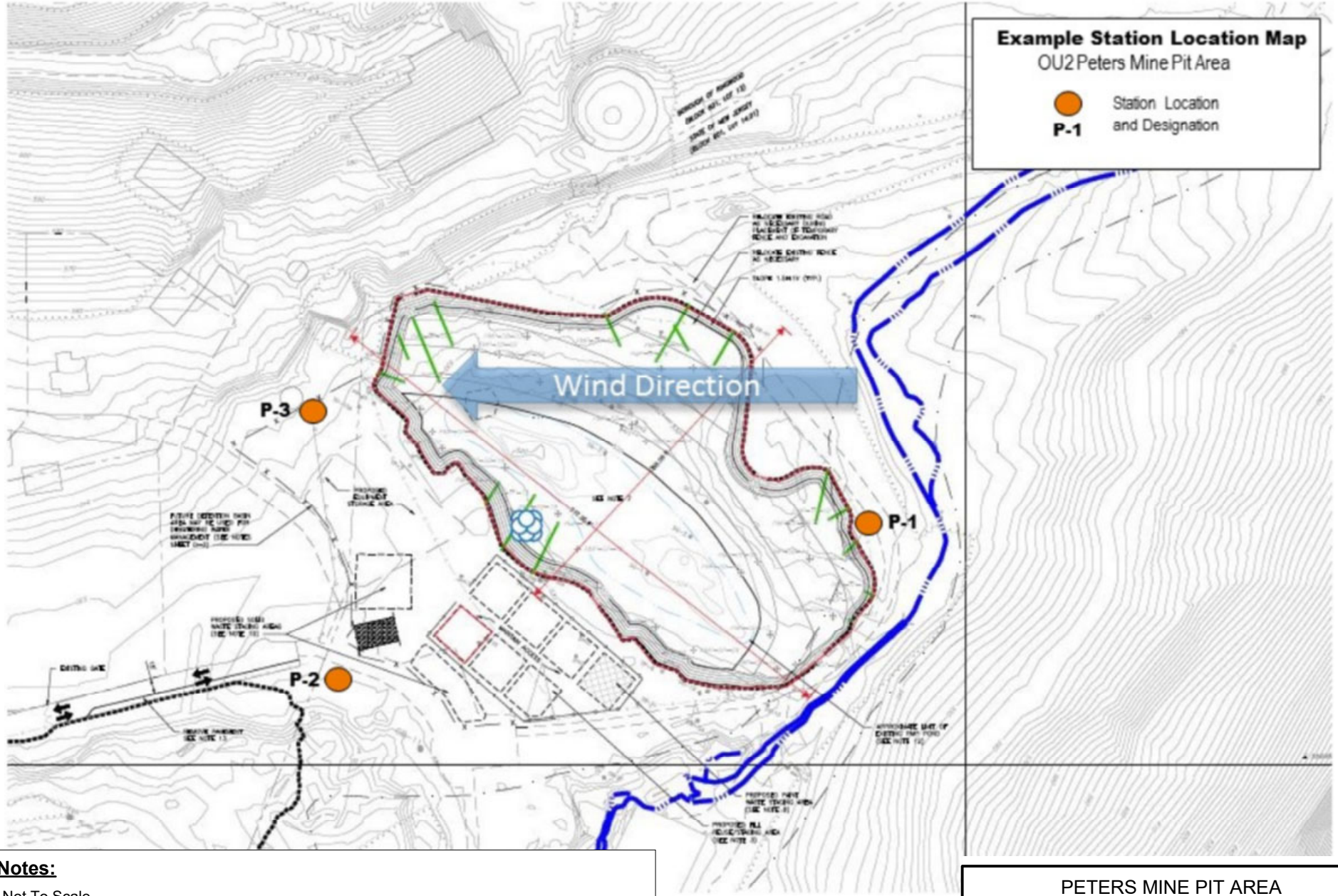
O'CONNOR DISPOSAL AREA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

EXAMPLE AIR MONITORING STATION LOCATION PLAN

Date: 12/06/20



Notes:

Not To Scale
Actual air monitoring stations will be field determined based on wind direction

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PETERS MINE PIT AREA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

EXAMPLE AIR MONITORING STATION LOCATION PLAN

Date: 12/06/20

Appendix E

Quality Assurance Project Plan (QAPP) (Prepared by Tetra Tech)

Ringwood Mines/Landfill Superfund Site Operable Unit Two

Quality Assurance Project Plan

Stockpile, Waste Sampling, Effluent and Groundwater Characterization

DECEMBER, 2020

PRESENTED TO

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#19 & 30: Sample Containers, Preservation, and Hold Times
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#21: Field SOPs
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#23: Analytical SOP's
#24: Analytical Instrument Calibration
#25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
#26 & 27: Sample Handling, Custody, and Disposal
#28: Analytical Quality Control and Corrective Action
#29: Project Documents and Records
#31, 32 & 33: Assessments and Corrective Action
#34: Data Verification and Validation Inputs
#35: Data Verification Procedures
#36: Data Validation Procedures
#37: Data Usability Assessment

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AC	Area of Concern
BGS	Below Ground Surface
CD	Consent Decree
Client	Ford Motor Company
CMP	Cannon Mine Pit
COC	Chain of Custody
FRDR	Final Remedial Design Report
ft	Feet
GC/MS	Gas Chromatography/Mass Spectrometry
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectrometry
IQAT	Independent Quality Assurance Team
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/A	Not Applicable
NJDEP	New Jersey Department of Environmental Protection
OCDA	O'Connor Disposal Area
OU2	Operable Unit 2
PAL	Project Action Limit
PMP	Peters Mine Pit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RAC	Remedial Action Contractor
RAWP	Remedial Action Work Plan
RECON	Remedial Construction Services, L.P.
Site	Ringwood Mines/Landfill Superfund Site
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure

Acronyms/Abbreviations	Definition
TIC	Tentatively Identified Compound
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 TITLE AND APPROVAL PAGE

QAPP Worksheet #1 & 2: Title and Approval Page

(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. Project Identifying Information
    a. Site Name: **Ringwood Mines/Landfill Superfund Site, Operable Unit 2 (OU2)**
    b. Site Location: **Ringwood, New Jersey**
    c. Contract/Work assignment number - **N/A**

2. Lead Organization:
    a. Lead Organization Project Manager: **Danielle Ondic, de maximis, Inc.**

    Signature Date

    b. Lead Organization Analytical Data Quality Manager: **Jim Tomalia, Cadena, Inc.**

    Signature Date

3. Federal Regulatory Agency: **Joseph A. Gowers, Remedial Project Manager, United States Environmental Protection Agency (USEPA)**

    Signature Date

4. State Regulatory Agency: **Kenneth Petrone, Case Manager, New Jersey Department of Environmental Protection (NJDEP)**

    Signature Date

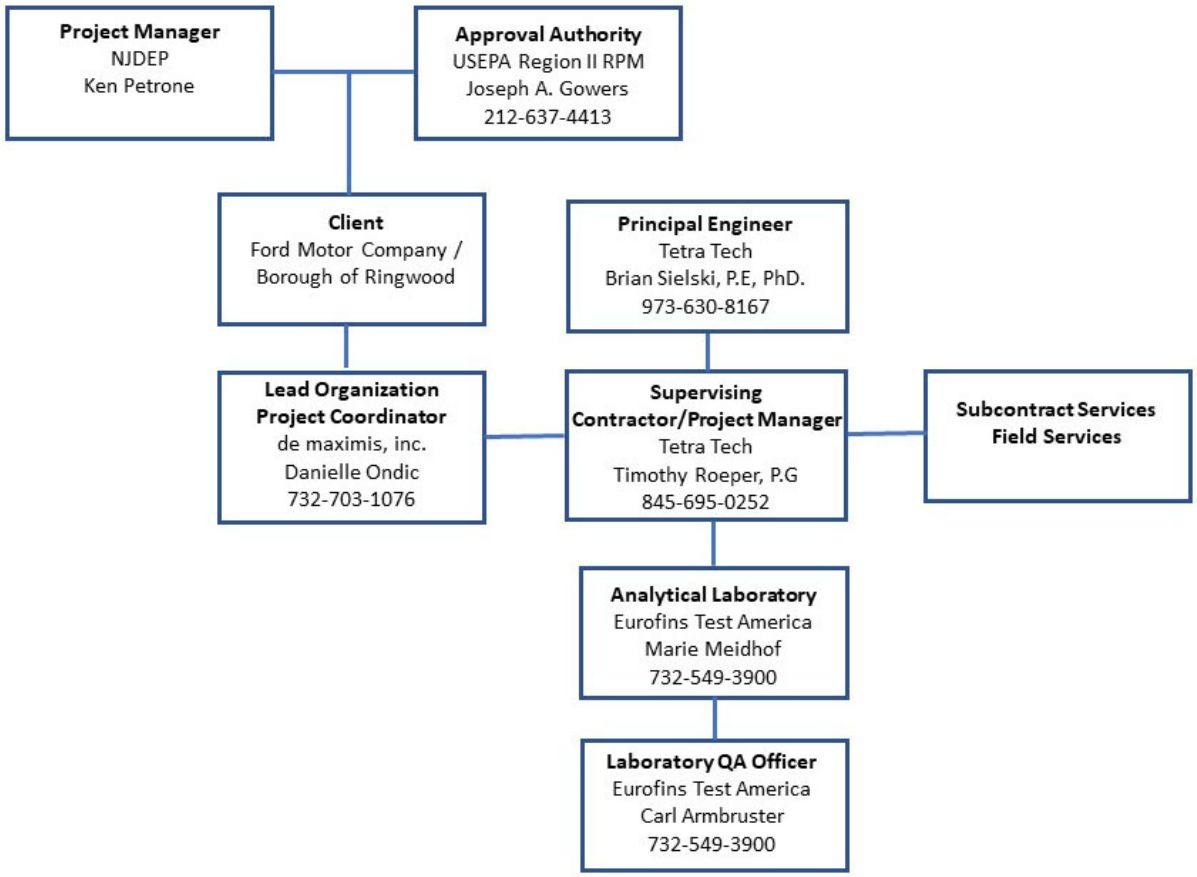
5. Other Stakeholders (as needed) – Not Applicable (**N/A)**

6. List plans and reports from previous investigations relevant to this project

    1. Final Remedial Design Report, Ringwood Mines/Landfill Superfund Site, Operable Unit 2, February 2017, revised October 2017.

2.0 PROJECT ORGANIZATION AND QAPP DISTRIBUTION

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)



*Organizational roles are for the implementation of the QAPP, for RA implementation see Figure 4-1 of the RAWP. All recipients noted within organizational chart will receive a copy of the QAPP.

3.0 PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: **USEPA**

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Joseph A. Gowers	Approval Authority			

ORGANIZATION: **de maximis, Inc.**

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Danielle Ondic	Assistant Project Coordinator	B.S. Chemical Engineering, B.A. Biochemistry, 20 years of Experience	Project Coordination-Superfund and Environmental Remediation	

ORGANIZATION: **Tetra Tech**

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Timothy Roeper	Construction Quality Assurance Manger	M.S. Geology, 38 years of experience	Hydrogeologic Investigations and contaminant transport	
Brian Sielski	Principal Engineer	Ph.D. Civil Engineering, 28 years of experience	Site Civil and Remediation	
Robert Schellberg	Independent Quality Assurance Team Official	B.S. Civil/Environmental Engineering 2 years of experience	Landfill Design, Permitting & Construction	

ORGANIZATION: **Remedial Construction Services, L.P. (RECON); Field Services**

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Brad Houston	Quality Control Manager/Project Engineer	4 years of experience	Civil Engineering	

ORGANIZATION: **Eurofins Test America**

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Marie Meidhof	Project Manager	30 years of experience	Environmental analytical assessment and monitoring	
Carl Armbruster	QA Officer	37 years of experience	Chemical analysis and data management	

*Signatures indicate personnel have read and agree to implement this QAPP as written

4.0 COMMUNICATION PATHWAYS

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathway, documentation, etc.)
Point of Contact with USEPA	de maximis	Danielle Ondic	732-703-1076	All materials and information about the project will be forwarded to Joseph A. Gowers (USEPA) by Danielle Ondic
Manage all Sampling Efforts	Tetra Tech	Timothy Roeper	845-695-0252	Tim Roeper will be the point of contact with Danielle Ondic for all aspects of the QAPP
Design Changes	Tetra Tech	Brian Sielski	973-630-8167	Changes or approval to engineering designs will be made by Brian Sielski
Quality Assurance Project Plan (QAPP) changes or unanticipated field conditions	Tetra Tech	Robert Schellberg	845-695-0209	Robert Schellberg will notify Tim Roeper by phone of required changes or difficulties. Tim Roeper will recommend changes and pursue approvals as needed.
Daily field sampling report	Tetra Tech	Robert Schellberg	845-695-0209	Update Brian Sielski of field sampling progress at end of each day via phone or email, as applicable
Lab data or sample receipt issues	Test America	Marie Meidhof	732-549-3900	Issues related to data quality, sample receipt, etc. will be reported to Tim Roeper
QAPP Amendments	USEPA	Joseph A. Gowers	212-637-4417	The use of alternative SOPs will be approved by Joseph A. Gowers prior to implementation.

5.0 PROJECT PLANNING SESSION SUMMARY

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Date of planning session: **September 25, 2020**
Location: **Tetra Tech, Middletown, New York Office**
Purpose: **Develop QAPP to discuss scope of work, including sampling protocols, frequency, and required analytical testing.**

Participants:

Name	Organization	Title/Role	Email/Phone
Timothy Roeper	Tetra Tech	Project Manager	845-695-0252
Robert Schellberg	Tetra Tech	Staff Engineer	845-695-0209
John Giuliano	Tetra Tech	Scientist	845-695-0222

Notes/Comments:

Consensus decisions made: **Prepare Draft QAPP to implement soil stockpile and waste characterization sampling and provide draft to USEPA for review. No project specific action levels or quality control required. Action levels will be based on published standards such as New Jersey Groundwater Quality Standards and laboratory quality control will be standard protocols and laboratory statistical control measures. Duplicates, equipment blanks and matrix spike samples not necessary for TCLP and RCRA characteristic testing based on historical data consistency. Duplicates not needed for effluent and groundwater samples based on historical consistency of groundwater data. Matrix spike samples will be collected for effluent and groundwater samples to confirm construction work has not altered matrix.**

Action Items:

Action	Responsible Party	Due Date
Complete QAPP	Tetra Tech	Est. December 18, 2020

6.0 CONCEPTUAL SITE MODEL

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

This QAPP has been prepared on behalf of Ford Motor Company (Client) for OU2 of the Ringwood Mines/Landfill Superfund Site (Site). OU2 for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area. The quality assurance (QA) and quality control (QC) activities included in this QAPP are associated with the OU2 Remedial Action (RA) as outlined in the Remedial Action Work Plan (RAWP).

The Site consists of approximately 500 acres in a historic iron mining district that includes forested areas, areas of overgrown vegetation, abandoned iron mine pits and shafts, and a closed municipal landfill. Portions of the Site are currently used as State of New Jersey parklands (Ringwood State Park), utility corridors for the Public Service Electric & Gas and the Rockland Electric Company, Borough of Ringwood facilities, including a Recycling Center and a Public Works yard and open space. In addition, 48 residential properties are dispersed throughout the Site. The following is summarized from the Remedial Investigation Reports prepared by Arcadis.

The land which comprises the Site has been utilized for the mining of iron ore almost continuously from the mid-1700s to the early 1900s. There are a number of former mine workings at the Site, which include former open pits that are now filled, closed shafts and tunnels, and prospect diggings. The former mining operations resulted in the disposal of mine tailings and mine waste rock in the CMP and PMP Areas. Part of the former OCDA was used as a "slime" tailings disposal area prior to being used for the placement of waste materials.

This QAPP specifically address proposed remediation activities within the PMP area. The PMP Area is located in the north central portion of the Site as shown in Figure 1. This area encompasses approximately three acres and is located such that the majority of the area is within Ringwood State Park and the balance is located on Borough of Ringwood property. An approximately one-half acre pond, an expression of the groundwater table, is located within the approximate center of the PMP Area where a former soil cap has subsided thus enabling the pond to form. The PMP Area is otherwise forested and overgrown with vegetation.

Groundwater at the Site occurs in the overburden and bedrock, more specifically, overburden/shallow bedrock (upper aquifer) and the deep bedrock (lower aquifer). The upper aquifer exists on the order of tens to hundreds of feet below the site and the lower aquifer exists on the order of hundreds to perhaps thousands of feet below the site. The transition from the upper to lower aquifer is gradual and the connectivity between the two is limited due to poor vertical permeability.

The direction of groundwater flow in the lower and upper aquifers of the PMP is generally to the southeast. Groundwater in the upper aquifer discharges to streams creating baseflow in the perennial streams. Surface water within the streams ultimately discharges into the Wanaque Reservoir, located approximately one mile from the confluence of Park Brook, North Brook, Mine Brook and the Ringwood River.

The remedial action specifies the in-situ soils may be reused after excavation if they are determined to be non-hazardous per RCRA standards. The Chemicals of Potential Concern (COPCs) that will be tested are outlined in Worksheet #15.

The remedy for the PMP Area (Figure 2) as defined by USEPA in the Record of Decision is briefly summarized as follows:

- Excavation of soil and fill to the water table, unless drums and paint waste are found to extend below the water table and can be removed, in which case, excavation will also include such materials;
- Segregation of excavated materials for re-use or off-site disposal based on the nature of the materials and the results of laboratory analyses, as applicable;
- Placement of compacted fill to achieve grades above the water table and provide overall grading of the area as necessary for Engineering Cap construction;
- Installation of an Engineered Geotextile/Soil Cap as an Engineering Control and restoration with indigenous vegetation consistent with Ringwood State Park; and
- Institutional Controls and long-term monitoring, maintenance, and reporting.

7.0 PROJECT/DATA QUALITY OBJECTIVES

QAPP Worksheet #11: Project/Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

1. The Problem. Mine tailings and historical waste have been dumped in the ACs contributing to soil and groundwater contamination.
2. Goal of the Study. The OU2 ROD calls for excavation of soil and fill to the water table to consolidate fill/waste materials, remove impacted soil and/or waste if identified and place compacted fill in the area, which ultimately will receive an engineered geotextile/soil cap. Analytical data collected under this QAPP will be used to determine if the excavated material may be re-used on Site or transported off Site for disposal.

   In addition, groundwater extraction from the remedial excavations may be required for the removal of drums and/or paint wastes (if found) below the groundwater table. The extracted groundwater will be treated and discharged to infiltration pits. As required by the discharge permits, if the water is discharged to infiltration pits outside of the excavation area, then effluent, hydraulic and groundwater quality monitoring will be required at identified monitoring wells upgradient and downgradient of the infiltration pits or stormwater basin.
3. Information inputs. Based on the remedial investigation which included soil and groundwater sampling, subsurface conditions and limits of impacted material to the extent possible have been defined. Excavation during the soil removal process may uncover unknown buried materials which will be sampled and characterized for proper disposal.
4. Boundaries of the Study. The work is proposed to occur within the PMP Area as shown on Figure 2.
5. Analytic Approach. Soil and drums/paint waste (if encountered) samples will be analyzed for ignitability, corrosivity, reactivity, and Toxicity Characteristic Leaching Procedure (TCLP) Metals. Monitoring wells OB-30A and OB-30B will be sampled for lead and total arsenic, Target Compound List (TCL) Volatile Organic Compounds (VOCs) plus 15 Tentatively Identified Compounds (TICs), TCL Semi-Volatile Organic Compounds (SVOCs) plus 15 TICs and 1,4-dioxane if hydraulic monitoring results indicate mounding is occurring at downgradient well OB-30A as a result of the discharge to the stormwater basin (i.e. outside the excavation limits). Background groundwater elevations will be monitored in upgradient well OB-21 to confirm elevation changes from precipitation. In addition, if the effluent quality of the discharge water exceeds groundwater quality standards, OB-30A and OB-30B will be sampled as well.
6. Performance or Acceptance Criteria. The results of the soil/waste sampling will be compared to RCRA standards for Hazardous Material. See Worksheet 37 – Step 5 for additional details. Analytical detection limits must be equal to or lower than the corresponding RCRA standards and meet applicable QA/QC criteria as defined herein. Results of effluent and groundwater sampling will be compared to groundwater quality standards such that analytical detection limits must be equal to or lower than the corresponding groundwater quality standard and applicable QA/QC criteria.

7. Plan for obtaining the data. Samples will be collected from stockpiled material from the excavation work. One sample per every 680 cubic yards is required per the NJDEP Fill Material Guidance for SRP Sites in the Recommended Sampling Frequency Guide for Alternative Fill. To meet this requirement excavated material will be stockpiled in approximate 500 cubic yard lots. This increased sample frequency will provide adequate samples for characterization. In addition, if drums or paint waste material is discovered, that material will be segregated and placed on/covered with plastic sheeting pending characterization for off-site disposal. Results will be requested with a turnaround time of 3-4 days. Based on longer method requirements for TCLP Metals this is the quickest turnaround time the laboratory can provide.

   Effluent water quality data will be collected from the effluent discharge every 10 days of treatment system operation, if discharging outside the excavation area. If the effluent water quality exceeds the permit requirements than monthly groundwater samples will be collected from OB-30A and OB-30B using low flow methods.

   Transducers will be deployed in wells OB-30A and OB-21 prior to commencing groundwater discharge outside the excavation area (if required), in order to monitor the groundwater elevations, as required by the discharge permits. Starting 60 days after the beginning of the discharge, data from the transducers will be reviewed every two weeks to determine if a rise in groundwater elevations have occurred as a result of the discharge. If groundwater is discharged outside the excavation area and a rise in water level greater than 0.25 feet in OB-30A is realized, then groundwater samples will be collected from OB-30A and OB-30B using low flow methods.

8.0 MEASUREMENT PERFORMANCE CRITERIA

QAPP Worksheet #12: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix: **Soil/Waste**

Analytical Group or Method: **TCLP Metals (**6010D/3010A/1311; 7470A/1311) **and RCRA Characteristics (1030,9045D,9014,9034)**

Concentration Level: **low to medium**

Parameter	Data Quality Indicator (DQI)	QC Sample or Measurement Performance Criteria	Measurement Performance Criteria
TCLP Metals	Analytical Precision	Laboratory Control Sample	80 –– 120%R
	Analytical Accuracy	Laboratory Control Sample Duplicate	RPD ≤ 25%
	Completeness	See Worksheet #34	See Worksheet #34
Corrosivity	Analytical Precision	Laboratory Control Sample	95 – 105%R
	Completeness	See Worksheet #34	See Worksheet #34
Cyanide, Reactive	Analytical Precision	Laboratory Control Sample	10 - 100%R
	Completeness	See Worksheet #34	See Worksheet #34
Sulfide, Reactive	Analytical Precision	Laboratory Control Sample	38 - 149%R
	Completeness	See Worksheet #34	See Worksheet #34
Ignitability - Burn Rate	Analytical Precision	Laboratory Control Sample	N/A
	Completeness	See Worksheet #34	See Worksheet #34

Matrix: **Groundwater/Effluent**

Analytical Group or Method: **TCL VOCs+15TICs (8260C), TCL SVOCs+15TICs (8270D), 1,4-Dioxane (8270D), Arsenic (6020B), and Lead (7470A)**

Concentration Level: **low to medium**

Parameter	Data Quality Indicator (DQI)	QC Sample or Measurement Performance Criteria	Measurement Performance Criteria
TCL VOC	Precision	Matrix Spike (MS)/Matrix Spike Duplicate (MSD)	Standard Laboratory Statistical Limits
	Accuracy-Laboratory	Laboratory Control Sample	Standard Laboratory Statistical Limits

	Accuracy-Contamination	Method Blank, Trip Blank, Field Blank	<Reporting Limit
TCL SVOC	Precision	MS/MSD	Standard Laboratory Statistical Limits
	Accuracy-Laboratory	Laboratory Control Sample	Standard Laboratory Statistical Limits
	Accuracy-Contamination	Method Blank, Field Blank	<Reporting Limit
1,4-Dioxane	Precision	MS/MSD	Standard Laboratory Statistical Limits
	Accuracy-Laboratory	Laboratory Control Sample	Standard Laboratory Statistical Limits
	Accuracy-Contamination	Field Blank	< Reporting Limit
Arsenic	Precision	MS/MSD	</=20% RPD/75 – 125%
	Accuracy-Laboratory	Laboratory Control Sample	80 - 120
	Accuracy-Contamination	Field Blank	<Reporting Limit
Lead	Precision	MS/MSD	</=20% RPD/75 – 125%
	Accuracy-Laboratory	Laboratory Control Sample	80 - 120
	Accuracy-Contamination	Field Blank	<Reporting Limit

9.0 SECONDARY DATA USES AND LIMITATIONS

APP Worksheet #13: Secondary Data Uses and Limitations
(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Data Type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Soil existing conditions	Final Remedial Design Report (FRDR)	Compare data to previous historical results to confirm known contaminants and concentration levels	Recognition of different sampling methodologies and depth of sample collection from the stockpile
Groundwater Quality	FRDR, Historical Groundwater Reports	Compare data to previous historical results to confirm known contaminants and concentration levels	Potential improper sampling techniques and sample collection depth

10.0 PROJECT TASKS AND SCHEDULE

QAPP Worksheet #14/16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible party	Planned start date	Planned completion date	Deliverable(s)	Deliverable due date
Stockpile and waste sampling	Remedial Action Contractor (RAC)	Spring 2021	Fall 2022	Field and Data summary	Immediately upon receipt of data from lab
Effluent and Groundwater Sampling	RAC	Spring 2021	Fall 2022	Field and Data summary	Immediately upon receipt of data from lab
Analytical Data	Eurofins Test America	Spring 2021	Fall 2022	Full Data package	Within 3-5 days of sample receipt

11.0 PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: **Soil/Waste**
Analytical Method: **TCLP Metals and RCRA characteristics**
Concentration level (if applicable): **low to medium**

Analyte	Project Action Limit (PAL)	PAL Reference	Project Quantitation Limit Goal	Laboratory-specific quantitation limit	Laboratory-specific detection limit
Silver	5.0 mg/L	40 CFR 261.24	0.01 mg/L	0.01 mg/L	0.00578 mg/L
Arsenic	5.0 mg/L	40 CFR 261.24	0.015 mg/L	0.015 mg/L	0.00333 mg/L
Barium	100.0 mg/L	40 CFR 261.24	0.20 mg/L	0.20 mg/L	0.0132 mg/L
Cadmium	1.0 mg/L	40 CFR 261.24	0.004 mg/L	0.004 mg/L	0.000327 mg/L
Chromium	5.0 mg/L	40 CFR 261.24	0.01 mg/L	0.01 mg/L	0.00498 mg/L
Lead	5.0 mg/L	40 CFR 261.24	0.01 mg/L	0.01 mg/L	0.00234 mg/L
Selenium	1.0 mg/L	40 CFR 261.24	0.02 mg/L	0.02 mg/L	0.00588 mg/L
Mercury	0.2 mg/L	40 CFR 261.24	0.0002 mg/L	0.0002 mg/L	0.0000910 mg/L
Corrosivity	pH <2,>12.5	40 CFR 261.22	0.1 SU	0.1 SU	N/A
Cyanide, Reactive	Non-Reactive	40 CFR 261.23	25 mg/kg	25 mg/kg	N/A
Sulfide, Reactive	Non-Reactive	40 CFR 261.23	20 mg/kg	20 mg/kg	11.3 mg/kg
Ignitability - Burn Rate	Flash point less than 60 C (140 F)	40 CFR 261.21	2.2 mm/sec	2.2 mm/sec	N/A

Matrix: **Groundwater/Effluent**

Analytical Method: **VOCs, SVOCs, 1,4-Dioxane, Arsenic, and Lead**

Concentration level (if applicable): **low to medium**

Analyte	PAL*	PAL Reference	Project Quantitation Limit Goal*	Laboratory-specific quantitation limit	Laboratory-specific detection limit
VOC	Higher of PQL or NJDEP GWQS	NJDEP GWQS	PQL Level noted in NJDEP GWQS	See attached table in Attachment A	See attached table in Attachment A
SVOC	Higher of PQL or NJDEP GWQS	NJDEP GWQS	PQL Level noted in NJDEP GWQS	See attached table in Attachment A	See attached table in Attachment A
1,4-Dioxane	Higher of PQL or NJDEP GWQS	NJDEP GWQS	PQL Level noted in NJDEP GWQS	See attached table in Attachment A	See attached table in Attachment A
Arsenic	Higher of PQL or NJDEP GWQS	NJDEP GWQS	PQL Level noted in NJDEP GWQS	See attached table in Attachment A	See attached table in Attachment A
Lead	Higher of PQL or NJDEP GWQS	NJDEP GWQS	PQL Level noted in NJDEP GWQS	See attached table in Attachment A	See attached table in Attachment A

*See Attachment A for list of all Analyte and NJDEP GWQS.

12.0 SAMPLING DESIGN AND RATIONALE

QAPP Worksheet #17: Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

1. The PMP area is the only area of the Site where excavated soils/waste will require testing to determine if the materials can be reused or transported off Site for disposal. The location is presented on Figure 2. Sampling will be conducted as needed to meet the following objectives:
    a. Soil Reuse: Determine if soils can be reused at the site or if they need to be transported off-Site for disposal (see below).
    b. Soil/Waste for Disposal: Determine waste characteristics for disposal purposes.
    c. Water Treatment Discharge: If excavation dewatering is discharged outside the excavation area effluent and hydraulic monitoring is required.
    d. Groundwater Sampling: If the monitoring referenced in C. above indicates the change in water elevation between upgradient and downgradient wells is greater than 6" or the effluent quality exceeds groundwater quality standards, then sampling of monitoring wells OB-30A and OB-30B will be required to monitor groundwater quality downgradient of the discharge point.
2. Work is anticipated to commence in Spring 2021 and conclude in 2022.
3. Samples will be collected from the PMP site only. The soil samples will be collected and sent to Eurofins/Test America Labs for analysis of TCLP Metals, ignitability, reactivity, and corrosivity. Groundwater and Effluent samples, if required, will be analyzed for TCL VOCs +15TICs, SVOCs+15TICs, 1,4-Dioxane, Arsenic, and Lead.
4. Approximately 28,000 cubic yards of material is expected to be excavated from the PMP Area. Per Recommended Sampling Frequency Guide for Alternative Fill, 41 samples would be required. To provide adequate sampling frequency, stockpiled material will be placed in approximate 500 cubic yard lots, with 1 composite sample collected per lot. To ensure adequate characterization of the stockpile, representative material will be collected for every 100 cubic yards of material placed in the pile and composited into 1 final sample for shipment to lab. Material will be collected biased towards areas of potential contamination. If drums or paint waste are discovered during excavation, a characteristic sample will be collected. In the event that Groundwater quality is impacted by the discharge to groundwater outside the excavation area Groundwater samples will be collected monthly until exceedances are no longer detected above background or natural conditions. Effluent samples will be collected every 10 days of discharge outside the excavation area.
5. Stockpiles will be clearly identified and segregated onsite. Water samples will be identified as effluent (EFF) and the date collected (as required by discharge permits), while collected groundwater samples, as required by the discharge permits, will be identified by well location (i.e., OB-30A and OB-30B) and date.
6. In the event field conditions change, and impacted soils are clearly identified during excavation, smaller stockpiles or more frequent sampling may be required to delineate materials.

13.0 SAMPLING LOCATIONS AND METHODS

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.1 and 2.3.2)

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP
SP-1-2020XXXX	S	From Stockpile	Composite	TCLP Metals and characteristics	SOPs S-1 and S-6
Drum-1-2020XXXX	TBD	N/A	Grab	TCLP Metals and characteristics	SOPs S-1 and S-6
OB-30A-2020XXXX	GW	14	Grab	TCL VOCs+15TICs, TCL SVOCs+15TICs, 1,4-Dioxane, As, Pb	SOPs S-2, 3, 4, 5, and 6
OB-30B-2020XXXX	GW	30	Grab	TCL VOCs+15TICs, TCL SVOCs+15TICs, 1,4-Dioxane, As, Pb	SOPs S-2, 3, 4, 5, and 6
EFF-2020XXXX	W	N/A	Grab	TCL VOCs+15TICs, TCL SVOCs+15TICs, 1,4-Dioxane, As, Pb	SOPs S-2 and S-6

[1] Key: S = soil, SD = sediment, GW = groundwater, W = effluent water, TBD = To Be Determined

BGS – Below Ground Surface

XXXX – month and day of sampling (e.g., 20201101 represents November 1, 2020)

SP-1 – Stockpile 1, number to be updated for each pile sampled

Drum-1 – number to be updated for each drum sampled

14.0 SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory (Name, sample receipt address, POC, e-mail, and phone numbers): **Eurofins Test America, 777 New Durham Rd, Edison, NJ 08817, Marie Meidhof,** marie.meidhof@eurofinset.com**, 732-593-2554**

List any required accreditations/certifications: **NJDEP(NELAP) #12028**

Back-up Laboratory: **None**

Sample Delivery Method: **Test America Courier service**

Analyte/ Analyte Group	Matrix	Method/SOP	Accreditation Expiration Date	Container (number, size, and type per sample)	Preservation	Preparation Holding Times	Analytical Holding Time	Data Package Turn-around
TCLP Metals	Soil	6010D/3010A /1311; 7470A/1311. 6010D: ED-MT-004, R 14;ED-MTP-003, R 12; ED-ORP-038, R 12. 7470A: ED-MT-017, R 12.	12028; 6/30/2021	(1) 4 oz glass	Unpreserved	Mercury – 28 days from collection to leach; ICP metals @ 6 months	28 days; 6 months	3-5 Days
Ignitability	Soil	1030. ED-WET-059, R 9	12028; 6/30/2021	(1) 4 oz glass	Unpreserved	N/A	None	3-5 Days
Corrosivity	Soil	9045D. ED- WET-061, R 11.	12028; 6/30/2021	(1) 4 oz glass	Unpreserved	N/A	Upon Receipt	3-5 Days
Reactivity	Soil	9014 and 9034.	N/A	(1) 4 oz glass	Unpreserved	N/A	14 days from	3-5 Days

		ED-WET-001, R9; ED-WET-070, R 7					collection to analysis	
Arsenic/ Lead	GW	6020B/7470A ED-MT-004, R 14	#12028 6/30/2021	(1) 250 ml plastic	HNO3 to pH less than 2; cool to 2-6 °C (aka 4±2 °C)	7470A – 28 days from collection; 6020B – 180 days from date of collection	7470A – 28 days from collection; 6020B – 180 days from collection	Standard 10 business days
TCL VOCs + 15 TICs	GW	8260C ED-MSV-014, Rev 8	#12028 6/30/2021	(3) 40 ml glass vials	HCL, pH<2; cool 2-4 °C	Immediately upon sample collection	14 days preserved, 7 days unpreserved	Standard 10 business days
TCL SVOCs + 15 TICs	GW	8270D ED-MSS-009, Rev 8	#12028 6/30/2021	(2) 250 ml glass bottles	None, 4±2 °C	7 calendar days from collection to extraction	40 days from extraction to analysis	Standard 10 business days
1,4-Dioxane	GW	8270D ED-MSS-009, Rev 8	#12028 6/30/2021	(2) 250 ml glass bottles	None, 4±2 °C	7 calendar days from collection to extraction	40 days from extraction to analysis	Standard 10 business days

15.0 FIELD QC SUMMARY

QAPP Worksheet #20: Field QC Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Matrix	Analyte/ Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Field Blanks	Equipment Blanks	Trip Blanks	Other	Total # analyses
Soil	TCLP Metals and characteristics	41	0	0	0	0	0	0	N/A	43
Drums	TCLP Metals and characteristics	TBD	0	0	0	0	0	0	N/A	TBD
GW	VOCs,SVOCs, 1,4-Dioxane, As, Pb	TBD	0	TBD	TBD	0	TBD	TBD	N/A	TBD
Effluent	VOCs,SVOCs, 1,4-Dioxane, As, Pb	TBD	0	TBD	TBD	0	0	TBD	N/A	TBD

Soil

- Sample totals subject to change based on quantity of material excavated

Total analyses will be determined based on the total volume of material excavated. Per the field procedure, 1 sample per 500 cubic yards of excavated material will be collected for analysis. Drums, if discovered during excavation will have 1 sample per drum collected and analyzed.

Groundwater and Effluent

- Effluent sampling only required if discharge outside of excavation area. Groundwater sampling only required if a) discharge is outside excavation area and b) effluent concentrations exceed NJGWQS or hydraulic monitoring indicates increase in water levels > 6" not attributable to regional changes due to precipitation. Number of samples, if required, will be dependant on above conditions and duration of dewatering activities.

16.0 FIELD STANDARD OPERATING PROCEDURES (SOPs)

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

SOP # or reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
S-1	Stockpile and Drum Sampling December 2020	Tetra Tech	Only 1 option	Yes	Editorial edits to focus on specific project
S-2	Groundwater/Effluent Sampling December 2020	Tetra Tech	Only 1 option	No	
S-3	Decontamination December 2020	Tetra Tech	Only 1 option	No	
S-4	Field Instrument and Equipment Maintenance and Calibration December 2020	Tetra Tech	Only 1 option	No	
S-5	Water Level Meter: Op Instructions 7/6/2009	Solinst	Only 1 option	No	
S-6	Sample Handling and Custody December 2020	Tetra Tech	Only 1 option	No	

17.0 FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

Field Equipment	Activity	SOP Reference	Title or position of responsible person	Frequency	Acceptance Criteria	Corrective Action
Horiba U-52	Auto calibrate for pH, temp, SC, DO, and Turbidity. Manual calibration for ORP	S-4	Field Technician	Daily	No error messages are present	Recalibrate, follow trouble shooting guidance in manaul
Bladder Pump and associated equipment	Visually inspect for excessive wear and test operation.	S-4	Field Technician	Daily	Equipment properly cleaned and decontaminated	Decontaminate, replace bladders, face plate and o-rings as needed
Solinst 101	Visually inspect for excessive wear and test operation	S-4, S-5	Field Technician	Daily	Light and buzzer activate	Replace batteries or unit as needed

18.0 ANALYTICAL SOPs

QAPP Worksheet #23: Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	Modified for Project? Y/N
L-1	Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by SW846 Method 6010D; SOP No. ED-MT-004; Rev. 14; 04/25/2020	Definitive	TCLP Metals	Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES)	No
L-2	Digestion of Water and Wastewater Samples for Analysis by ICP and ICP-MS, SW846 Method 3010A; SOP No. ED-MTP-003; Rev. 12; 10/7/2020	Definitive	Metals	Block Digestor	No
L-3	TCLP LEACH Extraction Procedure using the Toxicity Characteristics Leaching Procedure by SW846 1311; SOP No. ED-ORP-038; Rev. 12; 04/11/2019	Definitive	TCLP Metals	See SOP 3 – TCLP Non-Volatile	No
L-4	Mercury Analysis for Water and Wastewater using EPA 245.1 and SW846 7470A; Mercury in Drinking Water using EPA 245.1; Leeman Mercury Analyzer (Cold Vapor Technique); SOP No. ED-MT-017; Rev. 12; 08/03/2020	Definitive	Mercury	Leeman Mercury Analyzer	No
L-5	Ignitability, Powder Train Method for Determining the Ignitability of Solid Samples by Method SW846 1030; SOP No. ED-WET-059; Rev. 9; 06/28/2019	Definitive	Ignitability	Ceramic tile	No
L-6	Cyanide Reactivity using SW846 Method No. Vol. 1c 7.3.3 and SW846 9014; SOP No. ED-WET-001; Rev. 9; 6/17/2020	Definitive	Cyanide Reactivity	None	No

L-7	Analysis of Sulfide Reactivity by Method SW846 Sec 7.3.4.2; SOP No. ED-WET-070; Rev. 7; 12/12/2019	Definitive	Sulfide Reactivity	None	No
L-8	Analysis of pH for Soils and Organic Samples Determined Electrochemically by Method SW-846 9045D; SOP No. ED-WET-061; Rev. 11; 06/29/2020	Definitive	pH (Corrosivity)	pH meter	No
L-9	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) by SW846 Methods 8260C and 8260D; SOP No. ED-MSV-014; Rev. 8; 07/26/2020	Definitive	TCL VOCs + 15 TICs	GC/MS	No
L-10	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), SW846 Methods 8270D and 8270E; SOP No. ED-MSS-009; Rev. 8; 06/29/2020	Definitive	TCL SVOCs + 15 TICs; 1,4-Dioxane	GC/MS	No
L-11	Maintaining Sample Chain of Custody; SOP No. ED-SPM-005; Rev. 7; 07/08/2014	N/A	All	N/A	No

19.0 ANALYTICAL INSTRUMENT CALIBRATION

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
ICP	See SOP L-1 (ICV, CCV)	Within 10% of the true value and the replicate measurements must be less than 5% RSD	Every 10 samples and at the end of the analysis run	Within standards identified in SOP	Inspect, determine problem and/or clean, re-run calibration samples and any affected samples	Carl Armbruster, Laboratory QA Officer, Eurofins Test America	L-1
Leeman Mercury Analyzer	See SOP L-4	See SOP L-4 section 10.2	Daily or once every 24 hours and each time instrument is set up	Calibration curve must be great than or equal to 0.995	Inspect, determine problem and/or clean, re-run calibration samples and any affected samples	Carl Armbruster, Laboratory QA Officer, Eurofins Test America	L-4
Ceramic Tile	See SOP L-5	Burn rate less than 2.2 mm/sec	Each time a sample is analyzed	Burn rate less than 2.2 mm/sec	Check airflow and correct particle size, rerun test	Carl Armbruster, Laboratory QA Officer, Eurofins Test America	L-5
pH meter	See SOP L-8	0-14	Before analysis; anytime anomaly suspected	Within range of calibration solutions (±0.01 SU)	Recalibrate meter within different range closer to expected pH of sample	Carl Armbruster, Laboratory QA Officer, Eurofins Test America	L-8

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
GC/MS	See L-9 and L-10	Varies - See SOP L-9, L-10	Initial and every 12 hours	Within standards identified in SOP	Inspect, determine problem and/or clean, re-run calibration samples and any affected samples	Carl Armbruster, Laboratory QA Officer, Eurofins Test America	L-9 and L-10

20.0 ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTNENACE, TESTING, AND INSPECTION

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

See Laboratory QA Manual (L-12) ED-QA-LQM, Rev. No 18 08/01/2020

21.0 SAMPLE HANDLING, CUSTODY, AND DISPOSAL

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Sampling Organization: **RECON**

Laboratory: **Eurofins Test America**

Method of sample delivery (shipper/carrier): **RECON to deliver or pickup by Eurofins Test America Courier**

Number of days from reporting until sample disposal: **28 days**

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	RECON	S-6
Chain-of-custody form completion	RECON/Eurofins Test America	S-6, L-11
Packaging	RECON	S-6
Shipping coordination	RECON	S-6
Sample receipt, inspection, & log-in	Eurofins Test America	L-11
Sample custody and storage	Eurofins Test America	L-11
Sample disposal	Eurofins Test America	L-11

22.0 ANALYTICAL QUALITY CONTROL AND CORRECTIVE ACTION

QAPP Worksheet #28: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix: **Soil/Waste**
Analytical Group: **TCLP Metals and RCRA Characteristics**
Analytical Method/SOP: **L-1 through L-8**

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC*
Laboratory Control Sample	1 in 20 samples or per batch	80 – 120%	Determine problem, recalibrate	Carl Armbruster	Not Applicable
Matrix Spike	1 in 20 samples or per batch	75 - 125%	Determine problem, recalibrate.	Carl Armbruster	Not Applicable
Matrix Duplicate	1 in 20 samples or per batch	If original sample and dup are both ≥ 5X RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise ±RL.	Determine problem, recalibrate.	Carl Armbruster	Not Applicable
Method Blank	1 in 20 samples or per batch	<1/2 the RL or <10% of the measured concentration in the sample	Determine problem, recalibrate.	Carl Armbruster	Not Applicable
Post Digestion Spike	1 in 20 samples or per batch	75 – 125%	Determine problem, recalibrate.	Carl Armbruster	Not Applicable
Serial Dilution	1 in 20 samples or per batch	See Lab SOP-1	Determine problem, recalibrate.	Carl Armbruster	Not Applicable

* There are no project specific performance criteria. All work will be completed in accordance with standard laboratory quality control performance standards and acceptance criteria.

Matrix: **Groundwater/Effluent**
Analytical Group: **TCL VOCs+15TICs, TCL SVOCs+15TICs, 1,4-Dioxane, Arsenic, and Lead**
Analytical Method: **L-9, L-10, L-1**

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC*
Method Blank	1 in 20 samples	No detectable compounds	Review and revise equipment handling and decontamination procedures	Carl Armbruster	Not Applicable
Laboratory Control Sample	1 in 20 samples	Within Statistical Control Limits Worksheet 12	Determine problem, recalibrate	Carl Armbruster	Not Applicable
Matrix Spike	1 in 20 samples	Within Statistical Control Limits	Determine problem, recalibrate	Carl Armbruster	Not Applicable
Matrix Spike Duplicate	1 in 20 samples	Within Statistical Control Limits	Determine problem, recalibrate	Carl Armbruster	Not Applicable
Surrogate Spike	1 in 20 samples	Within Statistical Control Limits	Determine problem, recalibrate.	Carl Armbruster	Not Applicable
Internal Standards	All Standard Samples	Response within -50% to +100% of CCV	Determine problem, recalibrate	Carl Armbruster	Not Applicable

* There are no project specific performance criteria. All work will be completed in accordance with standard laboratory quality control performance standards and acceptance criteria

23.0 PROJECT DOCUMENTS AND RECORDS

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Sample Collection and Field Records

Record	Generation	Verification	Storage location/archival
Field data sheets	RECON, Sampler	Tetra Tech, Robert Schellberg, IQAT Official	Tetra Tech Office
Chain-of-Custody Forms	RECON, Sampler	Tetra Tech, Robert Schellberg, IQAT Official	Tetra Tech Office
Daily Construction Reports/CQA Forms/Photos	Tetra Tech - IQAT	Tetra Tech, Brian Sielski Project Engineer	Tetra Tech Office

Project Assessments

Record	Generation	Verification	Storage location/archival
Field audit checklist	Robert Schellberg	Tim Roeper	Tetra Tech Office

Laboratory Records

Record	Generation	Verification	Storage location/archival
Laboratory Report	Marie Meidhof	Carl Armbruster	Eurofins Test America

Laboratory Data Deliverables

Record	TCLP Metals	Reactivity	Corrosivity	Ignitability	VOCs	SVOCs	As, Pb	1,4-D
Narrative	X	X	X	X	X	X	X	X
COC	X	X	X	X	X	X	X	X
Summary Results	X	X	X	X	X	X	X	X
QC Results	X	X	X	X	X	X	X	X
EDD	X	X	X	X	X	X	X	X

24.0 ASSESSMENTS AND CORRECTIVE ACTION

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5

Assessments:

Assessment Type	Responsible Party & Organization	Number/Frequency	Estimated Dates	Assessment Deliverable	Deliverable due date
Field Sampling Audit	Tetra Tech – Robert Schellberg	1/at project start up	Spring 2021	Audit Memo	Summer 2021

Assessment Response and Corrective Action:

Assessment Type	Responsibility for responding to assessment findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for monitoring Corrective Action implementation
Field Sampling Audit	RECON	Field sampling corrective action and response	24 hours from receipt of Audit	As directed by data reviewer	Tetra Tech, IQAT Official

25.0 DATA VERIFICATION AND VALIDATION INPUTS

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
3	Field SOPs	X	
4	Laboratory SOPs	X	
Field Records			
5	Field logbook	X	X
6	Chain of Custody	X	X
7	Field Audit Reports	X	X
8	Field Corrective Action Reports	X	X
Analytical Data Package			
9	Case Narrative	X	X
10	Internal laboratory COC	X	X
11	Sample receipt records	X	X
12	Instrument calibration records	X	X
13	Definition of laboratory qualifiers	X	X
14	Results reporting forms	X	X
15	QC sample results	X	X
16	Electronic data deliverable	X	X

26.0 DATA VERIFICATION PROCEDURES

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Chain of Custody (COC)	SOP S-6; SOP L-11	Verify COC completely and accurately filled out, contents of cooler/shipping container match COC, COC signed by sampling team. Maintain copy of COC for files. Complete prior to transfer of samples to courier	Brad Houston, QC Manager/Project Engineer, RECON
Field Notes	Field Records	Verify field notes are complete for each sampling location and at a minimum include date, location ID, and time of sample. Complete following collection of samples.	Brad Houston, QC Manager/Project Engineer, RECON
Analytical Data Package	SOP L-1 through L-11	Verify that the required reporting elements and supporting documentation are included in the final data package. Complete before data package is released.	Carl Armbruster, QA Officer, Eurofins Test America Robert Schellberg, Tetra Tech

27.0 DATA VALIDATION PROCEDURES

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Data Validator: **Jim Tomalia; Cadena, Inc.**

Analytical Group/Method:	TCLP Metals and RCRA Characteristics, VOCs, SVOCs, As, Pb, 1,4-Dioxane
Data deliverable requirements:	Full Data Package
Analytical specifications:	WS 28
Measurement performance criteria:	WS 12
Percent of data packages to be validated:	100% Stage 2b
Percent of raw data reviewed:	0%
Percent of results to be recalculated:	0% for Stage 2b reviews
Validation procedure:	USEPA Contact Laboratory Program (CLP) National Functional Guidelines as appropriate
Validation code:	S2bVEM (Electronic and Manual)
Electronic validation program/version:	Earthsoft EDP and Collaborative Laboratory Management System

28.0 DATA USABILITY ASSESSMENT

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Identify personnel (organization and position/title) responsible for participating in the data usability assessment:

RECON – Sampler

Tetra Tech - IAQT

Cadena - Data Validation

Tetra Tech - Construction QA Manager

Describe how the usability assessment will be documented:

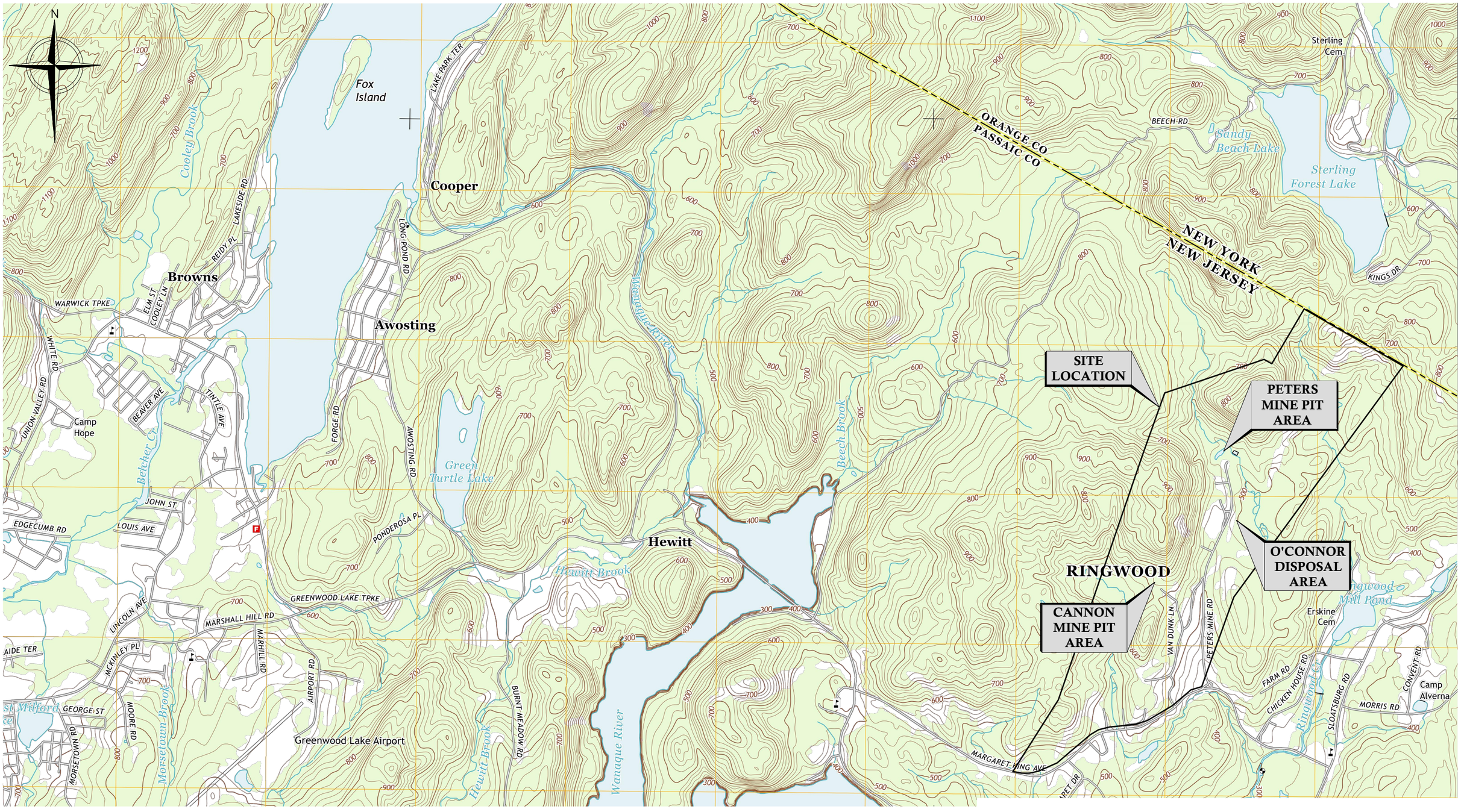
The assessment will be documented in a report memo to be included with the RAR, stating what activities were performed and results of each activity.

Summarize the data usability assessment process including statistics, equations, and computer algorithms that will be used to analyze the data:

Step 1	**Review the project's objectives and sampling design** The project goal is to identify contamination levels within the excavated soil. Soil will either be reused on site as fill or sent offsite for proper disposal depending on result of the laboratory analysis. Effluent samples will be collected to compare treated water quality to groundwater quality standards. Groundwater samples will be collected (as needed) to compare groundwater quality to groundwater quality standards. Drums and Paint Waste, if discovered will also be analyzed and disposed of offsite.
Step 2	**Review the data verification and data validation outputs** Data usability will include: assessment of results, comparison of reporting limits to project action levels, assessment of potential impact of any changes to the sampling methodology, and assessment of completeness. Any limitations on the data will be identified and the implication of such limitations described.
Step 3	**Verify the assumptions of the selected statistical method** Not Applicable
Step 4	**Implement the statistical method** Not Applicable

Step 5	**Document data usability and draw conclusions**
	The data usability will be documented in the report memo. Provided the data validation documents that no results failed to meet the required analytical QA/QC requirements, and the data do not indicate a large positive or negative bias, the data will be considered usable for the purpose of classifying soil as reusable or for disposal at a licensed facility, or that the effluent or groundwater data is usable for comparison to NJGWQS.

FIGURES



0 2000 4000

SCALE IN FEET

SOURCE NOTE:

1. BACKGROUND INFORMATION TAKEN FROM A USGS 7.5 MINUTE QUADRANGLE MAP TITLED "GREENWOOD LAKE, NY–NJ" AND DATED 2013.

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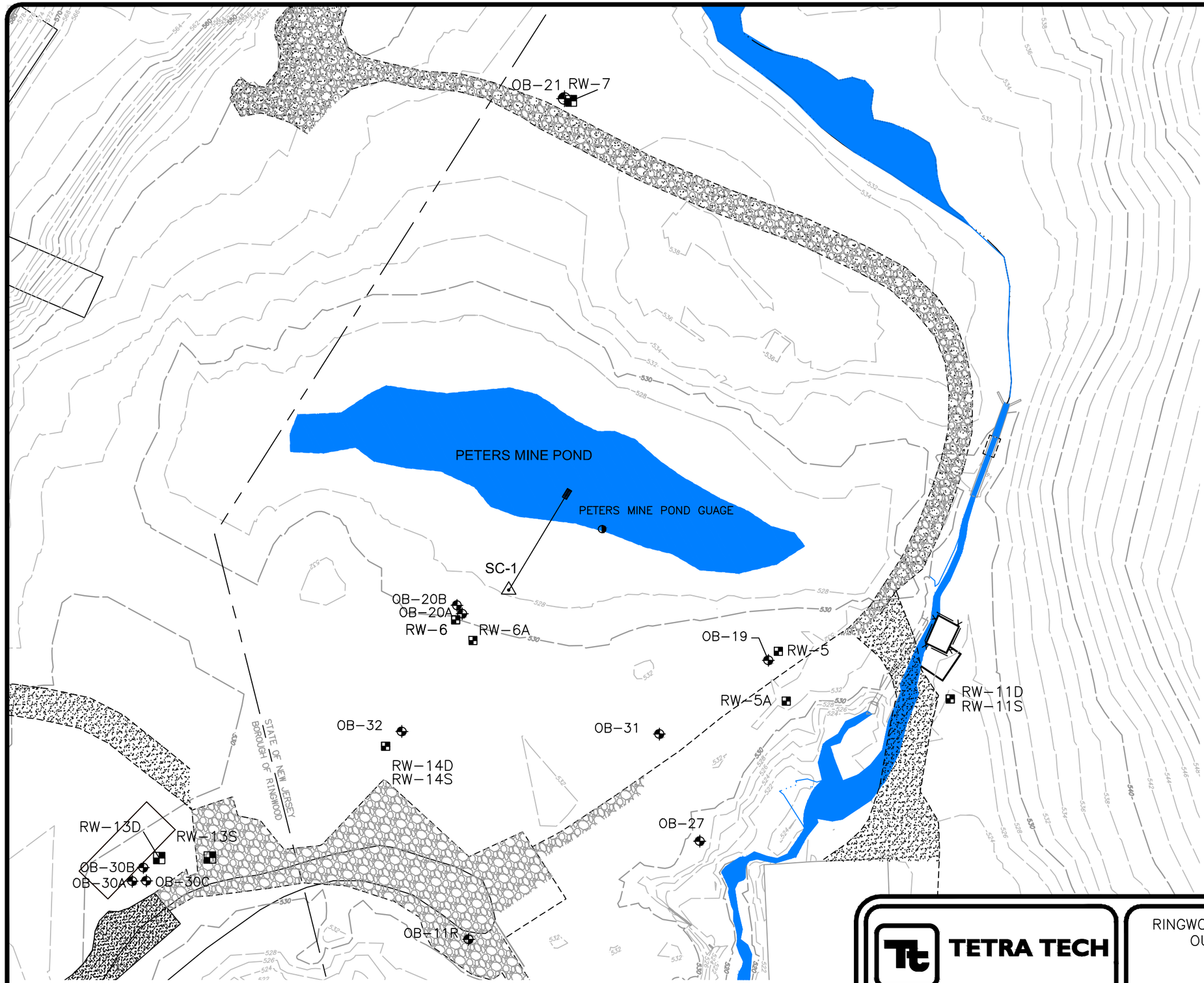
RINGWOOD MINES/LANDFILL SUPERFUND SITE
OU2 REMEDIAL ACTION WORK PLAN
RINGWOOD, NEW JERSEY

SITE LOCATION MAP

FIGURE NO. 1

PROJECT NO. 170101



LEGEND:

- EXISTING CONTOUR
- LIMIT OF SURFACE WATER
- PROPERTY BOUNDARY
- EXISTING DIRT TRAIL/ROAD
- STABILIZED ACCESS ROAD
- OB–19 OVERBURDEN MONITORING WELL
- STAFF GAUGE
- RW–5 BEDROCK MONITORING WELL
- SC-1 DIRECTIONAL MONITORING WELL
- WATER BODY
- STREAM

NOTES:

1. RW–3S REPRESENTS THE 77–87 FOOT INTERVAL AND RW–3D IS A MULTIPORT WELL.
2. RW–13S REPRESENTS THE 71–91 FOOT INTERVAL AND RW–13D IS A MULTIPORT WELL.

0 60' 120'

GRAPHIC SCALE

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RINGWOOD MINES/LANDFILL SUPERFUND SITE
OU2 REMEDIAL ACTION WORK PLAN
RINGWOOD, NEW JERSEY

PMP WORK AREA

FIGURE NO. 2

PROJECT NO. 170101

ATTACHMENTS

Groundwater and Effluent Sampling
Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

Volatile Organic Compounds	CASRN	Project Action Limit (ug/l)*	Project Quantitation Limit Goal** (ug/l)	Laboratory-specific quantitation limit (ug/l)	Laboratory-specific dectection limit (ug/l)
Chloromethane	74-87-3	NA	NA	1	0.402
Bromomethane	74-83-9	10	1	1	0.55
Vinyl chloride	75-01-4	1	1	1	0.171
Chloroethane	75-00-3	5	0.5	1	0.32
Methylene Chloride	75-09-2	3	1	1	0.315
Acetone	67-64-1	6000	10	5	4.42
Carbon disulfide	75-15-0	700	1	1	0.821
Trichlorofluoromethane	75-69-4	2000	1	1	0.32
1,1-Dichloroethene	75-35-4	1	1	1	0.264
1,1-Dichloroethane	75-34-3	50	1	1	0.264
trans-1,2-Dichloroethene	156-60-5	100	1	1	0.235
cis-1,2-Dichloroethene	156-59-2	70	1	1	0.219
Chloroform	67-66-3	70	1	1	0.326
1,2-Dichloroethane	107-06-2	2	2	1	0.43
2-Butanone	78-93-3	300	2	5	1.85
1,1,1-Trichloroethane	71-55-6	30	1	1	0.238
Carbon tetrachloride	56-23-5	1	1	1	0.208
Bromodichloromethane	75-27-4	1	1	1	0.343
1,2-Dichloropropane	78-87-5	1	1	1	0.353
cis-1,3-Dichloropropene	542-75-6	1	1	1	0.222
Trichloroethene	79-01-6	1	1	1	0.314
Dibromochloromethane	124-48-1	1	1	1	0.281
1,1,2-Trichloroethane	79-00-5	3	2	1	0.433
Benzene	71-43-2	1	1	1	0.203
trans-1,3-Dichloropropene	542-75-6	1	1	1	0.485
Bromoform	75-25-2	4	0.8	1	0.536
4-Methyl-2-pentanone	108-10-1	NA	NA	5	1.3
2-Hexanone	591-78-6	40	1	5	1.14
Tetrachloroethene	127-18-4	1	1	1	0.249
1,1,2,2-Tetrachloroethane	79-34-5	1	1	1	0.367
Toluene	108-88-3	600	1	1	0.379
Chlorobenzene	108-90-7	50	1	1	0.377
Ethylbenzene	100-41-4	700	2	1	0.298
Styrene	100-42-5	100	2	1	0.415
m&p-Xylene	179601-23-1	NA	NA	1	0.296
o-Xylene	95-47-6	NA	NA	1	0.361
Xylenes, Total	1330-20-7	1000	2	2	0.654
Freon TF	76-13-1	20000	0.3	1	0.311
MTBE	1634-04-4	70	1	1	0.465
Cyclohexane	110-82-7	NA	NA	1	0.321
1,2-Dibromoethane	106-93-4	0.03	0.03	1	0.498
1,3-Dichlorobenzene	541-73-1	600	5	1	0.342
1,4-Dichlorobenzene	106-46-7	75	5	1	0.334

Groundwater and Effluent Sampling
Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

1,2-Dichlorobenzene	95-50-1	600	5	1	0.431
Dichlorodifluoromethane	75-71-8	1000	2	1	0.311
1,2,4-Trichlorobenzene	120-82-1	9	1	1	0.365
1,2,3-Trichlorobenzene	87-61-6	NA	NA	1	0.357
1,2-Dibromo-3-Chloropropane	96-12-8	0.02	0.02	1	0.376
Bromochloromethane	74-97-5	NA	NA	1	0.412
Isopropylbenzene	98-82-8	700	1	1	0.336
Methyl acetate	79-20-9	7000	0.5	5	0.785
Methylcyclohexane	108-87-2	NA	NA	1	0.258
1,2-Dibromo-3-Chloropropane	96-12-8	NA	NA	0.02	0.0104
Ethylene Dibromide	106-93-4	NA	NA	0.02	0.0079

Semi-Volatile Compounds	CASRN	Project Action Limit (ug/l)*	Project Quantitation Limit Goal** (ug/l)	Laboratory-specific quantitation limit (ug/l)	Laboratory-specific dectection limit (ug/l)
Phenol	108-95-2	2000	10	10	0.292
2-Chlorophenol	95-57-8	40	20	10	0.377
2-Methylphenol	95-48-7	50	0.1	10	0.671
4-Methylphenol	106-44-5	50	0.1	10	0.651
2-Nitrophenol	88-75-5	NA	NA	10	0.747
2,4-Dimethylphenol	105-67-9	100	20	10	0.619
2,4-Dichlorophenol	120-83-2	20	10	10	1.07
4-Chloro-3-methylphenol	59-50-7	100	20	10	0.575
2,4,6-Trichlorophenol	88-06-2	20	20	10	0.857
2,4,5-Trichlorophenol	95-95-4	700	10	10	0.88
2,4-Dinitrophenol	51-28-5	40	40	20	14.4
4-Nitrophenol	100-02-7	NA	NA	20	3.98
4,6-Dinitro-2-methylphenol	534-52-1	0.7	0.03	0.4	0.375
Pentachlorophenol	87-86-5	0.3	0.1	0.2	0.154
Bis(2-chloroethyl)ether	111-44-4	7	7	1	0.633
N-Nitrosodi-n-propylamine	621-64-7	10	10	1	0.43
Hexachloroethane	67-72-1	7	7	2	0.803
Nitrobenzene	98-95-3	6	6	1	0.567
Isophorone	78-59-1	40	10	10	0.798
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	10	0.589
Naphthalene	91-20-3	300	2	2	1.13
4-Chloroaniline	106-47-8	30	10	10	1.88
Hexachlorobutadiene	87-68-3	1	1	1	0.78
2-Methylnaphthalene	91-57-6	30	10	10	1.1
Hexachlorocyclopentadiene	77-47-4	40	0.5	10	3.64
2-Chloronaphthalene	91-58-7	600	10	10	1.18
2-Nitroaniline	88-74-4	NA	NA	10	0.474
Dimethyl phthalate	131-11-3	100	10	10	0.766
Acenaphthylene	208-96-8	100	10	10	0.823
2,4/2,6-Dinitrotoluene Mix	25321-14-6	10	10	4	1.823
3-Nitroaniline	99-09-2	NA	NA	10	1.94

Groundwater and Effluent Sampling
Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

Acenaphthene	83-32-9	400	10	10	1.08
Dibenzofuran	132-64-9	NA	NA	10	1.1
Diethyl phthalate	84-66-2	6000	1	10	0.976
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	10	1.28
Fluorene	86-73-7	300	1	10	0.912
4-Nitroaniline	100-01-6	NA	NA	10	1.22
N-Nitrosodiphenylamine	86-30-6	10	10	10	0.115
4-Bromophenyl phenyl ether	101-55-3	NA	NA	10	0.745
Hexachlorobenzene	118-74-1	0.02	0.02	0.02	0.0131
Phenanthrene	85-01-8	100	0.3	10	0.58
Anthracene	120-12-7	2000	10	10	0.634
Carbazole	86-74-8	NA	NA	10	0.679
Di-n-butyl phthalate	84-74-2	NA	NA	10	0.84
Fluoranthene	206-44-0	300	10	10	0.842
Pyrene	129-00-0	200	0.1	10	1.64
Butyl benzyl phthalate	85-68-7	100	1	10	0.854
3,3'-Dichlorobenzidine	91-94-1	30	30	10	1.43
Benzo[a]anthracene	56-55-3	0.1	0.1	0.05	0.0156
Chrysene	218-01-9	5	0.2	2	0.907
Bis(2-ethylhexyl) phthalate	117-81-7	3	3	2	1.7
Di-n-octyl phthalate	117-84-0	100	10	10	4.75
Benzo[b]fluoranthene	205-99-2	0.2	0.2	0.05	0.024
Benzo[k]fluoranthene	207-08-9	0.5	0.3	0.05	0.0278
Benzo[a]pyrene	50-32-8	0.1	0.1	0.05	0.0216
Indeno[1,2,3-cd]pyrene	193-39-5	0.2	0.2	0.05	0.0362
Dibenz(a,h)anthracene	53-70-3	0.3	0.3	0.05	0.02
Benzo[g,h,i]perylene	191-24-2	100	0.3	10	1.43
Diphenyl	92-52-4	400	10	10	1.19
Acetophenone	98-86-2	700	10	10	2.33
Benzaldehyde	100-52-7	NA	NA	10	2.1
Caprolactam	105-60-2	4000	60	10	0.684
Atrazine	1912-24-9	3	0.1	2	1.35
2,2'-oxybis[1-chloropropane]	108-60-1	NA	NA	10	0.629
1,2,4,5-Tetrachlorobenzene	95-94-3	NA	NA	10	1.24
2,3,4,6-Tetrachlorophenol	58-90-2	200	3	10	0.746
1,4-Dioxane	123-91-1	0.4	0.1	0.2	0.016

Metals	CASRN	Project Action Limit (ug/l)*	Project Quantitation Limit Goal** (ug/l)	Laboratory-specific quantitation limit (ug/l)	Laboratory-specific dectection limit (ug/l)
Arsenic	7440-38-2	3	3	2	0.887
Lead	7439-92-1	5	5	1.2	0.11

* Project Action Limit from NJDEP GWQS as Higher of PQL or Ground Water Quality, dated June 16, 2020
** Project Quanitation Limit Goal from NJDEP GWQS as PQL, dated June 16, 2020
NA = Constituent not listed in NJDEP GWQS, dated June 16, 2020

STOCKPILE AND DRUM SAMPLING
STANDARD OPERATING PROCEDURE

Stockpile Sampling

Samples will be collected from stockpiled material. In accordance with the NJDEP Fill Material Guidance for SRP Sites Recommended Sampling Frequency Guide for Alternative Fill, a minimum of one sample is required per every 680 cubic yards of material. For this project, material will be stockpiled in approximate 500 cubic yard lots with 1 composite sample collected from each respective lot. This increased sample frequency will provide adequate samples for characterization and assure the minimum sampling frequency stated above will be met.

A composite sample will be collected from each approximate 500 cubic yard lot. As material is placed into the stockpile from the excavation, 1 representative sample biased towards potential contamination will be collected for every approximate 100 cubic yards of material. The material will be placed into a pre-cleaned stainless steel bowl or similar via a clean stainless steel scoop or trowel. Once all 5 samples have been collected, the materials will be mixed together. The composite sample will then be placed into laboratory supplied bottles. A new pair of nitrile gloves will be worn if required to fill the sample containers, otherwise the stainless steel scoop may be utilized.

The stainless steel bowl and scoop/trowel shall be decontaminated between stockpile sample collection as called for in SOP-3 Decontamination.

Bottles will be labeled with the corresponding stockpile identification, stored in the laboratory provided cooler, and sent to the laboratory for analysis under chain of custody.

Drum Sampling

All drums must be removed from the excavation and staged on secondary containment prior to opening. Drums shall be labeled with their corresponding drum identification number, ie: first drum removed is #1, second drum removed is #2, and so on. Upon removal of a drum

from the excavation, inspect the drum for corrosion, leaks, deterioration, bulging, or symbols and labels that may help identify the drum condition and contents prior to opening. If the drum appears to be in extremely poor condition, an over pack drum may need to be utilized to prevent a release.

Due to the unknown material within historically buried drums, extra caution must be taken when opening a drum. Proper PPE and monitoring devices, as listed in the Field Sampling Plan, must be used when opening drums. Drums can be opened with the following methods: Manual opening with non-sparking bung wrenches, drum deheading, or remote drum puncturing or bung removal. Open drums in well ventilated, designated areas only. Place drums with similar contents in their own respective groups. Once, the contents have been verified to be safe to handle, collect a sample into laboratory supplied bottle ware for analysis using the appropriate PPE. Drums shall remain in secondary containment, isolated from the rest of the work area while analysis is pending.

Bottles will be labeled with the corresponding drum identification, stored in the laboratory provided cooler, and sent to the laboratory for analysis under chain of custody.

All samples will be analyzed for TCLP Metals, ignitability, corrosivity, and reactivity.

GROUNDWATER/EFFLUENT SAMPLING STANDARD OPERATING PROCEDURE

Well Purging Procedures – Standard monitoring wells

Before collecting a representative groundwater sample, monitoring wells will be purged in accordance with the Low Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504, April 1996 described below. Groundwater wells will be purged at a rate of 100 to 500 ml per minute until three consecutive indicator readings are within the following ranges of each other:

± 0.1 for pH

± 3% for conductivity and temperature

± 10 mv for redox potential (ORP)

± 10% for DO and turbidity

Pumping rates will be adjusted depending upon the recovery rate of each well. If the parameters have not stabilized within 4 hours the attempt to reach stabilization will be noted and the sample will be collected. If the well will not sustain the minimum pumping rate, stop pumping when the water level reaches the top of the screen, or the well is evacuated if the static water level is within the screened interval, allow the well to recover until sufficient volume is available, and collect the sample as described below.

Equipment List (Typical):

- Bladder pump
- Control unit with Nitrogen tank
- bonded 1/4" tubing
- Field instrumentation (Horiba U-52 or equivalent)
- Field logbook
- Monitoring well lock keys

- Water level indicator (Solinst 101 or equivalent)
- Graduated bucket

1 Unlock the well cover and carefully remove it to avoid having foreign material enter the well.

2 Using an electronic water level indicator, measure the water level below top of casing (from permanent marked point).

3 Decontaminate the water level indicator between each monitoring well as outlined in the Decontamination SOP.

4 Measure and cut a length of 1/4" tubing equal to the total casing length plus 5 feet. Secure tubing to the pump and electrical leads. Insert secured pump into well casing to the middle of the screened interval.

5 Begin pumping. Monitor the water level drawdown adjusting pumping rate to maintain equilibrium between recharge rate and evacuation rate with less than 0.3 feet of drawdown, if possible. Do not pump at less than 100 ml/min. Continue pumping until the field indicator parameters are stabilized. If the recharge rate is not sufficient to maintain equilibrium with an extraction rate of no less than 100 ml/min and less than 0.3 feet of drawdown, continue pumping at 100 ml/min to obtain equilibrium and note the resulting drawdown. Do not drawdown the water level below the top of the screen. If the water level reaches the top of the screen, stop pumping, allow the well to recover, and then collect the sample. If the static water level was within the screened interval when starting, evacuate the well completely.

6 Every five minutes collect indicator readings for the parameters listed above.

7 Collect well purge water for appropriate disposal.

9 Record well purging data in the field logbook.

Groundwater Sampling Procedures

Wells will be sampled immediately following stabilization of the field parameters as described above or, if the water level was pumped down to the top of the screen or evacuated, after the well has recovered sufficiently to sample, preferably within two (2) hours. The only exception to the two (2) hour criterion will be for slow recovery wells where insufficient sample has accumulated to sample within the required two hours. For these wells, sample collection will take place as soon as the required sample volume can be feasibly collected.

1 Immediately after the field parameters reach stabilization, or within two (2) hours of monitoring well purging, if the well has recharged enough to sample, samples will be collected into appropriate containers using the pump and dedicated tubing used to purge the monitoring well.

2 Collect groundwater sample in appropriately prepared laboratory containers (containing appropriate preservatives, if required) directly from pump discharge tube.

3 Record well sampling data in the field book.

4 Close and lock protective casing.

5 Label each sample container with the appropriate sample identification data and place in coolers for transport to the analytical laboratory.

6 Initiate standard chain-of-custody procedures (Sample Handling and Custody SOP).

Treated Dewatering Effluent Sampling Procedures

The effluent will be sampled from the water treatment equipment in addition to the Groundwater sampling outlined above. Effluent grab samples will be collected every 10 days of discharge under the conditions described in the permits.

1 Collect effluent water sample in appropriately prepared laboratory containers (containing appropriate preservatives, if required) directly from water treatment discharge sample port.

2 Record effluent sampling data in the field book.

3 Label each sample container with the appropriate sample identification data and place in coolers for transport to the analytical laboratory.

4 Initiate standard chain-of-custody procedures (Sample Handling and Custody SOP).

DECONTAMINATION
STANDARD OPERATING PROCEDURE

An important aspect of quality control is the decontamination of field equipment. Improperly cleaned equipment can lead to cross-contamination and misinterpretation of data. The decontamination procedures used in this project are outlined in the following paragraphs.

Water Level Indicators

Upon completion of the liquid measurements, the probe will be raised to the surface and along with the wetted portion of the tape, will be decontaminated with the following procedure:

- Rinse with potable water
- Rinse with deionized water

Submersible and Bladder Pumps

When a submersible or bladder pump is used for well purging and/or sampling, it will be cleaned prior to and between each use. (Pump tubing will be discarded after each use.) The cleaning process will consist of the following:

- Flush a non-phosphate detergent solution through the pump by placing the pump in a bucket filled with the detergent solution.
- Flush potable water through the pump by placing the pump in a bucket filled with potable water.
- Rinse the internal and external portions of the pump with deionized water.

The power leads to the pump will be decontaminated in a similar fashion.

Stainless Steel Bowls, Scoops and /or Trowels

Stainless steel bowls and scoops/trowels shall be decontaminated between stockpile sample collection. The bowl and trowel will be rinsed with potable water with all remnants of the soil sample removed either by the potable water or wiping the material away. Once, cleaned the bowl and trowel will be rinsed with deionized water and dried with a clean towel/rag or similar. All rinse

water will be collected and added into the stockpile which will either be re-used as backfill or disposed of after testing.

FIELD INSTRUMENT AND EQUIPMENT MAINTENANCE AND CALIBRATON

The following field instruments may be used during groundwater sampling activities:

- Multi-parameter meter and flow through cell– Horiba U-52 or equivalent
- Water Level Meter – Solinst 101 or equivalent

Monitoring equipment will be protected (as much as practical) from contamination during field exploration without hindering operation of the unit. Operation of the equipment will be in accordance with the manufacturer's instructions provided with each piece of equipment (attached for reference). Calibration of the equipment will be conducted each day in accordance with the manufacturer instructions. If calibration is not maintained, the equipment will be placed on hold and not used until calibration is confirmed. Information related to calibration will be recorded in the field logbook and will include the instrument ID, date and time of calibration, calibration standard, and record of calibration measurement.

INSTRUMENT CALIBRATION AND FREQUENCY

Calibration of the equipment will be conducted each day in accordance with the manufacturer instructions. If calibration is not maintained, the equipment will be placed on hold and not used until calibration is confirmed. Information related to calibration will be recorded in the field logbook and will include the instrument ID, date and time of calibration, calibration standard, and record of calibration measurement.

FIELD EQUIPMENT

The following equipment will be used during groundwater sampling activities

- Bladder pump
- Control Unit and Nitrogen
- U-52 Horiba

Field equipment will be inspected at the start of each day and maintained and cleaned according to the manufacturer's specifications. Replace bladders every sample, replace face plate and o-rings as needed. Calibrate and clean U-52 Horiba as needed. Any defective equipment will be taken out of service until it has been shown to perform satisfactorily. All equipment will be cleaned and secured at the end of each day.

Service of equipment will be performed by qualified service organizations.

Solinst® Water Level Meter: Op Instructions

Model 101

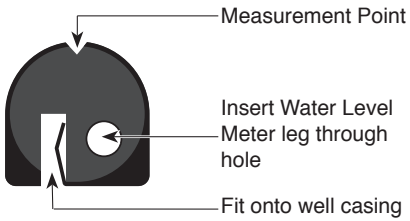
Equipment Check

1. Turn sensitivity dial **fully clockwise**.

> **Notes:** 1. Clockwise rotation of sensitivity dial turns meter on and increases sensitivity.
> 2. Always set switch to highest sensitivity position, then decrease if necessary.

2. Depress the Battery Test button to test the battery and circuitry (excluding the probe when not in use).
3. Submerse the probe in tap water. This completes the circuit and activates the buzzer and light.

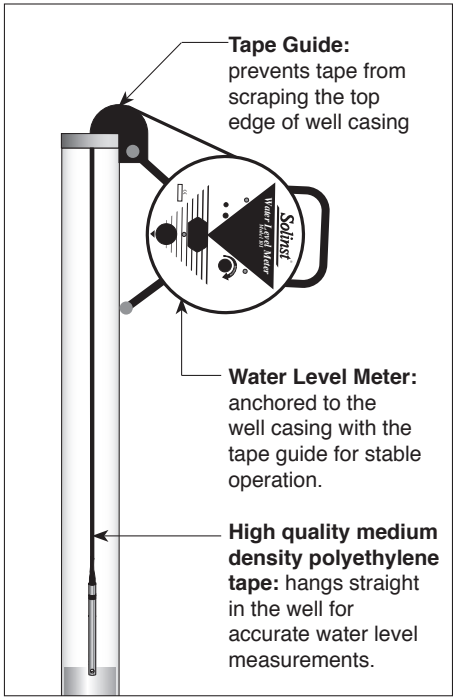
The Tape Guide



The Tape Guide has been designed to:

- Improve accuracy when reading water levels,
- Easily obtain repeatable measurements,
- Prevent tape being cut by well casing,
- Allow the tape and probe to hang straight from the side of the well.

1. Fit the small end of the Tape Guide onto the edge of well casing 2" dia. or larger.
2. Insert the leg of the Water Level Meter into the hole on the Tape Guide and rest the Water Level Meter on the side of the well casing. (See diagram above).
3. To store the Tape Guide, simply clip it onto the support bracket located on the back of the Water Level Meter.



Water Level Measurements

1. The P2/P6 zero measurement point is the tip of the needle in the center of the probe.
2. For ease of operation the Tape Guide can be used to support the Water Level Meter. (See diagram above).
3. Feed the tape into and out of the well using the groove in the top of the Tape Guide. The light and buzzer activate when the needle tip enters water. To ensure accuracy, lower and raise the probe a few times and then record the depth measurement from the tape at the top of the well.
4. When using the Tape Guide, the measuring point is offset from the top of casing. To adjust your measurements to the top of the casing, simply subtract the amount indicated on the front of the Tape Guide (ie 6 cm or 2/10 ft).

Routine Care

1. After the depth to water has been recorded, the tape should be carefully rewound onto the reel, the probe wiped dry and placed into the probe holder.
2. The probe, tape and reel can be cleaned with phosphate free (non-abrasive) detergent and warm water.
3. Use of a Water Level Meter Carrying Bag adds to the service life of the meter.
4. Use of the Tape Guide adds to the life of the tape.

Probe Care and Cleaning

1. The P2 and P6 probes should be wiped clean after each use.
2. Remove any dirt or water from around the central sensor pin.
3. If the central sensor pin is corroded or coated, use emery cloth to polish it.
4 Check the P2 probe seal/strain relief and replace the black heat shrink if there is any cracking or other damage.
5. After cleaning, place probe back in its holder.

Battery Replacement

- Battery type - alkaline, 9 volt.

1. The battery is housed in a convenient battery drawer located in the faceplate of the Water Level Meter.
2. To replace the battery, simply press the drawer in, lift then pull.
3. The battery drawer should slide out of the faceplate enough to pull it out.
4. Note the polarity (positive (+) terminal should be towards the small notch in the end of the drawer) and place new battery in the drawer and slide it back into the faceplate.

Replacement Parts

The following parts can be provided should they become lost or damaged.

1. Probes and seal kits
2. Splice kits
3. Lights, switches, etc.
4. Reels
5. Replacement tape with probe (Complete)
6. Assembled probes on shorter lengths of tape

Troubleshooting

SYMPTOM	CAUSE	REMEDY
No sound when probe immersed in water.	Dead battery.	Replace with 9V Alkaline.
	Water Conductivity is very low.	Increase sensitivity switch setting (turn clockwise) or call Solinst for assistance.
	Disconnected wires on circuit board.	Check all connections inside hub of reel for loose/disconnected wires - solder or reconnect.
	Broken wire in tape.	Locate break in tape - splice and seal. (Contact Solinst)
	Disconnected wire inside probe.	Contact Solinst to obtain parts/repair instructions.
Instrument continuously sounds after being immersed in water.	Water in probe. Probe may be dirty which could interfere with the circuit connection.	P2 Probe: Contact Solinst for probe seal kit. Disassemble, clean and reassemble probe using the new seal kit. P6 Probe: Return to Solinst for assessment or replace probe with new P2 or P6 probe on tape section using tape splice kit.

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Solinst®

SAMPLE HANDLING AND CUSTODY

Soil and drum samples will be collected directly from excavated material or drums into the sample containers provided by the laboratory. Bottle ware will be labeled with the sample location ID (as outlined on Worksheet #18 of the QAPP), date and time of sampling, preservative, requested analysis, and sampler's initials. Collected samples will be wrapped in bubble wrap or foam sleeves (if glass), stored on ice (as applicable) in a cooler and maintained in custody until transferred to a courier for delivery to the lab.

Samples would be considered to be "in custody" under the following conditions:

- It is in personal possession.
- It is in personal view after being in personal possession.
- It was in personal possession when it was properly secured.
- It is in a designated secure area.

A chain-of-custody form (example attached) is to be initiated at the time that the sample containers leave the site. It is important that the field personnel fill out the applicable sections of the form. The chain-of-custody forms will be placed in shipping containers, protected from moisture using plastic bags (e.g., Ziploc®) and will accompany the containers during transport to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until transportation to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date, and note the time of transfer on the chain-of-custody forms. The chain-of-custody is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the chain-of-custody record will be maintained by the field personnel along with the other field records.

Title: Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by SW846 Method 6010D

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

Method 6010D determines trace elements in solution using inductively coupled plasma-atomic emission spectrometry (ICP-AES). The method is applicable to all of the elements listed in Table 1. All matrices are digested prior to analysis (i.e. 3050B or 3010A).

Detection limits, sensitivity, and the optimum and linear concentration ranges of the elements can vary with the wavelength, spectrometer, matrix and operating conditions. Elements listed in Table 1 may be analyzed by this method if performance at the concentration levels of interest is demonstrated. The laboratory's reporting limits (RL) are listed in Table 1.

Table 1: Reporting Limit for Soil and Water

Element	Aqueous Reporting Limit (Non-TCLP) (ug/L)	Aqueous Reporting Limit (TCLP) *adjusted for typical 5X-dilution* (ug/L)	Soil Reporting Limit, *adjusted for typical 2X-dilution* (mg/Kg)
	6010D	6010D	6010D
Al	200	1000	40
Sb	20	100	4
As	15	75	3
Ba	200	1000	40
Be	2	10	0.40
Bo	50	250	10
Cd	4	20	0.80
Ca	5000	25000	1000
Cr	10	50	2
Co	50	250	10
Cu	25	125	5
Fe	150	750	30
Pb	10	50	2
Mn	15	75	3
Mg	5000	25000	1000
Mo	20	100	4
Ni	40	200	8
K	5000	25000	1000
Se	20	100	4
Ag	10	50	2
Na	5000	n/a	1000
Sr	20	100	4
Tl	20	100	4
Sn	50	250	10
Ti	20	100	4
V	50	250	10

Zn	30	150	6
Si	500	2500	n/a
S	200	1000	40

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Samples are digested with the appropriate digestion technique prior to sample analysis. SW846 Method 3050B (TestAmerica Edison SOP No. ED-MTP-005) is the procedure utilized for digesting metals in soil samples; SW846 Method 3010A (TestAmerica Edison SOP No. ED-MTP-003) is the procedure utilized for digesting metals in water samples. Following the sample preparation/digestion, a multi-elemental analysis of elements in solution is performed via Inductively Coupled Plasma- Atomic Emission Spectrometry (ICP-AES). Elemental constituents are determined simultaneously. Samples are nebulized and the aerosol is transported to the plasma torch where excitation occurs. Element specific spectra are produced by radio-frequency inductively coupled plasma. The spectra are dispersed by a grating and the intensities are measured. Background correction points and/or inter-element correction factors must be determined at instrument and method set-up. This laboratory semi-annually investigates the need for such factors and copies of the data are available. The points and correction factors determined are used throughout the year and verified on a daily basis. If a discrepancy exists, the situation is remedied.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Most interference are eliminated or greatly reduced during the acid digestion of the sample matrix. High salt concentrations can cause analyte signal suppressions and confuse interference tests. Dilute the sample if necessary.

4.2. Spectral interferences encountered on the instrument are corrected for by using baseline correction points and/or by applying background correction factors. Background correction points are determined by scanning the area on either side of the wavelength and recording the apparent intensity from all other method analytes. Use single element solutions at or near the upper linear range of each element. Interelement Correction Factors are determined by analyzing single element solutions and recording the apparent analyte concentration. All interfering elements must be analyzed at the same time as the elements of interest.

4.3. Physical interferences are effects associated with sample nebulization and transport. They are reduced or eliminated with use of a peristaltic pump and

internal standards. If these methods are insufficient to reduce the interference, they must be reduced by diluting the sample.

4.4. Memory interferences result when analytes in a previous sample contribute to the signals measured in a new sample. The necessary rinse times must be estimated prior to sample analysis. Until required rinse times are determined a suggested rinse time of 60 seconds shall be used. If a memory interference is suspected the sample must be reanalyzed.

4.5. Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique. If observed, changing the operation conditions (e.g., forward power) and/or buffering the sample (adding 2% Lithium to the internal standard solution) should reduce or eliminate the interference.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The ICP plasma emits strong UV light and is harmful to vision. All analysts must avoid looking directly at the plasma.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions. 2 - Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- iCAP 6500 Duo View ICP-OES Spectrometer with a solid state 27.12MHz RF generator. The nebulizer, plasma, and auxiliary gas to the sample introduction system are supplied and controlled via 3 independent mass flow controllers. Vacuum purged spectrophotometer with an axial and radial plasma torch. Purchased from ThermoFisher Scientific.
  Note: Operating conditions must be established by the analyst according to the instrument manufacturer's specification and must meet conditions satisfying the analytical and quality assurance requirements.

6.2. Supplies

- Volumetric Flasks (Class A): 50 mLs, 100 mLs, 500mls & 1000mls

- Eppendorf & Fisher Pipettes, varying volumes
- Polypropylene tubes
- Argon supply – 99.5%

7. Reagents and Standards

7.1. Reagents

7.1.1. 18 megohm Reagent grade Type II water

7.1.2. Concentrated distilled nitric acid--Trace Grade or Equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.3. Concentrated distilled hydrochloric acid--Trace Grade or Equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.4. 5% HNO3 + 5% HCl: Add 1 liter of concentrated HNO3 and 1 liter of concentrated HCl to deionized water and bring to 20 liter volume with deionized water. Note: Always add acid to water. Record preparation in TALS Reagent Module. Prepare every 12 months or refer to manufacturer's expiration date; store at room temperature.

7.1.5. 5% HNO3: Add 1 liter of concentrated HNO3 to deionized water and bring to 20 liter volume with deionized water. Note: Always add acid to water. Record preparation in TALS Reagent Module. Prepare every 12 months or refer to manufacturer's expiration date; store at room temperature.

7.2. Standards

Storage requirements: All standards are stored at room temperature. Standards containing Silver and HCl must be stored in amber containers or covered when not in use to minimize exposure to light.

Shelf-life: Stock standards – refer to manufacturer's instructions
Intermediate standards – 12 months
Working standards – 12 month
(Note: expiration date must not go beyond the expiration date of the source stock).

Concentration: see Attachment 3 for example certificates of analysis (COA) for all of the standards mixes listed below. The COA lists the manufacturer's part number, certified concentration and shelf life.

Standards must be prepared every 12 months or sooner if needed or required. "If needed" means the standard has been exhausted; "if required" means that the standard does not meet the QC criteria. **Exception Note:** *ICV should be prepared fresh monthly.*

All standards must be prepared in (5%HNO3/5%HCl) or when noted, 5%HNO3 (see Sec. 7.1.4 and 7.1.5).

7.2.1. Calibration stock standards - TA-CAL1, TA-CAL2, TA-CM-SEP19-EDI1-A, and TA-CM-SEP19-EDI1-B purchased from CPI International. 1000ppm each of: Ag, B, S, Zn purchased from CPI International. 10000ppm each of: As,Pb, Sb, Tl purchased from CPI International or equivalent.
.

7.2.2. Working Calibration Standards: see Attachment 1 for final elemental concentration.

7.2.2.1. CAL1: add 100 ml of 5%HNO_3/5%HCl to a clean 1000 ml volumetric flask. Add 10 ml of ME_Cal1-int (see 7.2.2.1.1). Bring to volume with 5%HNO_3/5%HCl.

7.2.2.1.1. ME_Cal1-int: add 100 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Using 10,000 ppm stock standards, add 0.05 ml of of Pb. Bring to volume with 5%HNO3/5%HCl.

7.2.2.2. CAL2: Add 500 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Add 10 ml each of TA-CM-SEP19-EDI1-A, and TA-CM-SEP19-EDI1-B. Bring to volume with 5%HNO3/5%HCl.

7.2.2.3. CAL3: add 500 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Add 2 ml of TA-CAL1; add 5 ml of TA-CAL2; add 0.1 ml Ag 1000ppm, add 0.2 ml B 1000ppm; add 0.5 ml Zn 1000ppm; add 1 ml S (note: sulfur may be omitted if it is not a requested analyte). Bring to volume with 5%HNO3/5%HCl.

7.2.2.4. CAL4/CCV: add 500 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Add 10 ml of TA-CAL1; add 25 ml of TA-CAL2; add 0.5 ml Ag 1000ppm, add 1 ml B 1000ppm; add 2.5 ml Zn 1000ppm; add 5 ml S (note: sulfur may be omitted if it is not a requested analyte).. Bring to volume with 5%HNO3/5%HCl.

7.2.2.5. CAL5: add 500 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Add 20 ml of TA-CAL1; add 50 ml of TA-CAL2; add 1 ml Ag 1000ppm, add 2 ml B 1000ppm; add 5 ml Zn 1000ppm; add 10 ml S (note: sulfur may be omitted if it is not a requested analyte). Bring to volume with 5%HNO3/5%HCl.

7.2.3. Initial Calibration Verification Stock Standards – TA-CAL1-SS, TA-CAL2-SS purchased from CPI International. 1000ppm each of: Ag, B, S, Zn purchased from CPI International or equivalent. All standards must be 2nd source standards. See attachment 1 for final elemental concentrations.

7.2.4. Working Calibration Verification Standards**:**

7.2.4.1. ICV: add 50 ml of 5%HNO3/5%HCl to a clean 100 ml volumetric flask. Add 1 ml of TA-CAL1-SS; add 2.5 ml of TA-CAL2-SS; add 0.05 ml Ag 1000ppm, add 0.1 ml B 1000ppm; add 0.25 ml Zn 1000ppm; add 0.5 ml S (note: sulfur may be omitted if it is not a requested analyte). Bring to volume with 5%HNO3/5%HCl. All standards used to create the ICV must be from a 2nd source (see sec 7.2.3).

7.2.4.2. CCV**:** see CAL4 (Sec. 7.2.2.4)

7.2.5. Stock Spike Standards:

7.2.5.1. Solutions A, B, C, and D (ICP-Spk), Part No. 4400-100419DD01: commercially purchased from CPI International. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 3 for the standards certified concentrations and catalog numbers.

7.2.5.2. Solutions A, B, C, and D (TCLP-Spk), Part No. SM-606-114: commercially purchased from High-Purity Standards. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 3for the standards certified concentrations and catalog numbers.

7.2.5.3. 1000ppm each of Sulfur and Silicon purchased from CPI International or equivalent.

7.2.5.4. Working Spike Standards

7.2.5.4.1. ME_LCS-int (for ICP prep) - Add the following to a 1000 ml volumetric flask and bring to volume using 5% HNO_3: 50 ml each of Part No. 4400-100419DD01 Solutions A, B, C, and D. Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

7.2.5.4.2. ME_TCLPspk (for TCLP prep) – Add the following to a 200 mL volumetric flask and bring to a volume using 5% HNO_3: 40 ml each of TCLP-Spk Solutions: A, B, C, and D- Part No. SM-606-114. Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

7.2.6. Spectral Interference Check (SIC) Solutions: – TA-ICP-ICSA, TA-ICP-ICSAB-1, TA-ICP-ICSAB-2 purchased from CPI International. 10,000 ppm each of: Na, K purchased from purchased from CPI International or equivalent.

7.2.7. Working SIC Standard A (ICSA): add 500 ml of 5%HNO3/5%HCl to a clean 1000 ml volumetric flask. Add 100 ml of TA-ICP-ICSA. Bring to volume with 5%HNO3/5%HCl. See Attachment 1 for final elemental concentration.

8. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Waters	Plastic, glass	100 mLs	HNO_3, pH < 2 prior to shipment; if not, acidify upon receipt in lab [2,3]	180 days	SW846 Method 6010D 40 CFR Part 136.3
Soils	Plastic, Glass	3 grams	Cool 4 ± 2°C	180 days	SW846 Method 6010D

[1] Inclusive of digestion and analysis.
[2] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 24 hours. Just prior to digestion or direct analysis, verify pH<2. If pH≥ 2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).
[3] Aqueous samples may be stored at room temperature.

Note: Samples for dissolved metals should be filtered in the field before acid is added to the sample. If the sample is to be filtered in the lab, no preservative is added to the sample until the sample is filtered.

9. Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Control	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	<1/2 the RL; or project specific requirements; or <10% of the measured concentration in the sample
Laboratory Control Sample (LCS) for *aqueous samples and Sulfur -soil*	1 in 20 or fewer samples	80-120%
Laboratory Control Sample Soil Reference Material (LCSSRM) in soil	1 in 20 or fewer samples	Vendor's certified limits
Matrix Duplicate [1]	1 in 20 or fewer samples	If original sample and dup are both ≥ 5X RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise ±RL.
Matrix Spike (MS)[1]	1 in 20 or fewer samples	75-125%
Matrix Spike Duplicate (MSD)[1]	When requested by client	75-125%; If MS and MSD are both ≥ 5X RL, then 20% RPD. If MS and MSD are less than the RL, the RPD is not calculated; otherwise ±RL.
Serial Dilution (1/5 dilution) [1]	1 per batch of 20 or fewer samples	See sec 9.1.6.
Post Digestion Spike[1]	1 per batch of 20 or fewer samples	75-125%

[1] The sample for DU, MS, MSD, SD, and PDS is randomly selected unless specifically requested by a client; Use the same environmental sample whenever possible. If insufficient sample amount is available, another environmental sample may be used.
[2] Statistical control limits are updated annually and are updated into lab database.

9.1.1 Method Blank (MB): One laboratory method blank will be analyzed with each batch of samples prepared together (not to exceed 20 samples). The method blank is used to identify possible contamination during acid digestion.

- Results must be less than the highest of: (1) ½ the RL, (2) project specific requirements, or (3) 10% of the measured concentration of the sample. If any analyte concentration in the blank is above the control limit, the batch must be prepared again for the element in question and the samples reanalyzed.

9.1.2. Laboratory Control Sample (LCS) & Laboratory Control Sample Soil Reference Material (LCSSRM): : A laboratory control sample must be analyzed with each group of samples digested. Results of the aqueous LCS must fall within ±20% of the true value. For solid matrices, a vendor supplied solid matrix with certified values is carried through the same preparation procedure as the samples. The results of the solid LCSSRM must fall within the 'QC Performance acceptance limits' of the reference material used for that sample. If not, all samples prepared in association with the LCSSRM must be redigested and reanalyzed.

9.1.3. Matrix Duplicate (DU): A duplicate is analyzed for each batch of samples. If original sample and duplicate are both ≥ RL (reporting limit), then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise, ±RL.

9.1.4. Matrix Spike (MS): A matrix spike is prepared and analyzed for each batch of samples digested. A recovery of 75-125% is required. An exception to this occurs if the sample concentration exceeds the spike concentration by a factor of four or more. If the recovery is not within specified limits a post digestion spike is required to be analyzed (see Sec 9.1.5). See Attachment 2 for list of the elemental concentrations.

9.1.5. Post-Digestion Spike: A post-digestion spike is analyzed for each batch of samples digested. Prepare the sample by mixing 0.20 ml of the working standard ME_LCS-int (Sec. 7.2.5.4.1) and 9.80 ml of the sample digestate. If Sulfur and Silicon are needed, spike 0.04 ml each of 1000ppm Sulfur and Silicon. Adjust the sample digestate volume accordingly. If sample requires dilution, adjust the sample as appropriate, (e.g. sample at 4X dilution, add 0.20 ml of the standard spike to 2.5 ml of sample digestate, and add 7.3 ml of the 5%HNO3/5%HCl). The acceptance range is 75-125% recovery. If both the MS and post digestion spike fail, then matrix effects are confirmed.

9.1.6. Serial Dilution (SD): A 1/5 dilution is prepared and analyzed on one sample per batch to determine if matrix interferences are present.

9.1.6.1. Select a sample and dilute the digestate by a factor of 5 (DF=5).

9.1.6.2. Analyze the dilution using the same procedures used for the un-diluted aliquot.

9.1.6.3. Compare the results of the diluted and un-diluted aliquots of sample digestate.

9.1.6.4. If the analyte concentration is minimally a factor of 25 above the RL (Reporting Limit), then the results of the dilution should be within ±20% of the result of the undiluted sample (original sample). If not, then a chemical or physical interference effect should be suspected.

9.1.7. Matrix Spike Duplicate (MSD): When requested by the client, a matrix spike duplicate is prepared and analyzed. A recovery of 75-125% is required. An exception to this occurs if the sample concentration exceeds the spike concentration by a factor of four or more. See Attachment 2 for list of the elemental concentrations. If the recovery is not within specified limits a post digestion spike is required (see Sec 9.1.5). If the MS and MSD are both ≥ RL (reporting limit), then 20% RPD. If MS and MSD are less than the RL, the RPD is not calculated; otherwise, ±RL.

9.2. Instrument QC

9.2.1. Initial Calibration Verification (ICV): Instrument calibration is verified using an independent standard at the midpoint of the calibration curve. The ICV source must be different from the calibration standards. Results must be within 10% of the true value and the replicate measurements must be less than 5% RSD. If results are outside of the specified limits, terminate the analysis, correct the problem, prepare new sets of ICAL standards if needed and recalibrate the instrument.

9.2.2. Continuing Calibration Verification (CCV) - The calibration must be verified every 10 samples and at the end of the analysis run by analyzing the CCV standard. The same solution used for the calibration standard 4 is used for the CCV standard. The concentration of the CCV standard must be at or near mid-range levels of the calibration. The final concentrations of the various elements are listed in Attachment 1. The results for the target compounds must be within +/-10% of the true value. If results are outside of the specified limits, terminate the analysis, correct the problem, recalibrate the instrument, and reanalyze the samples following the last good CCV. See CAL4/CCV of Sec 7.2.2.4 for the preparation instructions.

9.2.3. Initial and Continuing Calibration Blank (ICB/CCB):

9.2.3.1. Initial Calibration Blank (ICB) must be analyzed after the calibration curve. The value of the initial calibration verification blank must not exceed ½ reporting limit. If it does, terminate the analysis, correct the problem, and recalibrate. The initial calibration verification blank is the same blank solution as used for the calibration blank.

9.2.3.2. Continuing Calibration Blank (CCB) must be analyzed after the calibration curve, every 10 samples and at the end of the analytical run. The absolute value of the calibration verification blank must not exceed the reporting limit. If it does, terminate the analysis, correct the problem, recalibrate and reanalyze the samples following the last good CCB. The calibration verification blank is the same blank solution as used for the calibration blank.

9.2.4. Daily Interference Check Solution: Verify the inter-element and background corrections by analyzing the interference check solution (ICSA) daily at the beginning of the analysis run. ICSA is analyzed in order to demonstrate that proper corrections are being utilized for known interferences. Analyst must evaluate this solution in order to detect trends that require corrective actions. Pay particular attention to false positives and false negatives for elements not present in the interference check solutions. .

9.2.4.1. Results should fall within the control limit of +/-20% of the true value or +/-1 times the LLOQ of the true value, whichever is greater. See Attachment 1 for list of elements and the corresponding concentrations. See Sec 7.2.7 for preparation instructions.

9.2.5. Linear Range Check Standard (LRC): the LRC standard is prepared from single element stock standards of each metal obtained from a commercial source. The LRC is prepared by taking the appropriate volume of each stock and adding it to a 1L volumetric flask partially filled with 5%HNO_3/5%HCl and diluted to the mark after all elements have been added. The Table below lists the volume of each stock solution of each metal, volume used and final concentrations:

Linear Range Check (LRC) - A			
Elements	Stock Conc (mg/L)	Volume of stock (mL)	Final Conc (mg/L)
Mo	10000	0.5	5
Mn, Ni	10000	1	10
Cr, Ti, Zn	10000	1.5	15
Ba, Si	10000	3	30
Cu, Pb	10000	5	50
Fe, K	10000	30	300
Na	10000	40	400
Al, Ca, Mg	10000	50	500

Linear Range Check (LRC) - B			
Elements	Stock Conc (mg/L)	Volume of stock (mL)	Final Conc (mg/L)
As	10000	1	10
Se, TL	10000	0.3	3

The LRC standard is analyzed after each calibration. If the results fall within the control limit of +/-10% of the true value, then the linear range at

that concentration has been verified; if not, the linear range is the highest point in the calibration.

9.3. I<u>nstrument Performance Criteria</u>

Prior to the analysis of any samples the following must be performed.

9.3.1. <u>Instrument Detection Limits (IDLs):</u> The IDL for each analyte must be determined for each wavelength used on each instrument.

9.3.1.1. The IDLs for each analyte must be determined for each prep method. The IDL is determined by preparing 10 method blanks (see ED-MTP-003 & ED-MTP-005 for MB preparation instructions). Analyze the ten MB's and calculate the standard deviation and the mean (use zero for the mean if the mean is negative). The IDL = mean + (3 x Std Dev). The IDL must be determined when the instrument is initially set up, when the instrument is adjusted in any way that may affect the IDL (e.g., detector replacement), and annually.

9.3.2. <u>Linear Range Check (LRC)</u>: see Sec 9.2.5

9.3.3. <u>Single Element Interference Checks</u>:

Sixteen single-element interference check standards should be prepared and analyzed semi-annually (see table below). Each single-element solution is prepared using a clean 100 ml volumetric flask. The absolute value of the concentration observed for any unspiked analyte in the single-element interference checks must be less than two times the analytes' LLOQ.

<u>Elements</u>	<u>Stock Conc</u> (mg/L)	<u>Volume of stock</u> (mL)	<u>Final Conc</u> (mg/L)
Al	10000	5	500
B	10000	0.05	5
Ba	10000	0.3	30
Ca	10000	5	500
Cu	10000	0.5	50
Fe	10000	3	300
Mg	10000	5	500
Mn	10000	0.1	10
Mo	10000	0.05	5
Na	10000	4	400
Ni	10000	0.1	10
Si	10000	0.3	30
Sn	10000	0.02	2
V	10000	0.02	2

Zn	10000	0.15	15

10. Procedure

10.1. Sample Preparation

Prior to sample analysis, digest samples following sample digestion procedures: aqueous samples are digested using SW846 Method 3010A. Soil samples are digested using Method 3050B. Refer to TestAmerica Edison SOP Nos.ED-MTP-003 and ED-MTP-005 for the digestion procedure (see Section 15 for complete references).

10.2. Set up the instrument according to the instrument's operating parameters.

10.2.1. TJA 6500 Duo ICP

10.2.1.1. Set up the instrument with the operating parameters recommended by the manufacturer as specified in the iCAP 6000 Series ICP-OES Spectrometer Operator Manuals (see Sec 15.7 for reference). Allow the instrument to become thermally stable, minimally 30min. Perform a torch alignment by aspirating a 2 ppm Zn standard. *Note*: The following elements are analyzed using the axial viewing of the plasma: Al, As, Ag, Ba, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Sb, Se, Tl, V, Zn, B, Mo, Sn, S and Ti. The following elements are analyzed using the radial viewing of the plasma: Be, K, Na, Sr and Si.

10.2.1.2. Background correction points must be determined during the initial set-up of the instrument. Refer to the iTEVA Software Manual located in the Operator Manuals for instructions.

10.2.1.3. Interelement Correction factors must be verified daily. Refer to the iTEVA Software Manual located in the Operator Manuals for instructions. Criteria for determining IEC's is an apparent positive or negative concentration for the analyte that falls outside of one reporting limit from zero.

10.3. Calibration

10.3.1. Profile and calibrate the instrument according to the instrument manufacturer's instructions using a blank (5%HNO3/5%HCl) and 5 standards, see Section 7.2.2 for details on calibration standards preparation.

10.3.2. The instrument must be calibrated daily or once every 24 hours and each time the instrument is set up. The correlation coefficient (r) of the calibration curve must be ≥0.995.If not, the problem must be corrected, and the instrument must be recalibrated.

10.3.3. Calibration Curve Read-Back:

10.3.3.1. Low-level readback - The low-level calibration standard (Cal 2, at the RL): The %RE (relative error) must be +/- 20% (see Sec 11.5); if not, stop the analysis and recalibrate.

10.3.3.2. Mid-level readback - The mid-level calibration standard (Cal 4): The %RE (relative error) must be +/- 10% (see Sec 11.5); if not, stop the analysis and recalibrate.

10.4. Sample Analysis

10.4.1. Following a sample preparation/digestion procedure, the samples are ready for instrumental analysis. It is advisable to investigate each matrix for any complexities, which might adversely affect the acquisition of valid data.

10.4.1.1. Soil samples and relating QC samples are typically diluted 2X prior to analysis.

10.4.1.2. TCLP samples and relating QC samples (except TCLP MB) are diluted 5X prior to analysis. TCLP MB is not diluted.

10.4.1.3. Aqueous (non-TCLP) samples are typically analyzed without dilution.

10.4.2. Flush the instrument between standards and samples, minimally 60 seconds, using the calibration blank.

10.4.3. The following analytical run sequence is currently used for samples run under the SW846 6010D protocol:

Typical Analytical Sequence
INSTRUMENT WARM-UP (approx. 30 minutes)
Align torch using 2 ppm Zn std
STANDARDIZATION/CALIBRATION (Blank, 5 Cal Stds)
ICV
ICB
LLV (Low-level verification, n/a to this method)
ICSA
ICSAB (n/a to this method)
Int-A (n/a to this method)

Typical Analytical Sequence
Int-B (n/a to this method)
LRC-A
LRC-B
CCV
CCB
10 Samples
CCV
CCB
10 Samples
CCV
CCB

Note: Samples in the analytical sequence above which are not applicable in Method 6010D routinely analyzed are analyzed for Method 200.7 or for project specific QCs or laboratory QCs analyzed as additional interference checks.

10.4.4. A minimum of three exposures for each standard, sample and blank is required. The average of the exposures is reported.

10.4.5. Dilute and reanalyze all samples for which the required analytes exceed its linear range (see Sec 9.2.5) as well as samples which interfering elements exceeds its linear range.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Final results calculation in soil samples:

$$\text{Concentration = mg/kg} = C \frac{x\ V\ x\ D}{W}$$

Where:
C= Element concentration from Instrument (ppb)

V= Final volume of sample digested (in liters)
D= Dilution performed on sample
W= Initial dry weight of sample digested (in gram)

NOTE: All dry weight corrections are made in LIMS at the time the final report is prepared.

11.4. Final results calculation in aqueous samples :

$$\text{Concentration} = \text{mg/ L} = \frac{C \times V1 \times D}{V2}$$

Where:
C= Element concentration from instrument (ppb)
V1= Final volume of sample digested (in liters)
D= Dilution performed on sample)

V2= Initial volume of sample digested (in liters).

11.5. Relative Error (%RE):

% Relative Error = (100) (MC-TC)/TC

MC = Measured Concentration of the calibration standard
TC = True Concentration for the calibration standard

11.6. Data Reduction:

11.6.1. All data is recorded directly in TALS' Analyst Desktop II program.
11.6.2. Record standard preparations in TALS Reagent module.
11.6.3. Sample and standard preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS). The analyst must enter the following information: Source standard, initial and final sample volume, spike name and amount used, all reagents and their corresponding lot numbers, creation date and expiration date.
11.6.4. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch.

11.6.4.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.
11.6.4.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'
11.6.4.3. Acknowledge by filling in responses to all unacknowledged findings.

11.6.4.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.6.4.3.2. Fill in appropriate comments in the response box, then hit 'OK.'

11.6.4.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

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12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

12.4. Lower-Limit of Quantitation (LLOQ) for method 6010D:

12.4.1. LLOQ initial verification: prior to analyzing samples and after any change that may affect the LLOQ. The LLOQ is verified by the analysis of 7 replicate samples spiked at the LLOQ. Use the same concentrations as CAL 2 (see Sec 7.2.2.2 for preparation procedures). The 7 replicates must be digested prior to analysis. See SOPs ED-MTP-003 and ED-MTP-005 for digestion instructions. The LLOQ is verified when the mean recovery of the 7 replicates is +/-35% of the true value and the RSD $\leq$ 20%.

12.4.2. LLOQ on-going verification: the LLOQ is re-verified quarterly by the analysis of a method blank (MB) and 1 blank sample (deionized water) spiked at the LLOQ. Use the same concentrations as CAL 2 (see Sec 7.2.2.2 for preparation procedures). The MB and LLOQ samples must be digested prior

to analysis. See SOPs ED-MTP-003 and ED-MTP-005 for digestion instructions. The LLOQ is re-verified if the MB result is +/- 0.5 times the reporting limit for each analyte and when the recovery of the LLOQ sample is +/-35% of the true value.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are generated as a result of this analysis:

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710

Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Update V, Inductively Coupled Plasma – Optical Emission Spectrometry, Method 6010D, July 2014, Revision 4..

15.2. TestAmerica Edison SOP ED-MTP-005, *Hot Block Digestion of Sediments, Sludges and Soils, SW846 Method 3050B,* most current revision.

15.3. TestAmerica Edison SOP ED-MTP-003, *Digestion of Water and Wastewater Samples for analysis by ICP, SW846 Method 3010A,* most current revision.

15.4. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.5. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.6. TestAmerica Corporate SOP No. CA-Q-S-005, *Calibration Curves (General)*, most current revision.

15.7. iCAP 6000 Series ICP-OES Spectrometer Operator Manuals (8499 400 90001), Thermo Electron Corporation, 2005.

15.8. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Working Standard Concentration for ICP Elements in ug/L
Attachment 2: Matrix spike concentration for soil and aqueous samples
Attachment 3: Certified Values of each elements in multi-element stock standard

18.0. Revision History

- Revision 14, dated 25 April 2020
  - Sec 9.2.5: Added As, Se and Tl to the Linear Range check standard (LRC-B).
  - Sec 10.4.3: Renamed LRC as LRC-A; Added LRC-B to the analytical sequence.

- Revision 13, dated 13 April 2020

  - Removed all references to methods 6010B and 6010C throughout the SOP.
  - Sec 1.0, Table 1: Changed the typical dilution used for soil analysis from 4X to 2X; Added reporting limits for Sulfur and Silicon.
  - Sec 7.2: Changed the frequency of the ICV preparation from daily to monthly.
  - Sec 7.2.1: Updated the calibration stock standards used for this SOP.
  - Sec 7.2.2.1.1: Updated the preparation instructions for ME_Cal1-int.
  - Sec 7.2.2.2 thru 7.2.2.5: Updated preparation instructions for CAL standards.
  - Sec 7.2.3: Updated stock standards used for ICV.
  - Sec 7.2.4: Updated preparation instructions for ICV.
  - Sec 7.2.5.3: added Sulfur and Silicon to the stock spike standards list.
  - Sec 7.2.6: Updated stock standards used for SIC solutions.
  - Sec 7.2.7: Updated preparation instructions for SIC solution.
  - Deleted Standards which are no longer applicable (i.e. IntA, IntB).
  - Sec 9.1.2: removed instructions to use CCV as an LCS.
  - Sec 9.1.5: Added PDS spiking instructions for Sulfur and Silicon
  - Sec 9.2.5: Updated LRC preparation instructions
  - Sec 9.3.4: Updated preparation instructions for the single element interference study.
  - Sec 10.2.1.1: Added Sulfur to the list of elements analyzed axially.
  - Sec 10.3.3.1&10.3.3.2: Revised the criteria limits for low level and mid-level readback.
  - Sec 10.4.1.1: Updated soil digestate dilution instructions.
  - Sec 10.4.3: Updated the typical analytical sequence to reflect current laboratory practices.
  - Sect 10.4.4: Updated the number of minimum exposures from 2 to 3..
  - Sec 11.5: Added the calculation equation for Relative Error.
  - Sec 12.5.2: Updated the requirements for the LLOQ on-going verification.
  - Sec 15.1: Updated reference to SW846-Update V.
  - Attachment 1: removed Se, Sb, & Tl from Cal1; added concentration for Si in Cal2; added concentration levels for Sulfur
  - Attachment 2: added Sulfur and Silicon to the Matrix Spike table; updated all concentrations matrix spike concentrations for soil.
  - Attachment 3: Replaced all COAs to reflect the updated stock standards.

- Revision 12, dated 29 June 2018

  - Sec 1.1: Added Method 6010D to the list of methods applicable to this SOP
  - Sec 1, Table 1: Updated Table to include RL's for 6010D
  - Throughout the SOP removed all references to Reagent Water and replaced with 5%HNO_3/5%HCl
  - Sec 7.2: Added ICV preparation instructions and frequency for method 6010D.
  - Sec 7.2.2.4 & 7.2.4.2: Added the CCV preparation instructions in both sections; removed the CCV preparation instructions in Section 7.2.4.1.
  - Sec 7.2.6: Added B, Ba, Ca, Fe, Mg, Se, Zn, Al, As, Pb to the list of stock standards.
  - Sec 7.2.6 & 7.2.7: Renamed "Stock Interference Check Standard" and 'Working Interference Check Standards" to Spectral Interference check solution (SIC).
  - Sec 7.2.9 & 7.2.10: revised the preparation instructions for Int-A and Int-B.
  - Sec 9.1 Table: Added MB and PDS control limit criteria for method 6010D

- Sec 9.1.1: Added MB control limit criteria for method 6010D
- Sec 9.1.5: Added PDS control limit criteria for method 6010D
- Sec 9.1.6.5: Added serial dilution control limit criteria for method 6010D
- Sec 9.2.1: Revised to remove CCV procedure (ICV standard source separate from CCV source).
- Sec 9.2.2: Added CCV criteria; subsequent sections adjusted accordingly.
- Sec 9.2.3.2: Added ICB & CCB control limit criteria for method 6010D
- Sec 9.2.4.2: Added ICSA control limit criteria for method 6010D
- Sec 9.2.7: Added LRC preparation and control limit criteria for method 6010D
- Sec 10.2.1.1: Added axial/radial plasma view information in this section; deleted this information in Sec 12.
- Sec 10.2.1.3: Replaced the semi-annual linear range verification with daily verification.
- Sec 9.3.1.2: Added the IDL procedure for Method 6010D
- Sec 9.3.3: Added Linear Range check (LRC) information; Revised the analytical sequence to analyze first CCV prior to regular samples.
- Sec 9.3.4: Added Single Element Interference Check preparation procedure and criteria information
- Sec 10.3.2: Added calibration curve correlation coefficient criteria for method 6010D.
- Sec 10.3.3: Added calibration curve read-back instructions for method 6010D.
- Sec 10.4.5: Added dilution instructions for analytes and interfering analytes that exceed their linear range.
- Sec 12.6: Added LLOQ standard preparation and criteria information.
- Attachment 1: Added LLQC and LLOQ on this Table.

- Revision 11, dated 27 April 2018
  - Attachment 1: Corrected the working standard concentration for CAL2 specifically Sr, Sn, Ti, V, Zn and Si.
  - Sec 9.1.2: Revised to clarify the acceptance criteria used in the COA when evaluating recoveries for LCS.
  - Sec 12.4: Revised to include LDR as a QC method performance. Specified which elements are viewed at axial plasma and radial plasma.
  - Attachment 1: Added the analytical wavelength (nm) for each of the elements.

- Revision 10, dated 06 October 2017
  - Sec 10.1: Deleted reference to SOP# ED-MTP-002, not applicable to this SOP.
  - Sec 11.5.4: Replaced Data Review Checklist (CA-Q-WI-043) with TALS program Data Review Checker (DRC).
  - Sec 15.7: Deleted reference Data Review Checklist (CA-Q-WI-043); subsequent sections adjusted accordingly.

- Revision 9, dated 29 September 2015
  - Combined SOP ED-MT-033 with SOP ED-MT-004; retired SOP ED-MT-033 at the effective date of this SOP.
  - Sec 1.1: Added 6010C to the list of methods covered in this SOP. Remove the exception for filtered groundwaters not needing a digestion step.
  - Sec 1, Table 1: Updated table to include RL's for 6010C.
  - Sec 1, 2.0 & 10.1: Removed reference to method 3005A.

- Sec 7.1.4 & Sec 7.1.5: Replaced ICP Reagent Dilution logbook with TALS Reagent Module for the documentation of Standard/Reagent preparation.
- Sec 7.2: Added instructions for the storage of standards which contain both Ag and HCl.
- Sec 7.2.1: Updated the list of stock standards to reflect actual lab practices.
- Sec 7.2.2.1- 7.2.2.2: Updated the standard preparation.
- Sec 7.2.2.1.1 – 7.2.2.2.1: Added preparation instructions for Cal2.
- Sec 7.2.6: Updated the list of standards.
- Sec 7.2.9: Replaced Int-10 with Int-A; removed Int-10 Table and added preparation instructions for Int-A.
- Sec 7.2.10: Added preparation instructions for Int-B.
- Sec 9.1: Added MSD to the list of Sample QC. Updated the control limits for PDS to reflect method requirement.
- Sec 9.1.7: Added MSD and quality control information for MSD.
- Sec 9.2.4: Replaced Int-10 with Int-A & Int-B.
- Sec 9.2.5: Added Low-Level Initial/Continuing Calibration Verification Standard (LLICV/LLCCV) for method 6010C.
- Sec 10.3.1: Updated IDL study frequency and definition to reflect method requirements.
- Sec 10.3.3: Added LLQC instructions for method 6010C.
- Sec 10.4.2: Added correlation coefficient requirements for Method 6010C.
- Sec 10.5.1.3: Added dilution instructions for typical aqueous (non-tclp) samples.
- Sec 10.5.3: Updated to include Method 6010C; updated Table to include LLICV, LLCCV, Int-A & Int-B.
- Sec 11.5.4: Replaced Metals ICAL Data Review checklist EDS-WI-124 with the standardized ICP data review checklist CA-Q-WI-043.
- Sec 15: Removed reference to SOP ED-MTP-002 (method 3005A) in Sec 15.4; subsequent sections adjusted accordingly. Sec 15.7: Deleted Data review checklist WI# EDS-WI-007, checklist is referenced in the applicable digestion SOP. Added the standardized Data review checklist WI# CA-Q-WI-043. Sec 15.10: Deleted reference WI# EDS-WI-124.
- Attachment 1: Updated elemental concentrations for Cal1 and Cal2, LLICV/LLCCV.
- Attachment 3: Updated COAs for all standards.

- Revision 8, dated 03 June 2013
  - Sec 1 and 12: Updated LQM section references to reflect the most current LQM.
  - Sec 6.1: Deleted TJA 61E ICP, the lab no longer uses this instrument. All references to this instrument have been removed from this SOP.
  - Sec 7.2.1: Added Cu, Ni, Fe, Si and Zn to the calibration stock standards.
  - Sec 7.2.2.1.: Revised the preparation procedure for standard CAL1 to reflect actual lab practices.
  - Sec 7.2.2.1.1: Added the preparation instructions of the intermediate standard ME_Cal1-int.
  - Sec 7.2.2.2-7.2.2.4: Sections revised to include Si standard.
  - Sec 7.2.2.5: Added the preparation instructions for standard CAL5.
  - Sec 7.2.3 & 7.2.4.1: Replaced Part No SM-606-098 with SM-606-122.
  - Sec 7.2.9: Revised to include Si to INT-10 standard.
  - Sec 9.1 & 9.1.1: Revised the control limit of Method blank to reflect SW846 criteria.

- Sec 11.5.4: Added WI# EDS-WI-124, Initial Calibration Data Review, to metals data review checklist.
- Sec 15: Deleted SOP reference ED-MT-013, not applicable; added EDS-WI-124 to the list of references for this SOP.
- Attachment 1: Revised Table to update concentrations for standard CAL1.
- Attachment 3: Revised COA attachments for SM-606-122.

- Revision 7, dated 25 April 2011
  - Sec 1.1: Revised Table 1 to include the reporting limits for Aqueous TCLP/Non-TCLP and soils; included the information in Table 2 to Table 1; deleted Table 2.
  - Sec 3: Updated the LQM reference for the definitions.
  - Sec 4.0: Expanded the possible interferences for this method.
  - Sec 6.1: Added iCAP 6500 Duo View ICP-OES to the list of instruments.
  - Sec 6.2: Revised to include Argon supply to the list of supplies; deleted argon supply previously listed in Sec 7.1.4. Deleted Nitrogen which is not used by this method. Subsequent sections adjusted accordingly.
  - Sec 7.1.5: Added 5% HNO3 as the reagent for the analysis of undigested samples
  - Sec 7.2.1: Added TANJ-STD-3 and TANJ-STD-4; deleted standards Zn and La
  - Sec 7.2.2: Updated the preparation of CAL1, CAL2, CAL3, and CAL4
  - Sec 7.2.3: Added Solutions: A, B, C, and D, Part No. SM-606-098 (Duo_CCV-int)
  - Sec 7.2.4.1: Updated the preparation of ICV/CCV
  - Sec 7.2.5.1: Added Solutions: A, B, C, and D, Part No. SM-606-098 (Duo_CCV-int).
  - Sec 7.2.5.2: Added Solutions A, B, C, and D, Part No. SM-606-114 (TCLP-Spk).
  - Sec 7.2.5.3.1: Updated the preparation of ME_LCS-int.
  - Sec 7.2.5.3.2: Added the preparation of ME_TCLPspk.
  - Deleted RepLim-INT, previously Sec 7.2.9, subsequent sections adjusted accordingly.
  - Sec 7.2.9: Replaced INT-20 with INT-10.
  - Sec 8: Added footnotes 2 & 3.
  - Sec 9: Deleted all entries of the Blank Spike (BS) and LCSD for this SOP.
  - Sec 9.1.1: Updated pass/fail criteria for the MB.
  - Deleted the following QC samples: HSA (previously sec 9.2.3), Replim and Replim2 (previously sec 9.2.6 & 9.2.7), subsequent sections adjusted accordingly.
  - Sec 9.2.4: Updated pass/fail criteria for ICSA/ICSAB
  - Sec 10.2: Added the TJA 6500 Duo instrument set up procedure.
  - Sec 11.5: Updated Data Reduction section in accordance with TALS.
  - Sec 15.0: Added applicable references.
  - Updated Attachment 1 & 2 and removed Attachment 3 (Reporting Limt Check Standard – RepLim) and Attachment 4 (Interferent-20, Int-20). Attachment 5 (COAs) is now referred to as Attachment 3.

- Revision 1, dated June 26, 2008
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Added Table 2, reporting limits for soil and water by method 6010B.
  - Section 2: Included applicable digestion technique for method 6010B.
  - Section 7 Reagents and Standards: Added Reagent water (5% HNO3+5% HCl) in the list of reagents; included stability and storage information of all reagents and standards.

- Section 7.2 Standards: Added standards (ICP-PSPK, RepLim-INT & INT-20) in the list of instrument QC samples performed on this method.
- Section 8: Updated in Table format and have included sample container, sample size requirements and method reference.
- Section 9 Quality Control: Updated to include all Sample and Instrument QC for both matrices (soil and water).
- Section 9.1.6, Added Post-digestion spike and defined its spiking procedure, recovery limits and frequency.
- Section 9.2 Instrument QC: Added instrument QCs such as RepLim, RepLim-2, INT-20 and described their frequency, control limits and spiking procedure.
- Section 10 Procedure: Clarified steps performed during instrument operation including referencing TestAmerica SOP No. ED-MT-013.
- Section 15 References: Added references applicable to the SOP.
- Section 17 Attachment: Added attachments 2, 3 & 4 to list the elemental concentrations of BS, MS (for water and soil), RepLim, RepLim-2 and INT-20 in Table format.
- Attachment 5: included certificate of analysis of stock standards to list concentration of each element in the mix.

Attachment 1

Working Standard Concentration for ICP Elements in ug/L

Element (wavelength, nm)	CAL1	CAL2 LLOQ)	CAL3	CAL4 ICV CCV	CAL5	ICSA
Al (396.152)	n/a	200	10000	50000	100000	500000
Sb (206.833)	n/a	20	200	1000	2000	n/a
As (189.042)	n/a	15	200	1000	2000	n/a
Ba (233.527)	n/a	200	200	1000	2000	n/a
Be (313.042)	n/a	2	200	1000	2000	n/a
B (208.959)	n/a	50	200	1000	2000	n/a
Cd (226.502)	n/a	4	200	1000	2000	n/a
Ca (318.128)	n/a	5000	10000	50000	100000	500000
Cr (267.716)	n/a	10	200	1000	2000	n/a
Co (228.616)	n/a	50	200	1000	2000	n/a
Cu (324.754)	n/a	25	200	1000	2000	n/a
Fe (271.441)	n/a	150	10000	50000	100000	200000
Pb (220.353)	5	10	200	1000	2000	n/a
Mn (257.610)	n/a	15	200	1000	2000	n/a
Mg (279.079)	n/a	5000	10000	50000	100000	500000
Mo (202.030)	n/a	20	200	1000	2000	n/a
Ni (231.604)	n/a	40	200	1000	2000	n/a
K (766.490)	n/a	5000	10000	50000	100000	n/a
Se (196.090)	n/a	20	200	1000	2000	n/a
Ag (328.068)	n/a	10	100	500	1000	n/a
Na (589.592)	n/a	5000	10000	50000	100000	n/a
Sr (407.771)	n/a	20	200	1000	2000	n/a
Tl (190.856)	n/a	20	200	1000	2000	n/a
Sn (189.989)	n/a	50	200	1000	2000	n/a
Ti (334.941)	n/a	20	200	1000	2000	n/a
V (292.402)	n/a	50	200	1000	2000	n/a
Zn (206.200)	n/a	30	500	2500	5000	n/a
Si (288.158)	n/a	500	2000	10000	20000	n/a
S (182.034)	n/a	200	1000	5000	10000	n/a

Attachment 2

Matrix Spike Final Concentration in Solution (ug/L)			
ELEMENT	Aqueous (Non-TCLP)	TCLP	Soil
Aluminum	2000	5000	2000
Antimony	500	1000	500
Arsenic	2000	5000	2000
Barium	2000	10000	2000
Beryllium	50	1000	50
Cadmium	50	1000	50
Calcium	20000	20000	20000
Chromium	200	5000	200
Cobalt	500	1000	500
Copper	250	1000	250
Iron	1000	1000	1000
Lead	500	5000	500
Manganese	500	1000	500
Magnesium	20000	20000	20000
Nickel	500	1000	500
Potassium	20000	20000	20000
Selenium	2000	1000	2000
Silver	50	500	50
Sodium	20000	20000	20000
Thallium	2000	1000	2000
Vanadium	500	500	500
Zinc	500	1000	500
Boron	500	1000	500
Molybdenum	500	1000	500
Tin	500	1000	500
Titanium	500	1000	500
Strontium	500	1000	500
Sulfur	4000	4000	4000
Silicon	4000	4000	n/a

Attachment 3

Certificate of Analysis

Rev'd 1/8/15
C.C.

Expiry: 18-Jun-16

Part Number: **4400-100419DD01** **Solution B**
Lot Number: **14L126**
Shelf Life: **18 Months**

3453212
ID: ME_LCSspkB_00009
Exp: 06/16/16 Prpd: CDC
LCS & MS spk Solution B

TestAmerica/Edison
Custom Standard
10% HNO3

Concentrations in ug/mL ± 0.5%

Al	2000
Mg	20000
K	20000
Ca	20000
Na	20000

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

For questions or comments please call 1-800-878-7654 in the USA, +31 20 638 05 97 in Europe or visit our web-site at www.cpiinternational.com.

Certifying Officer

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E-mail: sales@cpiinternational.com

• ISO • 9001:2008 REGISTERED 17025 ACCREDITED

Certificate of Analysis

Expiry: 14-Jun-16

Rev'd 1/8/15
C.C.

Part Number: **4400-100419DD01**
Lot Number: **14L127**
Shelf Life: **18 Months**

Solution C

3453214
ID: ME_LCSspkC_00010
Exp: 06/14/16 Prpd: CDC
LCS & MS spk Solution C

TestAmerica/Edison
Custom Standard
5% HNO3 + 2% HF

Concentrations in ug/mL ± 0.5%

Sb	500
Mo	500
Sn	500
Ti	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

For questions or comments please call 1-800-878-7654 in the USA, +31 20 638 05 97 in Europe or visit our web-site at www.cpiinternational.com.

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• ISO • 9001:2008 REGISTERED 17025 ACCREDITED

Certificate of Analysis

Expiry: 14-Jun-16

Revised 1/8/15
C.C.

Part Number: **4400-100419DD01**
Lot Number: **14L128**
Shelf Life: **18 Months**

Solution D

3453216
ID: ME_LCSspkD_00005
Exp: 06/14/16 Prpd: CDC
LCS & MS spk Solution D

TestAmerica/Edison
Custom Standard
2% HNO3

Concentrations in ug/mL ± 0.5%

As	2000
Ba	2000
B	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

For questions or comments please call 1-800-878-7654 in the USA, +31 20 638 05 97 in Europe or visit our web-site at www.cpiinternational.com.

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E-mail: sales@cpiinternational.com

• ISO • 9001:2008 REGISTERED 17025 ACCREDITED

Rec'd 10-3-19 DE

7332235
ID: ME_6010-RL-A_00001
Exp:04/02/21 Prpd:DLE Opn:10/03/19
6010RL stock std-A

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CM-SEP19-EDI1-A

6010 RL Standard

Lot #: 10104372-1

Matrix: 2% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	1.00 ± 0.01 µg/mL	Co	5.01 ± 0.03 µg/mL	Ni	4.00 ± 0.02 µg/mL
Al	20.00 ± 0.10 µg/mL	Cr	1.01 ± 0.01 µg/mL	Pb	1.00 ± 0.01 µg/mL
As	1.51 ± 0.01 µg/mL	Cu	2.51 ± 0.01 µg/mL	Se	2.01 ± 0.01 µg/mL
B	5.00 ± 0.03 µg/mL	Fe	14.99 ± 0.07 µg/mL	Sr	2.00 ± 0.01 µg/mL
Ba	20.00 ± 0.10 µg/mL	K	500.0 ± 2.5 µg/mL	Tl	2.00 ± 0.01 µg/mL
Be	200.0 ± 1.0 µg/L	Mg	500.0 ± 2.5 µg/mL	V	5.01 ± 0.03 µg/mL
Ca	500.0 ± 2.5 µg/mL	Mn	1.50 ± 0.01 µg/mL	Zn	3.00 ± 0.02 µg/mL
Cd	399.6 ± 2.0 µg/L	Na	500.1 ± 2.5 µg/mL		

Source Material Lot # Chart

Element	Source Material Lot #	Element	Source Material Lot #	Element	Source Material Lot#
Ag	975475	Co	979906	Ni	984273
Al	995977	Cr	1011874	Pb	981329
As	175385	Cu	982446	Se	982461
B	982524	Fe	994438R	Sr	998106
Ba	994634	K	980507	Tl	991734
Be	451977	Mg	1013353	V	990117
Ca	855297	Mn	997487	Zn	984272
Cd	996631	Na	997471		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

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The Netherlands

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Rec'd 10-3-19 OE

7332255
ID: ME_6010-RL-B_00001
Exp:04/02/21 Prpd:DLE Opn:10/03/1
6010RL stock std-B

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM — Product #: TA-CM-SEP19-EDI1-B

6010 RL Standard — Lot #: 10104372-2

Matrix: 2% HNO_3/tr. HF

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Mo	2.00 ± 0.01 µg/mL	Sb	2.00 ± 0.01 µg/mL	Sn	4.99 ± 0.02 µg/mL
S	20.01 ± 0.10 µg/mL	Si	50.03 ± 0.25 µg/mL	Ti	2.00 ± 0.01 µg/mL

Source Material Lot # Chart

Element	Source Material Lot #	Element	Source Material Lot #	Element	Source Material Lot#
Mo	987189	Sb	1013797	Sn	977645
S	980152	Si	977647	Ti	987438

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Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer — October 2, 2019 **Certification Date**

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Rec'd 4-5-19 DE

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CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-ICP-ICSA

6830739
ID: ME_ICP_ICSA_00001
Exp:09/22/20 Prpd:DLE Opn:04/05/1
ICP stock standard

ICP ICSA Mix

Lot #: 992743-1

Matrix: 5% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Al	5000 ± 25 mg/L	Fe	2000 ± 10 mg/L
Ca	5000 ± 25 mg/L	Mg	5000 ± 25 mg/L

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

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Chuck Goudreau

Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

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Rec'd 4-5-19 D.E.

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CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

6830381
ID: ME_TA-Cal1_00001
Exp:09/22/20 Prpd:DLE Opn:04/05/1
Stock Std

Product #: TA-CAL1

ICP ICPMS CAL Mix # 1

Lot #: 992737-2

Matrix: 5% HNO_3/tr. HF

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
As	99.99 ± 0.50 mg/L	Li	100.0 ± 0.5 mg/L	Si	999.9 ± 5.0 mg/L
Ba	100.0 ± 0.5 mg/L	Mn	100.0 ± 0.5 mg/L	Sn	99.99 ± 0.50 mg/L
Be	99.97 ± 0.50 mg/L	Mo	99.98 ± 0.50 mg/L	Sr	100.0 ± 0.5 mg/L
Cd	100.0 ± 0.5 mg/L	Ni	99.99 ± 0.50 mg/L	Ti	100.0 ± 0.5 mg/L
Co	100.0 ± 0.5 mg/L	Pb	100.0 ± 0.5 mg/L	Tl	100.0 ± 0.5 mg/L
Cr	100.0 ± 0.5 mg/L	Sb	99.98 ± 0.50 mg/L	V	100.0 ± 0.5 mg/L
Cu	100.0 ± 0.5 mg/L	Se	99.99 ± 0.50 mg/L		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

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Chuck Goudreau

Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

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CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

6830443
ID: ME_TA-Cal1-SS_00001
Exp:09/23/20 Prp4:DLE Opn:04/05/1
2nd Source Stock Std

Product #: TA-CAL1-SS

ICP ICPMS CAL Mix # 1

Lot #: 992738-1

Matrix: 5% HNO_3/tr. HF

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
As	100.1 ± 0.5 mg/L	Li	100.1 ± 0.5 mg/L	Si	1000 ± 5 mg/L
Ba	100.0 ± 0.5 mg/L	Mn	100.0 ± 0.5 mg/L	Sn	100.0 ± 0.5 mg/L
Be	100.0 ± 0.5 mg/L	Mo	100.1 ± 0.5 mg/L	Sr	100.1 ± 0.5 mg/L
Cd	100.0 ± 0.5 mg/L	Ni	100.0 ± 0.5 mg/L	Ti	100.0 ± 0.5 mg/L
Co	100.0 ± 0.5 mg/L	Pb	100.0 ± 0.5 mg/L	Tl	100.0 ± 0.5 mg/L
Cr	100.0 ± 0.5 mg/L	Sb	100.0 ± 0.5 mg/L	V	100.0 ± 0.5 mg/L
Cu	100.0 ± 0.5 mg/L	Se	100.0 ± 0.5 mg/L		

Intended Use: This solution is intended for use as a second source certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

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Chuck Goudreau

Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

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CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

6830437
ID: ME_TA-Cal2_00001
Exp:09/22/20 Prpd:DLE Opn:04/05/1
Stock Std

Product #: TA-CAL2

ICP ICPMS CAL Mix # 2

Lot #: 992739-1

Matrix: 5% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Al	2000 ± 10 mg/L	Fe	2000 ± 10 mg/L	Mg	2000 ± 10 mg/L
Ca	2000 ± 10 mg/L	K	2000 ± 10 mg/L	Na	2000 ± 10 mg/L

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

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March 22, 2019
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CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-CAL2-SS

6830479
ID: ME_TA-Cal2-SS_00001
Exp:09/23/20 Prpd:DLE Opn:04/05/19
2nd Source Stock Std

ICP ICPMS CAL Mix # 2

Lot #: 992740-2

Matrix: 5% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Al	2000 ± 10 mg/L	Fe	2000 ± 10 mg/L	Mg	2000 ± 10 mg/L
Ca	2000 ± 10 mg/L	K	2000 ± 10 mg/L	Na	2000 ± 10 mg/L

Intended Use: This solution is intended for use as a second source certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

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Chuck Goudreau
Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

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Fax: (843) 767-7906

Certificate of Analysis

Certified Reference Material

ISO Guide 34:2009 (RMP) Accreditation Certificate Number AR-1436

ISO/IEC 17025:2005 Accreditation Certificate Number AT-1529

Product Description:

Name:	TCLP-Spk
Part Number:	**SM-606-114**
	Solution A
Lot Number:	**1803724**
Matrix:	4% HNO_3
Purity:	99.99% - 99.9996%

5757170
ID: ME_TCLP_A_00014
Exp: 02/12/19 Prpd: CDC
TCLP solution A stock

rec'd 2/12/18 LD

Certified Values:

Element	(µg/mL)	SRM ID	SRM Lot#	Element	(µg/mL)	SRM ID	SRM Lot#
Ba	5000 ± 30	3104a	140909	Mn	500 ± 7	3132	050429
Be	500 ± 5	3105a	090514	Ni	500 ± 3	3136	120619
Cd	500 ± 3	3108	130116	Se	500 ± 5	3149	100901
Co	500 ± 3	3113	000630	Sr	500 ± 3	*	
Cu	500 ± 3	3114	121207	Tl	500 ± 3	*	
Fe	500 ± 3	3126a	140812	Zn	500 ± 3	3168a	120629

Certified values are based on gravimetric and volumetric preparation, and verified against NIST SRM 3100 series when available via inductively coupled plasma optical emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor k is about 2.
* Refer to Traceability Information, Section d

Packaging and Storage Conditions:
The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Expiration Information:
The expiry date is guaranteed to be valid for twelve months from the shipping date provided and is guaranteed through the month of expiration. For this reason, standards from the same lot may have different expiration dates.

Shipped Date: **February 2018**

Certificate Issue Date: February 6, 2018

Moven Mutuvari
Moven Mutuvari PhD., Laboratory Manager

Lot No.: **1803724**
Rev. No.: 2.0.0
Page 1 of 2

HIGH-PURITY STANDARDS
www.highpuritystandards.com

P.O. Box 41727
Charleston, SC 29423
Phone: (843) 767-7900
Fax: (843) 767-7906

Certificate of Analysis

Certified Reference Material

ISO Guide 34:2009 (RMP) Accreditation Certificate Number AR-1436

ISO/IEC 17025:2005 Accreditation Certificate Number AT-1529

Product Description:

Name:	TCLP-Spk
Part Number:	**SM-606-114**
	Solution B
Lot Number:	**1803725**
Matrix:	5% HNO_3
Purity:	99.98% - 99.999%

5757173
ID: ME_TCLP_B_00011
Exp: 02/12/19 Prpd: CDC
TCLP solution B stock

rec'd 2/12/18 CD

Certified Values:

Element	(µg/mL)	SRM ID	SRM Lot#	Element	(µg/mL)	SRM ID	SRM Lot#
Ca	10000 ± 50	3109a	130213	K	10000 ± 50	3141a	140813
Mg	10000 ± 50	3131a	140110	Na	10000 ± 50	3152a	120715

Certified values are based on gravimetric and volumetric preparation, and verified against NIST SRM 3100 series when available via inductively coupled plasma optical emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.
* Refer to Traceability Information, Section d

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Shipped Date: **February 2018**

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Moven Mutuvari
Moven Mutuvari PhD., Laboratory Manager

Lot No.: **1803725**
Rev. No.: 2.0.0
Page 1 of 2

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Certificate of Analysis

Certified Reference Material

ISO Guide 34:2009 (RMP) Accreditation Certificate Number AR-1436

ISO/IEC 17025:2005 Accreditation Certificate Number AT-1529

Product Description:

Name:	TCLP-Spk
Part Number:	**SM-606-114** Solution C
Lot Number:	**1803726**
Matrix:	2% HNO_3 + 0.5% HF
Purity:	99.98% - 99.9999%

5757175
ID: ME_TCLP_C_00008
Exp: 02/12/19 Prpd: CDC
TCLP solution C stock

rec'd 2/12/18 LD

Certified Values:

Element	(µg/mL)	SRM ID	SRM Lot#	Element	(µg/mL)	SRM ID	SRM Lot#
Sb	500 ± 3	3102a	140911	Sn	500 ± 3	3161a	140917
B	500 ± 3	3107	110830	Ti	500 ± 3	3162a	130925
Mo	500 ± 3	3134	130418	V	250 ± 2	3165	160906
Ag	250 ± 1	3151	160729				

Certified values are based on gravimetric and volumetric preparation, and verified against NIST SRM 3100 series when available via inductively coupled plasma optical emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.
* Refer to Traceability Information, Section d

Packaging and Storage Conditions:
The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Expiration Information:
The expiry date is guaranteed to be valid for twelve months from the shipping date provided and is guaranteed through the month of expiration. For this reason, standards from the same lot may have different expiration dates.

Shipped Date: **February 2018**

Certificate Issue Date: February 6, 2018

Moven Mututuvari
Moven Mututuvari PhD., Laboratory Manager

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Certificate of Analysis

Certified Reference Material

ISO Guide 34:2009 (RMP) Accreditation Certificate Number AR-1436

ISO/IEC 17025:2005 Accreditation Certificate Number AT-1529

Product Description:

Name:	TCLP-Spk
Part Number:	**SM-606-114** Solution D
Lot Number:	**1803727**
Matrix:	5% HNO_3
Purity:	99.998% - 99.9999%

5757177
ID: ME_TCLP_D_00008
Exp: 02/12/19 Prpd: CDC
TCLP solution D stock

rec'd 2/12/18 LD

Certified Values:

Element	(µg/mL)	SRM ID	SRM Lot#	Element	(µg/mL)	SRM ID	SRM Lot#
Al	2500 ± 13	3101a	140903	Cr	2500 ± 13	3112a	030730
As	2500 ± 25	3103a	100818	Pb	2500 ± 15	3128	101026

Certified values are based on gravimetric and volumetric preparation, and verified against NIST SRM 3100 series when available via inductively coupled plasma optical emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.
* Refer to Traceability Information, Section d

Packaging and Storage Conditions:
The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Expiration Information:
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Shipped Date: **February 2018**

Certificate Issue Date: February 6, 2018

Moven Mutuvari
Moven Mutuvari PhD., Laboratory Manager

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Rec'd
4-5-19
DE

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-ICP-ICSAB-1

6830751
ID: ME_icp_ICSAB1_00001
Exp:09/22/20 Prpd:DLE Opn:04/05/1
ICP stock standard

ICP ICSAB Mix Solution 1

Lot #: 992184-1

Matrix: 5% HNO_3/0.5% HF

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Mo	100.0 ± 0.5 mg/L	Si	1000 ± 5 mg/L	Ti	100.1 ± 0.5 mg/L
Sb	100.0 ± 0.5 mg/L	Sn	100.0 ± 0.5 mg/L		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3), hydrofluoric acid (HF) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

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The Netherlands

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Rec'd 4-5-19 DE

CPI INTERNATIONAL

CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

Product #: TA-ICP-ICSAB-2

6830766
ID: ME_icp_ICSAB2_00001
Exp:09/22/20 Prpd:DLE Opn:04/05/1
ICP stock standard

ICP ICSAB Mix Solution 2

Lot #: 992185-1

Matrix: 5% HNO_3

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Ag	100.0 ± 0.5 mg/L	Cr	100.1 ± 0.5 mg/L	Pb	100.0 ± 0.5 mg/L
As	100.0 ± 0.5 mg/L	Cu	100.1 ± 0.5 mg/L	Se	100.0 ± 0.5 mg/L
B	1000 ± 5 mg/L	K	1000 ± 5 mg/L	Sr	100.0 ± 0.5 mg/L
Ba	100.0 ± 0.5 mg/L	Mn	100.0 ± 0.5 mg/L	Tl	100.0 ± 0.5 mg/L
Be	50.00 ± 0.25 mg/L	Na	1000 ± 5 mg/L	V	100.1 ± 0.5 mg/L
Cd	100.0 ± 0.5 mg/L	Ni	100.1 ± 0.5 mg/L	Zn	100.0 ± 0.5 mg/L
Co	100.0 ± 0.5 mg/L	P	1000 ± 5 mg/L		

Intended Use: This solution is intended for use as a certified reference material (CRM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured, processed, and certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO 17034**, and **ISO/IEC 17025**. This CRM was prepared to the certified concentrations shown above by gravimetric methods, using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to **NIST SRMs (see reverse side)**. The solution was stabilized using high purity nitric acid (HNO_3) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined based upon gravimetric procedures. Secondary verification of the certified concentrations was performed using ICP-OES that was calibrated and/or referenced against **NIST SRMs (see reverse side)**. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original CRM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

Period of Validity: CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

Chuck Goudreau, Certifying Officer

March 22, 2019
Certification Date

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Title: Digestion of Water and Wastewater Samples for Analysis by ICP and ICP-MS, SW846 Method 3010A

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Laura Demone	10/07/20	Donald Evans	10/06/20
Laura Demone Department Manager	Date	Donald Evans Operations Manager	Date
	10/05/20		10/06/20
Carl Armbruster Quality Assurance Manager	Date	Mark Acierno Laboratory Director	Date
Dan Helfrich Healthy & Safety Manager Coordinator	10/06/20 Date		

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

Method SW846 3010A covers the preparation procedures for the determination of elemental constituents in water samples, wastewater samples and leachates by inductively coupled plasma (SW846 Method 6010D) and inductively coupled plasma – mass spectrometry (SW846 Method 6020B).

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

The elements analyzed for by this method and the laboratory's reporting limits (RLs) are summarized below:

Element	Method 6010D Water (ug/L)	Method 6020B Water (ug/L)
Aluminum	200	40
Barium	200	4
Beryllium	2	0.8
Boron	50	80
Cadmium	4	2
Calcium	5000	200
Chromium	10	4
Cobalt	50	4
Copper	25	4
Iron	150	120
Manganese	15	8
Magnesium	5000	200
Molybdenum	20	4
Nickel	40	4
Potassium	5000	200
Silver	10	2
Sodium	5000	200
Strontium	20	4
Tin	50	16
Titanium	20	4
Vanadium	50	4
Zinc	30	16
Antimony	20	2
Arsenic	15	2
Lead	10	1.2
Selenium	20	2.5
Thallium	20	0.8
Silicon	500	n/a
Sulfur	200	n/a

2.0 Summary of Method

A volume of sample is refluxed with nitric acid until the digestate is light in color in a sample cup using a hot-block. After the digestate is reduced to a low volume, it is refluxed with hydrochloric acid and brought to a final volume for inductively coupled plasma (ICP) by SW846 Method 6010D or inductively coupled plasma-mass spectrometry (ICP-MS) analysis by SW846 Method 6020B.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Whenever reflux is required or sample is to be reduced, NEVER BOIL THE SAMPLE. Boiling could result in a significant loss of sample constituents.

4.2 See the current analytical SOPs for further information related to interferences: TestAmerica SOP Nos. ED-MT-004 *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by using SW846 Method 6010D* and ED-MT-034, *SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS*.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material [1]	Hazards	Exposure Limit [2]	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- Block Digestor: Adjustable and capable of maintaining a temperature of 90°C-95°C (Environmental Express or equivalent).

6.2. Supplies

- watch glasses
- 75 mm funnels
- 50 ml and 100 ml Hot Block Digestion Cups
- Whatman # 41 filter paper or equivalent
- 0.45 micron filter units and vacuum pump
- Pipettes varying volumes: Eppendorfs & Fisher

7.0 Reagents and Standards

7.1. Reagents

7.1.1. Nitric Acid, Concentrated - Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.2. Hydrochloric Acid, Concentrated - Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.3. Reagent Grade Water 18 Megohm Minimum

7.2. Standards

7.2.1 Stock ICP Spike Standards:

7.2.1.1 Solutions A, B, C, and D (ICP-Spk), Part No. 4400-100419DD01: commercially purchased from CPI International. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 1 for the standards certified concentrations and catalog numbers. 1000ppm each of Silicon and Sulfur purchased from CPI International or equivalent.

7.2.1.2 Solutions A, B, C, and D (TCLP-Spk), Part No. SM-606-114: commercially purchased from High-Purity Standards. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 1 for the standards certified concentrations and catalog numbers.

7.2.2 Stock ICP-MS Spike Standards:

7.2.2.1 ICPMS LCS/SPK, Part No. SM-606-111: commercially purchased from High-Purity Standards. Store at room temperature; for stability information, refer to manufacturer's instructions. This stock standard doesn't require any pre-dilutions and is ready to be spiked directly into the QC samples. See Attachment 1 for the standards certified concentrations and catalog numbers.

7.3 Working Spike Standards:

7.3.1. ME_LCS-int (for ICP prep) - Add the following to a 1000 ml volumetric flask and bring to volume using 5% HNO_3: 50 ml each of Part No. 4400-100419DD01 Solutions A, B, C, and D (Sec 7.2.1.1). Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

7.3.2. ME_TCLPspk (for TCLP prep) – Add the following to a 200 mL volumetric flask and bring to a volume using 5% HNO_3: 40 ml each of Part No. SM-606-114 (TCLP-Spk) Solutions: A, B, C, and D (Sec 7.2.1.2). Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample[4] Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Water	Polyethylene, glass	50 ml	HNO_3 to pH < 2 prior to shipment; if not, acidify upon receipt in lab [2,3]	180 Days	40 CFR Part 136.3

[1] Inclusive of digestion and analysis.
[2] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 24 hours. Just prior to digestion or direct analysis, verify pH<2. If pH≥ 2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).
[3] Aqueous samples may be stored at room temperature.
[4] All containers must be pre-washed with detergents, acids and water.

9.0 Quality Control

9.1. Sample QC - The following quality control samples are prepared with every 20 samples or every batch of samples digested whichever comes first.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	See the Quality Control Section of the referring analytical SOP (i.e., SOP No. ED-MT-004 and ED-MT-034)
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	
Matrix Spike (MS)[1]	1 in 20 or fewer samples	
Sample Duplicate (DUP)[1]	1 in 20 or fewer samples	
Matrix Spike Duplicate (MSD)	When requested by the client	

[1] The sample selection for MS and Sample Duplicate is random unless specifically requested by a client. Quality control samples prepared with each set of samples digested include Matrix Spike, Sample Duplicate, Method Blank, Laboratory Control Sample and Matrix Spike Duplicate (MSD: when requested by the client). Use the same environmental sample for the matrix spike and duplicate sample whenever possible. If insufficient sample volume is available, another environmental sample may be used for the duplicate sample.

9.2 Instrument QC

None

10.0 Procedure

10.1. Sample Preparation

10.1.1. Filtration Procedure for Dissolved Metals not filtered in the Field

10.1.1.1. The unpreserved sample must be filtered through a 0.45um filter unit as soon as practical after collection.

10.1.1.2. Collect the required volume of filtrate by using a 0.45um filter unit and a vacuum pump.

10.1.1.3. Acidify the filtrate with 1:1 HNO_3 to a pH of <2.

10.1.1.4. The method blank (MB) must be filtered and digested under the same conditions as the lab filtered samples.

10.1.2. During digestion, at least 2-3 ml of sample solution must be maintained in the digestion cup. Sample must never be allowed to go to dryness. If sample should go to dryness, discard sample and redigest.

10.1.3. Pour out 50 ml of well-mixed sample into a 50 ml digestion cups *[note:100 mL hot block digestion cups can be used, except use the same sample volume (50 mL) for the entire preparation batch].* Label the cup with the sample number using a permanent marker. Prepare the QC samples as follows.

10.1.3.1. Method Blank (MB): Pour out 50 ml of deionized reagent water into the 50 ml digestion cup. Label the cup MB mm/dd/yy (this being the date the sample was prepared) and batch number. The Method Blank is carried through the complete digestion process.

10.1.3.2. Matrix Duplicate (DU): Label the digestion cup assigned for the duplicate sample with sample number and suffix 'DU'. Pour 50 ml of the well-mixed sample.

10.1.3.3. Matrix Spike Sample (MS): Measure 50 ml of well-mixed sample into the appropriately labeled 50 ml digestion cups (cup is labeled with the sample number and suffix 'MS'). The resulting elemental concentrations are listed in Attachments 2 & 3.

- For ICP preps (non-TCLP): spike the ICP Matrix Spike sample with 1 ml of ME_LCS-int (Sec 7.3.1). If Silicon and Sulfur are needed, spike 0.2 mL each of 1000ppm Sulfur and Silicon.
- For ICP and ICPMS preps (TCLP): spike the Matrix sample with 0.5 ml ME_TCLPspk (Sec 7.3.2). If Silicon and Sulfur are needed, spike 0.2 mL each of 1000ppm Sulfur and Silicon.

- For ICP-MS preps (non-TCLP): spike the sample with 0.25 ml ICPMS LCS/SPK (Sec 7.2.2.1).

10.1.3.4. Laboratory Control Sample (LCS): Pour out 50 ml of deionized reagent water sample into the appropriately labeled 50 ml digestion cups. Label the cup 'LCS' and the batch number. Spike the ICP-LCS and ICPMS- LCS (as appropriate) in the same way as the Matrix Spike Sample, see Sec. 10.1.3.3. Refer to Attachments 2 & 3 for final elemental concentrations.

10.1.4. Add 1.5 ml concentrated HNO_3, cover with ribbed watch glass, place digestion cup on hot block and reduce volume to approximately 5 ml. Do not allow sample to boil or dry.

10.1.5. Cool digestion cup and add another 1.5 ml concentrated HNO_3, cover cup with a watch glass, and return to hot block allowing a gentle reflux action.

10.1.6. Continue heating, adding additional HNO_3 until the digestate is light in color or does not change in appearance. Additional acid must not exceed to more than 1.5 ml. Allow the sample to cool down

10.1.7. Add 5 ml of 1:1 HCl and warm cup gently for 15 minutes to dissolve any precipitate or residue. Allow sample to cool down.

10.1.8. Wash down watchglass and digestion cup walls with deionized water. If necessary, accurately label a new 50 ml sample cup and filter samples through a #41 Whatman filter paper to remove any silicates and other insoluble material that could clog the nebulizer on the instrument.

10.1.9. Bring the sample volume up to 50 ml.

10.1.10. Enter all batch/sample information into TALS (see Sec 11.4. for instructions). Print the sample labels from the batch and attach to the corresponding sample cups. These labels contain information such as: Job & sample number, Batch number and container number.

10.2. Calibration

10.2.1. The volume of the 50ml and 100 ml hotblock digestion cups are verified for each lot received. The 50 ml and 100 ml volume verification with the appropriate Lot number is documented in the 'Metals Labware Volume Verification Logbook.'

10.3. Sample Analysis

10.3.1. Refer to the Analytical SOP, TestAmerica Edison SOP No. ED-MT-004, and SOP No. ED-MT-034.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Concentration:

Refer to TestAmerica SOP No. ED-MT-004 and ED-MT-034.

11.4. Documenting and Reporting

11.4.1. Sample preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS).

11.4.1.1. Double click the TALS icon on the computer desktop. Enter your username and password and select Login.

11.4.1.2. Under TALS Menu, click the 'plus' sign next to Analyst. Double click Analyst Desktop II. Click the 'plus' sign next to Methods.

11.4.1.3. Right click the prep method that you are using to prep the samples. Select Create New Batch-From Scratch.

11.4.1.4. The analyst must enter the following information: Sample names (use scanners), initial and final sample volume, spike name and amount used, and all reagents and their corresponding lot numbers.

11.4.1.5. After saving the batch information in TALS, select Print-Batch Sheets (which must be submitted to metals analytical dept. along with the samples) and select Print-Batch Labels (which must be attached to the corresponding final digestate sample cups in the batch).

11.4.2. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable preparation batch.

11.4.2.1. Open the preparation batch and click on the Edit tab above to enter the Edit Mode.

11.4.2.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.4.2.3. Acknowledge by filling in responses to all unacknowledged findings.

11.4.2.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.4.2.3.2. Fill in the appropriate comments in the response box, then hit 'OK.'

11.4.2.3.3. Acknowledge all finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal

restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; SW-846, Method 3010A.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision

15.4. TestAmerica Edison SOP No. ED-MT-004, *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by using SW846 Method 6010B*, 6010C & 6010D; most current revision.

15.5. TestAmerica Edison SOP No. ED-MT-034, *SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS,* most current revision.

15.6. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.7. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Certificate of Analysis of ICP and ICPMS stock standard.
Attachment 2: ICP: Laboratory Control Sample and Matrix Spike Final Concentration in Soln (ug/L), for Non-TCLP and for TCLP
Attachment 3: ICP-MS Matrix Spiking Solution, ICPMS LCS/SPK

18.0. Revision History

- Revision 12, dated 07 October 2020
  - Updated SOP header with Eurofins emblem.
  - Sec 3: Updated location of 'Definitions' to Appendix 5 of Lab Quality Manual.
  - Throughout the document removed SOP references to the analytical methods 6010B, 6010C, 6020, and 6020A.
  - Sec 1.1: Updated the Reporting Limits table to reflect current lab practices.
  - Sec 7.2.1.1: Added Si and S to the list of stock ICP spike standards.
  - Sec 10.1.3.3: Added MS spiking instructions for Si and S.
  - Sec 11.3: Removed reference to SOP ED-MT-033.
  - Sec 15.9: Removed reference WI# EDS-WI-007, Metals preparation data review checklist, not applicable.
  - Attachment 2: Added LCS and MS final concentration in solution for Si and S.

- Revision 11, dated 06 September 2018
  - Throughout the SOP - revised to reference the analytical method 6010D and 6020B.
  - Sec 11.4.2: Replaced data review instructions (Metals Data Review Checklist-EDS-WI-007) with TALS Data Review Checker (DRC); instructions added in SOP.

- Revision 10, dated 03 August 2016
  - Updated this SOP to reflect the new initial and final sample volumes (50ml) keeping the sample/reagent volume ratio the same; 100 ml initial and final sample volumes have been removed from this SOP.
  - Removed all reference to SOP ED-MT-033 from this SOP.
  - Sec 6.2: Added 50ml hotblock digestion cups to the list of supplies.
  - Sec 7.2.2.1: Added the part number for the ICPMS stock spike standard.
  - Sec 8.0: Revised the minimum sample size to 50ml.
  - Sec 9.1: Added matrix spike duplicate to the list of QC sample.
  - Sec 10.1.3.3: Revised the spiking amount (ml) added to the Matrix spike sample to reflect the 50 ml final volume.
  - Sec 10.14, Sec 10.1.5, Sec 10.1.6, and Sec 10.1.7 Updated the amount (ml) of

reagents added to reflect the 50 ml final volume.
  - Sec 10.2.1: Added 50ml hotblock digestion cups.

- Revision 9, dated 19 August 2013
  - Sec 1 & 12: Updated LQM section references to reflect the most current LQM revision.
  - Sec 11.4.1.6. Added requirements to complete the Batch preparation section of the Metals Data Review Checklist (EDS-WI-007) prior to data submission.

- Revision 8, dated 24 August 2011
  - Sec 10.1.1.4: Added new section to include procedure for filtering method blanks.

- Revision 7, dated 13 April 2011
  - Sec 1.1: Revised to reference the analytical methods 6010C and 6020A and added their corresponding reporting limits to the Analytical Method Reporting Limits Table.
  - Sec 2.0, 10.3 & 11.3: Revised to reference the analytical methods 6010C and 6020A.
  - Sec 3: Revised LQM reference to the list of definitions.
  - Sec 4.2: Added SOP No. ED-MT-033 and ED-MT-034 for reference.
  - Sec 7.2.1 & 7.3: Added new spike standards for ICP (p/n 4400-100419DD01) and TCLP prep (TCLP-Spk).
  - Sec 8: Added Footnotes.
  - Sec 10.1.3.3: Added TCLP spiking instructions.
  - Sec 11.4: updated documenting and reporting instructions to comply with TALS procedure.
  - Sec 15: added applicable references.
  - Sec 17: Attachment 2: Updated Table to include TCLP spike concentration; deleted internal COC (previously attached as Attachment 4).
  - Updated COAs in attachment 1.

- Revision 6, dated 24 November 2008
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Sec 1.1: Deleted '*flame atomic absorption spectroscopy*.'
  - Added information related to ICP-MS (method 6020) where applicable (i.e. Sec 1.1, Sec 7 etc.).
  - Added Laboratory's reporting limits in Table format.
  - Sec 6: Updated list of equipment and supplies to include current materials used (e.g. added block digestor, deleted hot plate & centrifuge tubes).
  - Section 7: Included storage and stability information of reagents and standards. Updated the source of the stock spike standards and the preparation instructions for the ICP working spike standards.
  - Section 8: Updated in Table format and have included sample container, sample size requirements and method reference.
  - Sec 10: Deleted procedure for acid rinsing glassware; replaced use of beakers with disposable digestion cups
  - Deleted the use of 100 ml digestion cup and replaced with 125ml specimen cup.
  - Deleted procedure for transferring digestates from digestion cup to specimen cup. Also added information and procedure on internal chain of custody to identify

sample digestates.

- Section 15: Added applicable references
- Section 17: Added attachment 1 to include certificate of analysis of stock standards, attachment 3 to include on instrument elemental concentrations of the ICPMS QC samples and attachment 4 to describe the internal chain of custody used for the digested samples.

Attachment 1

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SoLN. A
DE 4-4-11

Expiry: 21-Sep-12

Certificate of Analysis

Date Rec'd 03/22/11 MP

Part Number: **4400-100419DD01**
Lot Number: **11C157**
Shelf Life: **18 Months**

TestAmerica/Edison
Custom Standard
5% HNO3

Concentrations in ug/mL ± 0.5%

Fe	1000	Zn	500
Se	2000	Mn	500
TL	2000	Ni	500
Be	50		
Cd	50		
Cr	200		
Co	500		
Cu	250		
Pb	500		
Ag	50		
Sr	500		
V	500		

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution B**
Lot Number: **11C157**
Shelf Life: **18 Months**

TestAmerica/Edison
Custom Standard
10% HNO3

Date Rec'd
03/22/11 MP

Concentrations in ug/mL ± 0.5%

Al	2000
Mg	20000
K	20000
Ca	20000
Na	20000

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution D**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
05/22/11 MH

TestAmerica/Edison
Custom Standard
2% HNO3

Concentrations in ug/mL ± 0.5%

As	2000
Ba	2000
B	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution C**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
03/22/11 MP

TestAmerica/Edison
Custom Standard
5% HNO3 + 2% HF

Concentrations in ug/mL ± 0.5%

Sb	500
Mo	500
Sn	500
Ti	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Certificate of Analysis

SM-606-111
(ICPMS LCS/SPK)

Lot # 1031503

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts and Oxides	99.98+%	HNO_3, 4% + Tr HF	µg/mL ± 0.5% See element list on reverse

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.
President

Exp Date: NOV 15 2011
MSDS ATTACHED

SM-606-111
(ICPMS LCS/SPK)
Element List
(µg/mL)

Aluminum	500
Antimony	5
Arsenic	10
Barium	10
Beryllium	5
Boron	100
Cadmium	5
Calcium	500
Chromium	10
Cobalt	5
Copper	10
Iron	500
Lead	5
Magnesium	500
Manganese	50
Molybdenum	10
Nickel	10
Potassium	500
Selenium	10
Silver	5
Sodium	500
Strontium	10
Thallium	4
Tin	10
Titanium	10
Vanadium	10
Zinc	50

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Certificate of Analysis

Rec'd 4-11-11 DE

SM-606-114 (TCLP-Spk)
Solution A

Lot # 1109507

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts and Oxides	99.995+%	HNO_3, 4%	µg/mL ± 0.5% See element list on reverse

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.

APR 0 7 2012

SM-606-114 (TCLP-Spk)

Solution A

Element List

(µg/mL)

Barium	5000
Beryllium	500
Cadmium	500
Cobalt	500
Copper	500
Iron	500
Manganese	500
Nickel	500
Selenium	500
Strontium	500
Thallium	500
Zinc	500

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Rec'd 4-11-11 DE

SM-606-114 (TCLP-Spk)
Solution B
Lot # 1109508

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts or Oxides	99.98+%	HNO_3, 5%	10,000 µg/mL ± 0.5% Calcium Magnesium Potassium Sodium

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.
President

APR 0 7 2012
Exp Date:
MSDS ATTACHED

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Certificate of Analysis

Rec'd 4-11-11 DE

SM-606-114 (TCLP-Spk) Solution C

Lot # 1109509

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts and Oxides	99.96+%	HNO_3, 2% HF, 0.5%	µg/mL ± 0.5% See element list on reverse

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.
President

Exp Date: APR 07 2012

SM-606-114 (TCLP-Spk)

Solution C

Element List

(µg/mL)

Anitmony	500
Boron	500
Molybdenum	500
Silver	250
Tin	500
Titanium	500
Vanadium	250

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Certificate of Analysis

rec'd 4-11-11 DE

SM-606-114 (TCLP-Spk) Solution D

Lot # 1109510

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts or Oxides	99.998+%	HNO_3, 5%	2500 µg/mL ± 0.5% Aluminum Arsenic Chromium Lead

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.
President

Exp Date: APR 07 2012
MSDS ATTACHED

Attachment 2

ICP: LCS & Matrix Spike Final concentration in solution (ug/L)		
ELEMENT	**For Non-TCLP**	**For TCLP**
Aluminum	2000	5000
Antimony	500	1000
Arsenic	2000	5000
Barium	2000	10000
Beryllium	50	1000
Cadmium	50	1000
Calcium	20000	20000
Chromium	200	5000
Cobalt	500	1000
Copper	250	1000
Iron	1000	1000
Lead	500	5000
Manganese	500	1000
Magnesium	20000	20000
Nickel	500	1000
Potassium	20000	20000
Selenium	2000	1000
Silver	50	500
Sodium	20000	20000
Thallium	2000	1000
Vanadium	500	500
Zinc	500	1000
Boron	500	1000
Molybdenum	500	1000
Tin	500	1000
Titanium	500	1000
Strontium	500	1000
Silicon	4000	4000
Sulfur	4000	4000

Attachment 3

ICPMS Matrix Spiking Solution, ICPMS LCS/SPK	
Element	**Matrix Spike Conc. (ug/L)**
Aluminum (Al)	2500
Antimony (Sb)	25
Arsenic (As)	50
Barium (Ba)	50
Beryllium (Be)	25
Boron (B)	500
Cadmium (Cd)	25
Calcium (Ca)	2500
Chromium (Cr)	50
Cobalt (Co)	25
Copper (Cu)	50
Iron (Fe)	2500
Lead (Pb)	25
Magnesium(Mg)	2500
Manganese (Mn)	250
Molybdenum (Mo)	50
Nickel (Ni)	50
Potassium (K)	2500
Selenium (Se)	50
Silver (Ag)	25
Sodium (Na)	2500
Strontium (Sr)	50
Thallium (Tl)	20
Tin (Sn)	50
Titanium (Ti)	50
Vanadium (V)	50
Zinc (Zn)	250

Title: TCLP LEACH Extraction Procedure using the Toxicity Characteristics Leaching Procedure by SW846 1311

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 This SOP describes the Toxicity Characteristic Leaching Procedure (TCLP) using Method 1311. The procedure is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid and multiphasic wastes.

1.1.2 TCLP extracts are prepared for the digestion and analysis of metals, extraction and analysis of semi-volatile organics and volatile organics. Refer to the appropriate analytical method for specific procedures and reporting limits.

1.1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1 Solid samples are extracted with an appropriate extraction fluid and then filtered prior to analysis. Liquids, with less than 0.5% solids, are directly filtered for analysis.

2.2 Multiphasic samples are extracted as specified by the method, either by combination or separate analysis.

2.3 There are three scenarios that migh preclude the necessity of performing the TCLP extraction procedure:

2.3.1.1 If total analysis of sample is not detectable or below regulatory limits, the "TCLP" need not be run.

2.3.1.2 If the initial filtrate even upon re-combination would yield results above regulatory limits, then the sample is deemed hazardous and the remaining sample need not be tumbled and filtered.

2.3.1.3 ZHE need not be run if analysis of bottle extracted sample is above regulatory levels and sample is deemed hazardous.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Potential interferences that may be encountered during analysis are discussed in the individual analytical methods.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

There are no specialized safety concerns associated with this method.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetic Acid	Corrosive Poison Flammable	10 ppm-TWA	Contact with concentrated solution may cause serious damage to the skin and eyes. Inhalation of concentrated vapors may cause serious damage to the lining of the nose, throat, and lungs. Breathing difficulties may occur.
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Sodium Hydroxide	Corrosive	2 Mg/M3-Ceiling	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Equipment

- Pressure Filtration Apparatus-Millipore
- Zero Headspace Extractor (ZHE)-Associated Design and Manufacturing
- Tumbling Apparatus-Associated Design and Manufacturing
- Metering Pump PC Titrate(Model# PC-1000-400)
- Magnetic Stirrer
- Hot plate
- pH meter-Orion
- Balance – capable of accurate weighing to ± 0.10g.
- 1L filtration flask + Buchner funnel
- Vacuum pump

6.2. Supplies

- Glass fiber Filters- 0.70u, 142mm (Environmental Express) – acid washed TCLP filters
- Extraction Bottles-2 Liter Teflon bottles or borosilicate glass
- 1 Liter plastic bottle (for metals only)
- Disposable pipets
- Tubing-Cole-Parmer (H-06406-66 Teflon FEP) or equivalent
- Thermometer-NIST traceable
- 400ml beakers and watch glasses
- Volumetric flasks-1000ml and 2000ml
- 20ml /40ml Glass VOA Vials
- Class A graduated cylinder, 100ml and 2000ml
- Disposable weigh pans + spatulas

7.0 Reagents and Standards

7.1 Reagents

Life of Reagents: 6 months
Storage Requirements: store at room temperature
Reagent grade: ACS grade

7.1.1 ASTM Type II water- deionized water

7.1.2 VOA Water, distilled water- obtained from VOA lab

7.1.3 Glacial Acetic Acid (conc.) - immerse in warm water if crystallized

7.1.4 Sodium Hydroxide Solution (1.0N.) - Dissolve 40g NaOH in 1000ml DI water.

7.1.5 Hydrochloric Acid Solution (1.0N)- Add 83 ml concentrated HCL to a 1L volumetric flask (partially filled with DI water) and dilute to the mark with deionized water.

7.1.6 Nitric Acid Solution (1.0N.)- Add 64 ml concentrated HNO3 to a 1L volumetric flask (partially filled with DI water) and dilute to the mark with deionized water.

7.1.7 Extraction Fluid #1- Add 125.4 ml glacial acetic acid and 1414.6 ml of 1.0N NaOH solution to deionized water and bring to 22 liter volume with deionized water. USE DISTILLED WATER FOR TCLP VOA FLUID, obtained from VOA lab, with the same volumetric measurements. The pH of the fluid must be 4.93±0.05. Record preparation and pH of the fluid in the TCLP/SPLP Reagent logbook.

Note: The pH of the fluid must be checked each time before use to ensure that they are within the specifications. If pH is not within the limits, fluids shall be discarded and fresh fluid must be prepared. Record the pH of the fluid in TALS under the initial pH of the leachate blank.

7.1.8 Extraction Fluid #2- Add 125.4 ml glacial acetic acid to de-ionized water and bring to 22 liter volume with deionized water. The pH of the fluid must be 2.88±0.05. Record preparation and pH of the fluid in the TCLP/SPLP Reagent logbook.

Note: The pH of the fluid must be checked prior to use to ensure that they are within the specifications. If pH is not within the limits, fluids shall be discarded and fresh fluid must be prepared. Record the pH of the fluid in TALS under the initial pH of the leachate blank.

7.2 Standards

Analytical standards should be prepared according to the applicable analytical methods.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation[1]	Holding Time[3,4]	Reference
Soils/water Volatiles[2]	Glass	100 g	Cool 4 ±2°C	14	SW846 1311
Soils/water Semi-volatiles	Glass	100 g	Cool 4 ±2°C	14	SW846 1311
Mercury	Plastic, Glass	100 g	Cool 4 ±2°C	28	SW846 1311
Metals, except Hg	Plastic, Glass	100 g	Cool 4 ±2°C	180	SW846 1311

[1] Preservatives should not be added to the sample before extraction. Refrigerate only.
[2] VOA Samples should be opened only prior to extraction. Do not agitate, stir, or mix samples. Obtain sample for weighing only after checking with VOA department sample custodian. Weigh the sample out in the VOA lab if other types of VOA analysis are to be conducted. The samples should only be brought to the TCLP room if only TCLP analysis is required.
[3] Rush jobs should be tumbled immediately after receipt.
[4] Extracts should be allowed to settle for approximately an hour and then be filtered. Do not delay filtration or wait a day to filter the samples; all samples must be filtered as soon as tumbling is completed.

9.0 Quality Control

9.1 Sample QC - The following quality control samples are prepared with each batch of samples.

9.1.1 Leachate Blank: Prepare a leachate blank for each batch of samples extracted or every twenty samples, whichever is more frequent. Leachate blank must be set up for each fluid type used. For water samples, a leachate blank must be filtered the same way as the water samples (use DI water). Subdivide blanks for both metals and organic analyses. Record pH before and after extraction in TALS. All reusable TCLP/ZHE extraction vessels must be routinely scheduled for use in leachate blank prep and analysts will exhaust all available reusable TCLP vessels before re-using the sample vessel for a Leachate Blank. Vessel use is tracked via work instruction EDS-WI-159, "Leachate Vessel Tracking for Leachate Blanks, non-volatile" (see Attachment 2).

9.1.2 Matrix Spike: Matrix spikes are to be analyzed for each method after extraction. Matrix spiking is performed at the regulatory level and is described in the appropriate analytical SOP. For metals, the matrix spike is added after filtration and before preservation.

10.0 Sample Preparation

10.1 Preliminary tests, non-volatile TCLP:

10.1.1. Phase type: Examine sample to determine whether sample is solid, liquid, or multi-phasic.

10.1.2. If the % dry solid is less than 0.5%, then filter the sample and discard the solid residue and filter paper, and use the filtrate as the TCLP extract.

10.1.3. If the waste will obviously yield no liquid with pressure filtration then proceed to Section 10.1.6.

10.1.4. For multi-phasic samples, if free liquid is visible, perform the % wet solid test. (Oily samples are treated as solids if they do not pass through filter). Use the % wet solids determination to calculate the quantity of extraction fluid to be used for multi-phasic samples (see formulas below).

10.1.5. % wet solid test:

10.1.5.1. Weigh the following items: filter paper, filtrate container which is used to collect the filtrate, and a sample container, usually a 400 ml beaker, which is used to contain the sample aliquot.

10.1.5.2. Evaluate the sample for particle size. If the sample contains large materials, let the sample pass thru a 0.375 inch sieve. Discard any large material retained in the sieve.

10.1.5.3. Weigh out 100-150g sample aliquot (if available) into the 400 ml beaker. Record the weight of the "sample+beaker." Transfer sample aliquot to the pressure filter apparatus.

10.1.5.4. After transferring the sample to the filtration apparatus, weigh the 400 ml beaker container with residue. Determine the final weight of the sample by subtracting the weight of the 400 ml beaker with residue from the sample + beaker weight (10.1.5.3).

10.1.5.5. Filter the sample and carefully remove the filter with residue. Note: Filter the sample to dryness. If the filter paper remains wet, perform the % dry solids test (see 10.1.5.6.8.4.).

10.1.5.6. If a dry solid residue is obtained on the filter paper, proceed as follows.

10.1.5.6.1. Weigh the sample container with filtrate. Store at 4ºC for later re-combination.

10.1.5.6.2. Determine the weight of filtrate collected (liquid phase) by subtracting off the initial weight of the filtrate container (10.1.5.1) from the sample container with filtrate (10.1.5.6.1).

10.1.5.6.3. Calculate % wet solids:

$$\% \text{ wet solids} = \frac{S}{\text{Total weight of waste (10.1.5.3)}} \times 100$$

where: S= weight of solid in grams; determined by subtracting off the weight of liquid phase (10.1.5.6.2) from the final weight of the sample (10.1.5.4).

Total weight of waste = in grams (liquid and solid phase)

10.1.5.6.4. The solid sample residue on the filter paper shall be used for extraction. The amount must be sufficient to support all analyses requested.

10.1.5.6.5. Quantitatively transfer the solid material, including the filter used to separate the liquid from the solid, into the extractor bottle.

10.1.5.6.6. Determine the appropriate fluid to be used (see 10.1.6).

10.1.5.6.7. Determine the amount of extraction fluid to be used (ml).

Amount of extraction fluid:

$$\frac{20 \times \%\ \text{wet solid (10.1.5.6.3)} \times \text{total weight of waste (10.1.5.4)}}{100}$$

10.1.5.6.8. If liquid material is entrained in the solid residue and filter paper from the filtration apparatus then proceed as follows.

10.1.5.6.8.1. Carefully remove the filter paper with residue from the filtering apparatus.

10.1.5.6.8.2. Weigh filter paper with residue.

10.1.5.6.8.3. Place the filter with residue in oven at 100±20℃ and dry. Repeat this step until weights agree by 1%.

10.1.5.6.8.4. Calculate % dry solids using the formula below:

$$\%\ \text{dry solids} = \frac{\text{(Wt. of dry waste + filter) - tared wt. of filter}}{\text{Total weight of waste (10.1.5.3)}} \times 100$$

10.1.5.6.8.5. If % dry solid is equal to or greater than 0.5% proceed to section 10.1.5.6.4 through 10.1.5.6.7.

10.1.6. Determination of Appropriate Extraction Fluid.

10.1.6.1. Use only Fluid#1 for TCLP VOA samples utilizing the ZHE for extraction.

10.1.6.2. For all other fractions, place 5.0g of sample in a 400ml glass beaker.

10.1.6.3. Add 96.5ml of DI water to beaker and stir the sample for 5 minutes using a magnetic stirrer.

10.1.6.4. Measure the pH of the solution using a calibrated pH meter and record the pH value.

10.1.6.5. If pH is less than 5.0, use extraction fluid#1. If pH is greater than 5.0 go to next step.

10.1.6.6. Add 3.5ml 1.0N. HCl and cover with watchglass.

10.1.6.7. Heat beaker to 50℃ on hotplate and maintain at 50° C for 10 minutes.

10.1.6.8. Let solution cool to room temperature.

10.1.6.9. Measure the pH of the solution. If pH is still less than 5.0 use Fluid #1 otherwise use Fluid #2.

10.2. Preliminary test, volatile TCLP

This method is used for the TCLP extraction of samples for volatile analysis. Do not allow waste, the initial liquid phase, or the extract to be exposed to the atmosphere for any more time than is absolutely necessary. Any manipulation of these materials should be done when cold (4℃) to minimize loss of volatiles. Headspace should not be allowed in any of the extraction or collection containers.

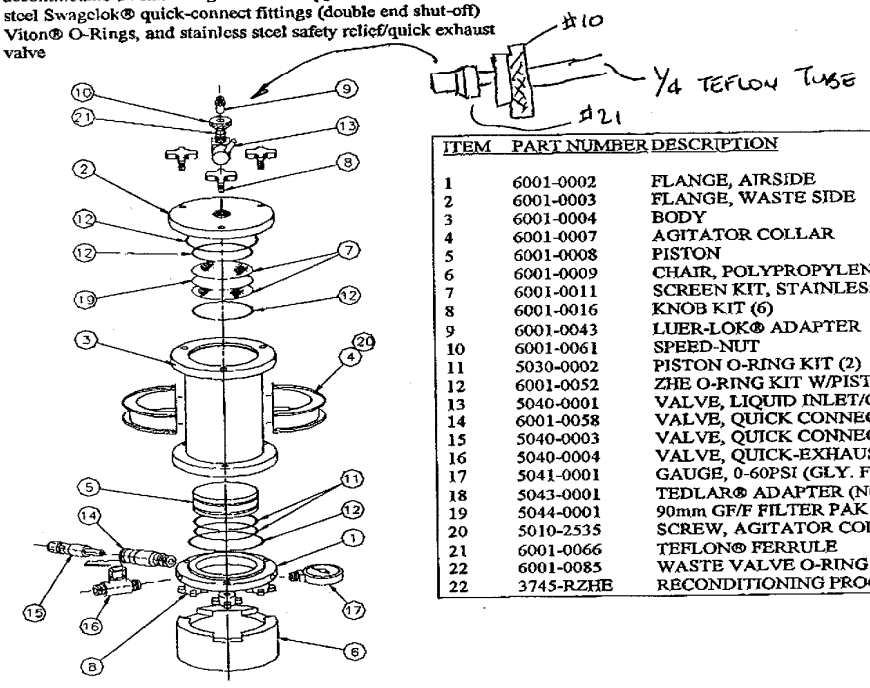
NOTE: **If the sample consists of pure oil, paint or solvent, consult the supervisor before proceeding.** If the sample matrix is deemed unacceptable for the ZHE extractor, the supervisor is required to contact the Project Manager to notify the client. The project manager and client would then evaluate if a total constituent volatile analysis of the sample will meet the needs of the project.

Assemble the ZHEs (refer to the diagram below for cited part no. references):

MODEL 3745-ZHE SPECIFICATIONS

MATERIAL: 316 Stainless Steel, all welds inspected per MIL-I-6866. Standard Viton® O-Rings, supplied with an agitator collar, and a polypropylene chair for set-up.
DIMENSIONS: 127.00mm (5.00") dia., 241.30mm (9.50") plus sample fitting. Will easily fit Associated Design's ROTARY AGITATOR MODEL: 3740-4-BRE, 3740-6-BRE, 3740-8-BRE, and 374-12-BRE.
CONNECTIONS: Sample side supplied with 316 stainless Steel Luer-Lok® adapter and a Teflon® bushing adapter to accommodate Tedlar® bags. Airside supplied with stainless steel Swagelok® quick-connect fittings (double end shut-off) Viton® O-Rings, and stainless steel safety relief/quick exhaust valve

PRESSURE: Working pressure 50 psi
FILTER/PREFILTER SIZE: 90mm .7 micron GF/F Filter
EFFECTIVE FILTRATION AREA: 45.8cm²
PISTON BREAKWAY FORCE: 2-5 psi
VOLUME: 550ml (nominal)
GAUGE: 2-1/2" dia., 0-60 psi glycerin filled



ITEM	PART NUMBER	DESCRIPTION
1	6001-0002	FLANGE, AIRSIDE
2	6001-0003	FLANGE, WASTE SIDE
3	6001-0004	BODY
4	6001-0007	AGITATOR COLLAR
5	6001-0008	PISTON
6	6001-0009	CHAIR, POLYPROPYLENE
7	6001-0011	SCREEN KIT, STAINLESS STEEL (2)
8	6001-0016	KNOB KIT (6)
9	6001-0043	LUER-LOK® ADAPTER
10	6001-0061	SPEED-NUT
11	5030-0002	PISTON O-RING KIT (2)
12	6001-0052	ZHE O-RING KIT W/PISTON O-RING
13	5040-0001	VALVE, LIQUID INLET/OUTLET
14	6001-0058	VALVE, QUICK CONNECT BODY
15	5040-0003	VALVE, QUICK CONNECT STEM
16	5040-0004	VALVE, QUICK-EXHAUST/RELIEF
17	5041-0001	GAUGE, 0-60PSI (GLY. FILLED)
18	5043-0001	TEDLAR® ADAPTER (NOT SHOWN)
19	5044-0001	90mm GF/F FILTER PAK (100)
20	5010-2535	SCREW, AGITATOR COLLAR (2)
21	6001-0066	TEFLON® FERRULE
22	6001-0085	WASTE VALVE O-RING KIT (3)
22	3745-RZHE	RECONDITIONING PROGRAM

All pieces of ZHE apparatus are labeled and assembled as a single unit. Assuming the vessel is unassembled, first place the Model #3745-ZHE body (3) with either end up and install the air side flange O-ring (12) in the gland on top of the body.

Replace the piston O-rings (12) on the piston (5) by stretching them over the piston and into the gland. NOTE: Be careful not to “roll” the O-rings into the gland. Wet the piston with extraction fluid.

Align the piston (5) carefully with the top of the body (3) and gently press it into the body. Continue pressing the piston into the body until it is completely inside the cylinder. NOTE: Care is necessary not to damage the O-rings. It may be helpful to moisten the O-rings with extraction fluid.

Locate the air side flange (1) and place it on top of the ZHE. Visually align the holes in the flange and the ZHE body and secure the flange with three knobs (8). Uniformly tighten the knobs.

Invert the partially assembly ZHE such that the air side flange (1) is now down.

Prepare a new Filter-Pak by placing a glass filter element between the two Stainless steel screens. Set the assembled filter-Pak to the side, until sample is added.

Locate the waste side flange (2) and install a Filter-Pak O-ring (12) in the inner gland of the flange. Install the body O-ring (12) in the outer gland of the waste side flange. NOTE: Be careful not to “roll” the O-rings into the glands.

Invert the waste side flange (2) and place it on top of the ZHE, aligning the holes at the same time.

Place the assembled ZHE with liquid inlet/outlet valve (14) on the top

Verify that both the liquid inlet/outlet valve (13) and the quick-exhaust/relief valve (16) are open. NOTE: The quick exhaust/relief valve is open when the handle is up and the liquid inlet/outlet valve is open when the arrow points up.

10.2.1. Obtain the sample from VOA lab and examine the sample phase type.

10.2.2. If the waste is 100% solid, proceed to section 10.3.

10.2.3. If the waste contains <0.5% dry solids, the liquid portion after filtration is defined as the TCLP extract. The amount of filtrate collected must be sufficient to support all volatile analyses requested.

10.2.4. If the waste contains material, which appears to be liquid but will not filter, this material is then defined as solid and is carried through the TCLP extraction.

10.2.5. If the waste visibly contains free liquid, >0.5% wet solid (10.1.5.6.3), determine the amount of waste to charge into the ZHE in grams as follows.

$$\text{Wt. of waste to charge to ZHE} = \frac{25}{\%\text{wet solid (10.1.5.6.3)}} \times 100$$

10.2.6. Weigh a 20 ml glass vial and sample container (usually 400 ml beaker). The vial will be used to collect the liquid portion of the sample and the beaker will be used for weighing the sample aliquot (solid + liquid phase).

10.2.7. Quantitatively transfer the entire sample into the ZHE vessel and place the filter and support screen. Tighten all fittings on the device and position the device vertically (gas inlet/outlet flange on the bottom).

10.2.8. Attach the nitrogen gas line to gas inlet valve and pressurize in 1-10 psi increments (up to 50 psi) to force all headspace slowly out of the ZHE. Recheck the pressure. If the device does not have the built-in pressure gauge, pressurize the device and submerge it in water, and check for the presence of air bubbles escaping from any other fittings. If pressure is lost, check all fittings and inspect and replace o-rings, if necessary. Retest the device. If leakage problem cannot be solved, tag the device out of service or contact the manufacturer for advice.

10.2.9. Place the 20 ml glass vial under the liquid inlet/outlet valve and open the valve to begin filtration. Apply 1-10 psi as needed to force the liquid phase of the sample into the 20 ml vial. If no additional liquid comes out of the ZHE, stop filtration. Close the liquid inlet/outlet valve and discontinue the addition of pressure.

10.2.10. Weigh the 20 ml vial containing the filtrate and store at 4ºC for later re-combination.

10.2.11. Determine the weight of filtrate collected (liquid phase) by subtracting off the weight of the 20 ml vial10.2.6.) from the weight of the 20 ml vial + filtrate (10.2.10).

10.2.12. If >1.0% of the original sample weight adhered to the beaker, determine the weight of this residue and subtract it from the original sample weight (10.2.5).

10.2.13. Calculate the weight of extraction fluid (ml) to add to the ZHE as follows.

$$\text{Wt. of extraction fluid} = \frac{20 \times \%\text{ wet solid} \times \text{wt. of waste (10.2.5 or 10.2.12)}}{100}$$

10.2.14. Take the filter with the solid residue from the ZHE and immediately transfer it to another vessel, which has been given a clearance by the VOA department manager.

10.2.15. Add the extraction fluid as determined in Sec. 10.2.13 into the vessel.

10.2.16. Proceed to section 10.3.6.

10.3. VOA TCLP Preparation

Note: Do not clean, load, or filter ZHE extracts if any volatiles are smelled in the immediate area.

10.3.1. Obtain clearance for ZHE vessels that are to be used from the VOA department.

10.3.2. Obtain the sample from the VOA lab.

10.3.3. Weigh out 25g of sample (or calculated amount if multi-phasic) and place in ZHE vessel.

10.3.4. Attach nitrogen to gas inlet valve and pressurize to 50psig.

10.3.5. Add 500 ml of fluid# 1 from a one (1) liter graduated cylinder into the ZHE vessel using the Fluid Metering Pump. Place a new filter and support screen on the vessel. Refer to Attachment #1 for a diagram depicting the set up of metering pump/ZHE vessel assembly.

10.3.6. Tighten/close the liquid inlet/outlet valve. Verify pressure relief valve is closed on bottom of ZHE. Be sure flange nuts are secured well before pressurizing ZHE!

10.3.7. Slowly bleed off any headspace gas and close the liquid inlet/outlet valve when any fluid appears.

10.3.8. Continue to pressurize ZHE to 50psig and detach the nitrogen line.

10.3.9. Place the ZHE onto the tumbler apparatus. Be sure the tumbler is balanced. Use an extra ZHE that is empty if necessary.

10.3.10. Set timer for 18±2 hours and speed at 30±2 rpm. Be sure you are not near apparatus when turning on, or serious injury could result! Note: The rotators must be checked daily to ensure they are rotating at 30±2rpm. Record rpm in TALS under batch information.

10.3.11. Ambient temperature should be maintained at 23±2℃ during the extraction process.

10.3.12. When tumbler stops (at 18± 2 hours), hold brake release button and rotate until ZHEs are right side up and allow sample to settle several minutes. Verify that pressure remains in the ZHE or the sample must be re-extracted.

10.3.13. Begin filtering samples by attaching a fresh length of teflon tubing to the ZHE's sample inlet valve and hold a fresh VOA vial below the tube outlet. Attach nitrogen line to gas inlet valve and slowly open sample inlet valve. **Note**: Do not delay filtration or wait a day to filter the samples; all samples must be filtered as soon as tumbling is completed.

10.3.14. Discard the first 25 ml of fluid as waste, unless multiphasic, and collect the remaining filtrate without headspace in the VOA vials. Three 20ml vials are minimum required.

10.3.15. If sample appears to be miscible and there is an original filtrate (10.2.9), filter the sample completely into the same 40ml vial in order to combine the original and final filtrate in a single container. If immiscible, a separate 20ml vials shall be used for the final filtrate. Note the filtrate volumes and record the results in lab workbook so that they can be later re-combined mathematically.

10.3.16. Label the vials with the sample number and date filtered on both the vials and cap and give to the VOA sample custodian. Also submit a copy of the batch information sheet.

10.3.17. Clean the ZHEs by disassembling all parts, including the O-rings, and washing with soap and water. If sample was unusually dirty, then O-rings and plastic inlet valve bushing should be changed and a test blank shall be tumbled per advice from VOA department.

10.3.18. Allow the ZHE vessels, partially disassembled, to air-dry.

10.4. TCLP (Non-Volatile Preparation)

10.4.1. Obtain sample and perform preliminary steps as described above (Sec.10.1).

10.4.2. Determine fluid type if sample requires extraction, see section 10.1.6.

10.4.3. Label bottles to be used for extraction including a Blank for each type of fluid used and for every 20 samples set up.

10.4.4. Perform filtration on required amount of sample (to leave 100g wet residue) if multi-phasic. Note volume and store filtrate in refrigerator.

10.4.5. If not multi-phasic, weigh out 100g of sample and place into a labeled 2 L extraction bottle. If there is limited volume, a lower weight can be used as long as the weight to volume ratio remains 1:20. Note: If a lower weight is used due to limited volume, document the deviation in the TALS and record it in the Non-conformance summary.

10.4.6. Add Extraction Fluid as calculated in 10.1.5.6.7.

10.4.7. Place bottles onto the tumbler apparatus keeping the tumbler balanced. Use extra bottle if necessary.

10.4.8. Set timer to 18±2 hours, set speed at 30±2 rpm and after moving clear of tumbler press start button. Note: The rotators must be checked daily to ensure they are rotating at 30±2rpm. Record rpm in TALS.

10.4.9. Ambient temperature should be maintained at 23±2℃ during the extraction process.

10.4.10. Stop tumbler periodically to loosen and re-tighten caps as needed to allow for the release of built-up pressure.

10.4.11. Remove bottles from tumbling apparatus when tumbling is complete and allow solids to settle for approximately an hour. **Note**: Do not delay filtration or wait a day to filter the samples; all samples must be filtered as soon as tumbling is completed.

10.4.12. Assemble Millipore pressure filtration apparatus with clean acid washed filter (purchased from Environmental Express).

10.4.13. Place labeled filtrate collection bottle beneath filtration apparatus and slowly pour approximately one liter of the extractor bottle contents into pressure filter. Filtrate shall be collected in an amber glass jars for organic analysis and plastic bottles for metals analysis. Note: bottle labels are printed directly from TALS database.

10.4.14. Attach top flange and be sure all flange nuts are securely hand tight.

10.4.15. Verify pressure relief valve is closed (located on top of apparatus) and pointed away from face.

10.4.16. With nitrogen line attached, increase pressure in 10psi increments until fluid begins to filter out. Increase pressure up to 50psi.

10.4.17. If filter clogs, a clean filter may be placed in the apparatus as many times as needed.

10.4.18. Finish filtering the remaining contents of the extractor bottle.

10.4.19. If multiphasic, combine original filtrate with filtered extract if miscible, otherwise note and record both volumes in lab workbook and preserve separately for analysis. Results will be combined mathematically.

10.4.20. Measure and record the pH of the filtrate.

10.4.21. Place amber bottles in TCLP refrigerator for non-VOA organics analysis. Give plastic bottles with extract for metals analysis to metal extraction personnel. Metals digestion department will preserve the extract with HNO3 to pH< 2. A small aliquot of the extract shall be tested before preserving the whole volume. If a precipitate forms when acidified, do not preserve sample to be analyzed with acid. Sample should be analyzed immediately.

10.4.22. Clean bottles with hot soapy water and rinse with deionized water. Allow air-drying.

10.5. Documentation

10.5.1. Obtain clearance sheets from VOA department before using ZHEs.

10.5.2. Submit a copy of ZHE batch information to VOA department with the sample extracts.

10.6. Calibration

The pH meter must be calibrated before use.

10.7. Sample Analysis

Refer to the appropriate analytical method for specific procedures.

11.0. Data Reduction

11.1. TCLP extraction is updated in TALS so the next method chain will update to 'Ready' status. The sample IDs and the batch information are entered into TALS at the time the samples are set up. The following data types are entered in TALS database: date/time tumbling start, date/time tumbling stop, rpm, initial amount (g), final amount (ml), initial pH, pH after HCL, initial room temp, final room temp, vessel number, filtration completion date/time, leachate pH, extraction fluid lot number and the date/time the final leachate pH is measured.

11.2. The department manager is responsible for reviewing the data for completeness and accuracy.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity

needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

14.2.1. No specific waste streams are generated for the extraction method.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW846 Method 1311.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.4. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.5. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.6. TestAmerica Edison Work Instruction # EDS-WI-062, TCLP_ASTM Extraction Data Review Checklist, most current revision.

15.7. TestAmerica Edison Work Instruction # EDS-WI-159, Leachate Vessel Tracking for Leachate Blanks, non-volatile, most current revision..

16.0. Method Modifications:

N/A

17.0. Attachments

Attachment 1: ZHE and Fluid Metering Pump Assembly

18.0. Revision History

- Revision 12, dated 11 Apr 2019
  - Section 9.1.1: Updated to include procedure for rotating vessels used for extraction of Leachate Blanks.
  - Added preamble to Section 10.2 which includes details on setup and use of ZHE vessels.
  - Section 10.2.8: Updated to included detailed ZHE leak check procedure
  - Sectoin 15.0: added reference to TestAmerica Edison Work Instruction # EDS-WI-159, Leachate Vessel Tracking for Leachate Blanks, non-volatile.
  - Attachment 2: added this attachment which details TestAmerica Edison Work Instruction # EDS-WI-159, Leachate Vessel Tracking for Leachate Blanks, non-volatile

- Revision 11, dated 29 September 2015
  - Section 6.2: replaced 'Tedlar Bag' with '20ml/40ml Glass VOA Vial'
  - Section 10.2: replaced 'Tedlar Bag' with '20ml/40ml Glass VOA Vial' throughout section.
  - Section 10.3: replaced 'Tedlar Bag' with glass vial throughout the section (20 ml or 40 ml as appropriate).

- Revision 10, dated 13 November 2012
  - Section 10.3.5 and Section 10.3.6: revised the order of steps such that the ZHE vessel is pressurized prior the introduction of the ZHE fluid.

- Revision 9, dated 17 August 2012
  - Approvals: added Organic Extractions Manager to the list of required approvals.
  - Section 6.1: added Metering Pump PC Titrate (Model# PC-1000-400)
  - Section 9.1.1.: following statement was added: "All reusable TCLP/ZHE extraction vessels must be routinely scheduled for use in leachate blank prep (it is not acceptable to reuse a single vessel for blank prep)."
  - Section 10.3.5: updated to reflect use of Metering Pump for transfer of fluid into the ZHE vessel.
  - Attachment 1: this new attachment depicting the Metering Pump/ZHE assembly was added.

- Revision 8, dated 10 January 2012
  - Sec 1.1.3 & 12: Revised LQM references to reflect the most current LQM.
  - Sec 6: Updated list of equipment and supplies.
  - Sec 10.3.12 and 10.4.9: Added room temperature requirement; subsequent sections adjusted accordingly.
  - Sec 15: Added applicable references.

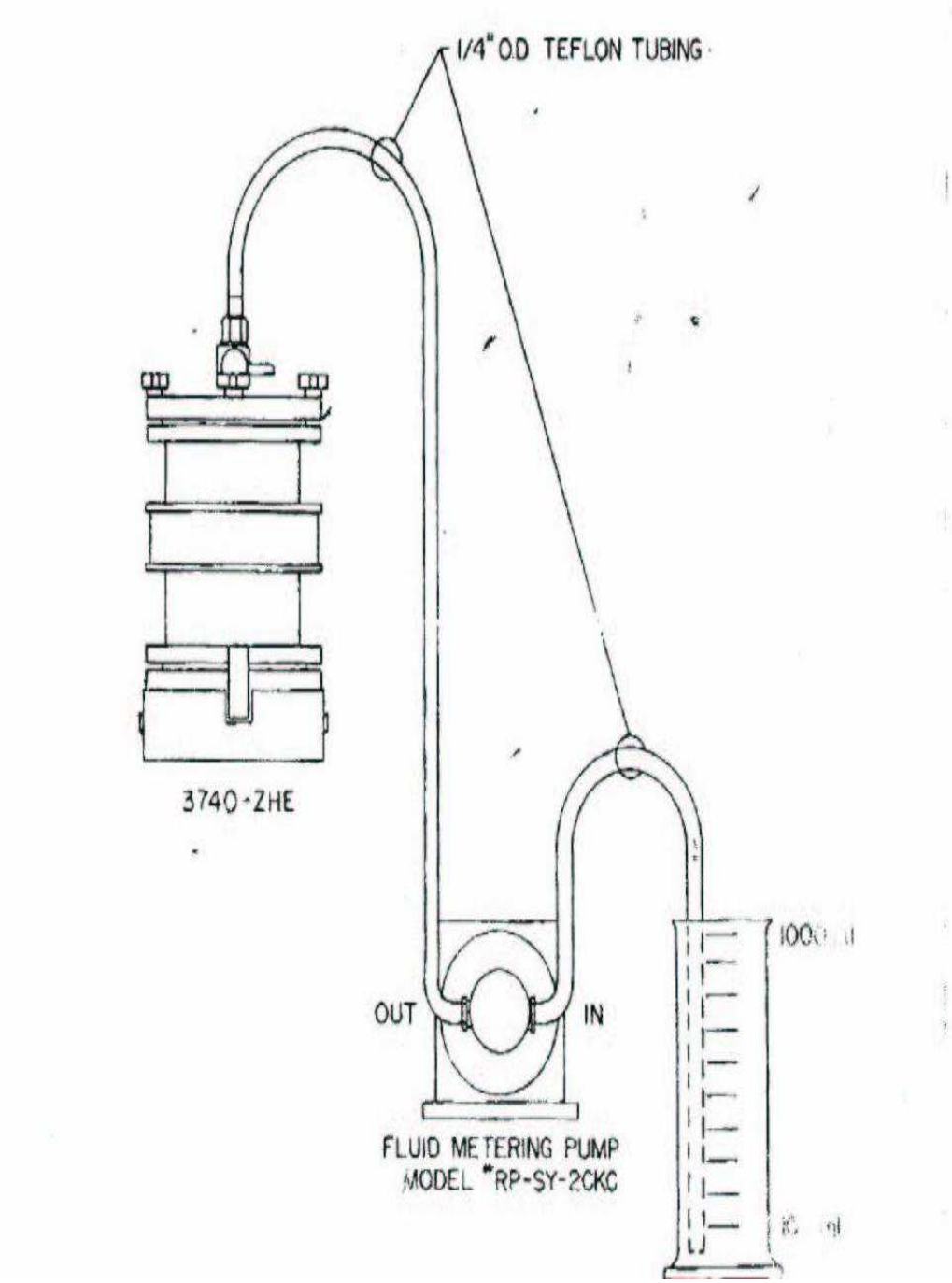
- Revision 7, dated 02 November 2009
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Sec 8: Clarified holding time for all matrices and TCLP analyses; reformat in Table format; additional footnotes included.

- Sec 9.1.1: Added the requirement for filtering a leachate blank with water sample batch.
- Sec 10.3.13 & 10.4.10: Specified the time limit required for sample filtration.
- Sec 10.5.2: Revised to include the use of TALS batch sheet instead of logbooks.
- Sec 11: Revised in accordance to the new TALS (deleted text: Use the start date (set up date) when updating in the LIMS system. For TCLP: Label blank as T042298 (T, followed by the start date). For ZHE: Label blank as Z042298 (Z, followed by the start date).
- Sec 11: Listed specific data types to enter in TALS database.
- Sec 15: Added applicable references.

- Revision 6a, dated 25 March 2009
  - Sec 9.3.11 & 9.4.8: Added text: The rotators must be checked daily to ensure they are rotating at 30±2rpm.
  - Sec 7.2.11: Revised text to clarify holding time. "Samples must be extracted and filtered within 14 days of the collection date for VOA and Semivolatiles. Extracts should be allowed to settle for approximately an hour and then be filtered.
  - Sec 7.2.2: Revised text to clarify holding time. "Samples must be extracted within 28 days of the collection for Mercury and 180 days for other Metals. Extracts should be allowed to settle for approximately an hour and then be filtered.
  - Sec 9.4.5: Deleted text: If extract is for metals only, a 50g sample can be weighed out and placed into a 1L plastic bottle. Revised text to:

    "If not multi-phasic, weigh out 100g of sample and place into a labeled 2 L extraction bottle. If not multi-phasic, weigh out 100g of sample and place it into a labeled 2L extraction bottle. If there is limited volume, a lower weight can be used as long as the weight to volume ratio remains 1:20. Note: If a lower weight is used due to limited volume, document the deviation in the TCLP logbook and TALS and record it in the Non-conformance summary."
- Revision 6, dated September 2006
  - Section 5.6: Volume of reagents used to prepare TCLP fluid was changed to reflect the actual volume prepared in the laboratory. The amount of glacial acetic acid was changed from 5.7 ml to 125.4 ml, the amount of 1N NaOH was changed from 64.3 ml to 1414.6 ml and the final volume was changed from 1000 ml to 22 liters.
  - Section 5.7: For the same reason as in section 5.6, the amount of glacial acetic acid was changed from 5.7 ml to 125.4 ml and the final volume was changed from 1000 ml to 22 liters.

Attachment 1:
ZHE and Fluid Metering Pump Assembly



Attachment 2:

Leachate Vessel Tracking for Leachate Blanks

1) Select a vessel to use for Leachate Blank (LB) and strikethrough the vessel ID number below.
2) Vessel ID numbers without a line drawn are available to use for Leachate Blank. Only use vessel without a line through it.
3) This tracking sheet is complete when all vessel ID numbers below are used up; reprint new tracking sheet.

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72

EDS-WI-159, Rev 0

02/28/2019

Title: Mercury Analysis for Water and Wastewater using EPA 245.1 and SW846 7470A; Mercury in Drinking Water using EPA 245.1; Leeman Mercury Analyzer (Cold Vapor Technique)

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

EPA Method 245.1 and SW846 Method 7470A are applicable to the determination of mercury in water matrices. Mercury may be found in water in both inorganic and organic forms. Organomercury compounds must first be broken down to respond to the cold vapor atomic absorption technique.

The typical detection limit using a 30 ml sample size is 0.2ug/L Hg.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

A digested sample is analyzed using cold vapor atomic absorption. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is measured as a function of mercury concentration.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 The addition of potassium persulfate during the digestion step can eliminate the possible interference from sulfide in the sample without affecting the recovery of inorganic mercury.

4.2 Copper may also be a potential interference although no effect has been observed for samples containing up to 10 mg/l total copper.

4.3 Samples that contain high levels of chloride have a potential to interfere due to a reaction that takes place during the oxidation step. During this step chloride is converted to free chlorine which absorbs light at 253.7 nm. The analyst must not allow the chlorine to be swept into the optical cell. The possibility of the chlorine interfering with the analysis can be minimized by using an excess of up to 7.5 ml hydroxylamine sulfate.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
a)Mercury b)(1,000 PPM in Reagent)	Oxidizer Corrosive Poison	0.1 mg/M^3 Ceiling (Mercury Compounds)	Extremely toxic. Causes irritation to the respiratory tract. Causes irritation. Symptoms include redness and pain. May cause burns. May cause sensitization. Can be absorbed through the skin with symptoms to parallel ingestion. May affect the central nervous system. Causes irritation and burns to eyes. Symptoms include redness, pain, and blurred vision; may cause serious and permanent eye damage.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison	1 mg/M^3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrochloric Acid	Corrosive Poison	5 PPM-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Permanganate	Oxidizer	5 Mg/M^3 for Mn Compounds	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Dry crystals and concentrated solutions are caustic causing redness, pain, severe burns, brown stains in the contact area and possible hardening of outer skin layer. Diluted solutions are only mildly irritating to the skin. Eye contact with crystals (dusts) and concentrated solutions causes severe irritation, redness, and blurred vision and can cause severe damage, possibly permanent.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1. Leeman Laboratories Inc. Hydra II AA Automated Hg Analyzer

6.1.2. Computer and Monitor with Leeman Envoy software

6.1.3. Block digestor (Environmental Express or SCP Science): Adjustable and capable of maintaining a temperature of 90 -95°C.

6.2 Supplies

6.2.1. 50 ml Hot Block Digestion Cups

6.2.2. 100 ml graduated cylinder

6.2.3. Eppendorf Pipettes and tips in various sizes

6.2.4. 100 ml volumetric flasks

6.2.5. 15 ml sample cups

6.2.6. 10 liter carboy container

6.2.7. Pump tubing:

- Sample, viton, blue tab
- Reductant, red tab
- Drain, blue tab
- Rinse, black tab

6.2.8. Drying Tube – Purchased pre-packed with Magnesium Perchlorate from Leeman Labs. Located prior to the optical cell.

6.2.9. Nitrogen or Argon supply - capable of producing 80 PSI.

7. Reagents and Standards

7.1. Reagents

Storage requirements: store at room temperature

Life of Reagent: - Concentrated acids: refer to manufacturer's instructions
- Laboratory prepared reagents and diluted acids: one year

Document prepared reagents in the Reagent module located in the TestAmerica Laboratory System (TALS).

7.1.1 Sulfuric acid - Concentrated (Trace Grade or Equivalent); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.2 Nitric acid - Concentrated (Trace Grade or Equivalent)

7.1.3 Hydrochloric acid-Concentrated (Trace Grade or Equivalent)

7.1.4 Potassium Permanganate (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.5 Sodium Chloride (analytical reagent grade); for stability information, refer to manufacturer's instructions.

7.1.6 Hydroxylamine Hydrochloride (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.7 Stannous Chloride (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.8 Potassium Persulfate (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.9 Deionized water - 18 megohm minimum

7.1.10 10% Hydrochloric Acid- Add approximately 5 liters of deionized water into an 8 liter carboy container. Cautiously add 800 ml of concentrated HCl and bring the final volume up to 8 liters with deionized water.

7.1.11 10% Stannous chloride solution - Add 50 g of $SnCl_2$ to 500 ml 10% HCl solution.

7.1.12 Sodium chloride/Hydroxylamine Hydrochloride solution - Dissolve 120 g of NaCl and 120 g of hydroxylamine hydrochloride in deionized water and dilute to 1 liter using deionized water.

7.1.13 Potassium Permanganate ($KMnO_4$) 5% solution w/v - Dissolve 100 g of $KMnO_4$ in deionized water and dilute to 2 liters using deionized water.

7.1.14 0.15% Nitric Acid- Add approximately 5 liters of deionized water into an 8 liter carboy container. Cautiously add 12mL of concentrated HNO_3 and bring the final volume up to 8 liters with deionized water.

7.1.15 Potassium Persulfate ($K_2O_8S_2$) 5% solution w/v: Dissolve 50 g of potassium persulfate in 1 liter of deionized water.

7.2 Standards

Storage requirements: all standards are stored at room temperature
Shelf-life: Stock standards – refer to manufacturer's instructions
Intermediate standards – made fresh daily
Working standards – made fresh daily

(Note: expiration date must not go beyond the expiration date of the source stock).

Concentration: see Attachment 1 for example certificates of analysis (COA) for all of the standards mixes listed below. The COA lists the manufacturer's part number, certified concentration and shelf life.

Document standard preparation in TALS (see Section 11.5.2).

7.2.1 Stock Mercury Calibration (10 ppm Hg) - Purchase from SCP Science; store at room temperature; for stability information, refer to manufacturer's instructions.

7.2.2. Stock Mercury Quality Control Standard (10 ppm Hg) - Purchase from Inorganic Ventures; store at room temperature; for stability information, refer to manufacturer's instructions. This stock standard must be purchased from a second source vendor.

7.2.3. Intermediate Calibration Standard (DCAL-Int): Dilute 1 ml of Stock Mercury Calibration (Sec 7.2.1) to 100 ml with 0.15% HNO_3. The resulting solution will contain 100ppb Hg.

7.2.4. Intermediate Quality Control Standard (DQCS-Int): Dilute 1 ml of Stock Mercury Calibration Verification Standard (Sec 7.2.2) solution to 100 ml with 0.15% HNO_3. The resulting solution will contain 100ppb Hg.

7.2.5. Calibration Standard Preparation: Use six 50 ml hot block digestion cups to prepare the standards. Add small portion of 0.15% HNO_3 to each cup. Working in increasing order, spike the appropriate cup with 0.0, 0.06, 0.3, 0.6, 1.5, and 3.0 ml of working solution DCAL-Int (Sec 7.2.3). Bring to final volume of 30 ml and mix thoroughly. The corresponding concentrations are 0.0ppb, 0.2ppb, 1.0ppb, 2.0ppb, 5.0ppb, and 10.0ppb mercury respectively. For drinking water analysis, the 2.0ppb standard is also analyzed as the Maximum Contaminant Level (MCL) standard

7.2.6. Quality Control Standard (QCS) Preparation: Add a small portion of 0.15% HNO_3 to a 30 ml hot block digestion cup and spike 1.5 ml of DQCS-Int (Sec 7.2.4). Bring up to final volume and mix thoroughly. The resulting solution will contain 5.0 ppb of Hg.

7.2.7. Initial Calibration Verification (ICV) standard: Add a small portion of 0.15% HNO3 to a 30 ml hot block digestion cup and spike 1.5 ml of DQCS-Int (Sec 7.2.4). Bring up to final volume and mix thoroughly. The resulting solution will contain 5.0 ppb of Hg.

7.2.8. Continuing Calibration Verification (CCV) standard 5.0ppb: The 5.0 ppb

prepared from the calibration standards (Sec 7.2.5) is used as the Continuing Calibration Verification standard (CCV).

7.2.9. Maximum Contaminant Level (MCL) standard 2.0 ppb *for drinking water analysis:* The 2.0ppb standard prepared from the calibration standards (Sec 7.2.5) is analyzed as the Maximum Contaminant Level (MCL) standard.

7.2.10. Reporting limit check standard (CRI) 0.2 ppb: Use the 0.2 ppb prepared from the calibration standards (Sec 7.2.5) as the reporting limit check standard (CRI).

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [2]	Reference
Waters	P. FP, G[1]	250 ml	HNO_3, pH < 2 prior to shipment; if not, acidify upon receipt in lab; Cool 4±2°C	28 Days	40 CFR Part 136.3

[1] Polyethylene, fluoropolymer, glass
[2] Inclusive of digestion and analysis
[3] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 16 hours for method 245.1 drinking water and 24 hours for non-potable water. Just prior to digestion or direct analysis, verify pH<2. If pH≥2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).

9.0 Quality Control

9.1. Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	**245.1**: < RL or; <10%sample concentration (whichever is greater) **7470A**: < RL; **or;** < 5% of the reg limit; **or,** < 5% of the measured sample concentration (whichever is greater)
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	**245.1**: 85-115% **7470A**: 80-120%
Matrix Duplicate (DUP)[1]	1 in 20 or fewer samples	20% RPD
Matrix Spike (MS)[1]	**245.1**: 1, if 10 samples or less; 2 if 11-20 samples **7470A**: 1 in 20 or fewer samples	**245.1**: 70-130% **7470A**: 75-125%
Matrix Spike Duplicate (MSD)	When requested by client	**245.1**: 70-130% **7470A**: 75-125% **For both 245.1** & **7470A**: If MS and MSD are both ≥ 5X CRDL, then 20% RPD. If MS and MSD are less than the CRDL, the RPD is not calculated; otherwise ±CRDL.
Serial Dilution (SD) for 7470A	1 in 20 or fewer samples	±10%

[1] The sample for DUP and MS are randomly selected, unless specifically requested by a client. Use the same environmental sample for the matrix spike and matrix duplicate sample whenever possible. If insufficient sample amount is available, another environmental sample may be used for the duplicate sample.

9.1.1 **Method Blank:** One laboratory method/preparation blank will be analyzed with each batch of samples prepared together (not to exceed 20 samples). Preparation blank is used to identify possible contamination during acid digestion. If the Mercury concentration in the MB is above the specified control limit, the batch must be prepared again and the samples reanalyzed.

- For 7470A, results must be less than RL, 5% of the regulatory limit for that analyte, or 5% of the measured concentration in the sample, whichever is greater.
- For 245.1, results must be less than RL or less than 10% of the determined Mercury concentration in the sample, whichever is greater.

9.1.2 **Laboratory Control Sample (LCS):** A laboratory control sample must be analyzed with each batch of samples digested. A blank is spiked with 0.1 ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. Results of the aqueous LCS must fall within ±15% of the true value for Method 245.1 and ±20% for Method 7470A.

9.1.3 **Matrix Duplicate (DUP):** A duplicate is analyzed for each batch of samples digested. If original sample and duplicate are both ≥ CRDL, then 20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL.

9.1.4 **Matrix Spike (MS):** A matrix spike is prepared and analyzed for each batch of samples. A portion of sample is spiked with 0.1 ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. A recovery of 70-130% for Method 245.1 and 75-125% for Method 7470A is required.

9.1.5 **Matrix Spike Duplicate (MSD):** When requested by the client, a matrix spike duplicate is prepared and analyzed for each batch of samples. A portion of sample is spiked with 0.1 ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. A recovery of 70-130% for Method 245.1 and 75-125% for Method 7470A is required. For both 245.1 & 7470A: if original sample and duplicate are both ≥ CRDL, then 20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL.

9.1.6 **Serial Dilution (SD):** For method 7470A, a five fold serial dilution must be performed on one sample per batch. The sample should contain a sufficiently high concentration; minimally a factor of 25 times above the estimated detection limit. Dilute the sample by a minimum of five fold (1+4) and reanalyze. Results must agree within 10% of the original determination. If not, a chemical or physical effect should be suspected.

9.2 Instrument QC

9.2.1. **Initial Calibration Verification (ICV):** Initial calibration is verified after calibration. The ICV solution should be prepared using a second source vendor; see section 7.2.7 for preparation instructions. Use a concentration of mercury at the midpoint of the calibration range (5.0ppb). The Cal standard containing 5ppb is analyzed as the ICV; see Sec 7.2.7 for preparation instructions. For 245.1, the results must not differ from the true value by more than 5%. For 7470A, the results must be within 10% of the true value. If it's outside of the acceptable limits, terminate the analysis, correct the problem and recalibrate the instrument.

9.2.2. **Continuing Calibration Verification (CCV):** Calibration verification is performed after the calibration, after every 10 samples, and at the end of the run. The CCV solution should be prepared from the same CAL standard as used to prepare the calibration solutions. Use a concentration of mercury at the midpoint of the calibration range (5.0ppb). The Cal standard containing 5ppb is analyzed as the CCV.

For 245.1 and 7470A, CCV must not differ from the true value by more than 10%. If it does, stop the analysis and recalibrate. Re-analyze the previous ten samples following the last good calibration verification.

9.2.3. **Initial and Continuing Calibration Blank (ICB/CCB):** ICB and CCB must be analyzed after the calibration curve, every 10 samples and at the end of the analytical run. For methods 245.1 and 7470A, the absolute value of the calibration verification blank must not exceed the reporting limit. If it does, terminate the analysis, correct the problem, recalibrate and reanalyze the samples following the last good CCB. The calibration verification blank is the same blank solution as used for the calibration blank.

9.2.4. **Maximum Contaminant Level (MCL):** For drinking water analysis, one MCL standard shall be analyzed per calibration. The 2.0ppb standard prepared from the calibration standards (Sec 7.2.5) is analyzed as the Maximum Contaminant Level (MCL) standard. The result must be within 50% of the true value. If it's outside of the acceptable limit, terminate the analysis, correct the problem, and recalibrate the instrument.

9.2.5. **Quality Control Standard (QCS):** The calibration is verified after calibration using a second source vendor; see Sec 7.2.6 for preparation instructions. For 245.1 and 7470A, the results must not differ from the true value by more than 10%. If it's outside of the acceptable limits, terminate the analysis, correct the problem and recalibrate the instrument.

9.2.6. **Reporting limit check standard (CRI):** At the beginning of the analysis, verify the accuracy at the reporting limit (RL) by analyzing a solution at the RL level. RL check solution is analyzed to demonstrate that the mercury analyzer is capable of detecting the target analyte at the reporting limit (RL). Laboratory limits are 50-150% of the true value.

10.0 Procedure

10.1 Sample Preparation

10.1.1 Filtration Procedure for Dissolved Mercury not filtered in the Field

10.1.1.1 The unpreserved sample must be filtered through a 0.45um filter unit as soon as practical after collection.

10.1.1.2 Collect the required volume of filtrate by using a 0.45um filter unit and a vacuum pump.

10.1.1.3 Acidify the filtrate with 1:1 HNO_3 to a pH of <2.

10.1.1.4 The method blank (MB) must be filtered and digested under the same conditions as the lab filtered samples.

10.1.2 If sample is preserved in laboratory, hold sample for 16 hours for method 245.1 drinking water and 24 hours for wastewater following acidification. Verify and record if sample pH is < 2.0 after 16 or 24 hours (depending on the analysis- drinking water or wastewater) and prior to digestion/analysis. If pH is > 2.0, add HNO3, hold for 24 hours and verify pH.

10.1.3 Transfer 30 ml sample (DI water for MB and LCS) or standard, or an aliquot diluted to 30 ml, to an appropriately identified 50 ml hot block digestion cup. For QA samples, transfer 3 aliquots of 30 ml sample to three digestion cups labeled as SAMPLE, DUP and MS. Spike LCSW and MS with 0.1 µg of mercury (0.3 ml of DCAL-INT standard).

10.1.3.1. Due to insufficient sample volume or an unusual matrix (e.g., samples with potentially high interferences), it may be necessary to perform a pre-digestion dilution. For example, a 10X pre-digestion dilution can be performed by transferring 3 mL of sample to 50 mL hotblock cup. Add 27 ml of deionized water. Record 3 mL initial volume and 30 mL final volume in TALS (see Sec 11.5.2). Continue to section 10.1.3.

10.1.4 Add 1.5 ml concentrated H_2SO_4 and 0.75 ml concentrated HNO_3 mixing well after each addition.

10.1.5 Add 4.5 ml of potassium permanganate solution to each bottle. Mix well and let stand for 15 minutes (minimum); if the color has disappeared, add additional $KMnO_4$ until the purple color persists for at least 15 minutes (document in the Sample preparation log any additional amount of $KMnO_4$ added). The same amount of $KMnO_4$ must be added to the standards and samples.

10.1.6 Add 2.4 ml potassium persulfate solution to each bottle.

10.1.7 Heat for 2 hours in a 95^{o} C hot block digestor. Remove from block digestor and cool.

10.1.8 Add 1.8 ml Sodium chloride - Hydroxylamine hydrochloride solution to reduce the excess permanganate. Mix well; solution should become colorless. If necessary additional Sodium chloride - Hydroxylamine HCl solution may be added.

10.1.9 Due to differing rates of evaporation, the final volume of the standards/samples maybe different. <u>The standards and samples, including all QC, must be at the same final volume before analysis;</u> if not, find the

sample or standard with the highest final volume (e.g., 41 mL) and add deionized water to any sample or standard to bring them to the same final volume . Mix well. Wait at least 30 seconds after decolorization before analyzing.

10.2 Calibration

10.2.1. The instrument must be calibrated daily or once every 24 hours and each time the instrument is set up. The instrument is calibrated according to the manufacturer's specifications and must contain at least four standards and a blank. The laboratory currently uses five standards and a blank. The correlation coefficient of the calibration curve must be ≥0.995. If it does not, the problem must be corrected, and the instrument must be recalibrated. Standard preparations must be documented in TALS (see Sec 11.5.2).

10.2.2. Prepare five calibration standards, blank and calibration verification standard as detailed in sections 7.2.5 and 7.2.6.

10.2.3. Calibration Curve Read-Back:

10.2.1.1 Low-Level Readback (at the RL) – evaluate the 0.2 ug/L calibration standard. The %RE (relative error) must be +/- 20% (see Sec 11.4). If %RE is outside of criteria limits, stop the analysis and recalibrate.

10.2.1.2 Mid- Level Readback – evaluate the 5.0 ug/L calibration standard (the mid-level calibration standard). The %RE (relative error) must be +/- 10% (see Sec 11.4). If %RE is outside of criteria limits, stop the analysis and recalibrate.

10.3 Sample Analysis

10.3.1 Following a sample digestion procedure, the samples are ready for instrumental analysis. It is advisable to investigate each matrix for any complexities, which might adversely affect the acquisition of valid data.

10.3.2 The following analytical run sequence is currently used:

Instrument Calibration (Blank and five standards)

ICV
ICB
CRI
QCS
MCL (for drinking water analysis)
CCV

CCB
10 Samples
CCV
CCB
Repeat until run is completed
CCV
CCB

10.3.3 Instrument Operation:

10.3.3.1. Turn on Computer, Monitor and the Hg analyzer (Hydra IIAA).

10.3.3.2. Plumbing the Reagent Lines:

10.3.3.2.1. One at a time, feed each of the pump tubes into a pump cassette, sliding the tube through the plastic clips at the bottom until the plastic tab is secure. Then, holding the tube taut, slide the loaded cassette onto the pump head and click the clamp, lever up. The tab end of the tube should be located at the front of the pump head.

10.3.3.2.2. Reductant (Red): Connect tab end of tube to the reductant tubing that is connected to the reductant bottle and the other end to the mixing tee.

10.3.3.2.3. Sample (Blue): Connect tab end of tube to the autosampler probe and the other end to the mixing tee.

10.3.3.2.4. Drain (Blue): Connect the tab end of tube to the sample discharge tube connected on the Liquid/Gas separator and the other end to the waste line.

10.3.3.2.5. Rinse (Black): Connect tab end of tube to rinse tubing that is connected to the rinse bottle. Connect the other end to the rinse tubing leading to the rinse cup.

10.3.3.3. Preparation of Reagents:

10.3.3.3.1. Pour the 10% $SnCl_2$ solution into the reductant bottle.

10.3.3.3.2. Pour the 10% HCl solution into the rinse reservoir bottle.

10.3.3.4. Start the Program:

10.3.3.4.1. Click the Envoy icon on the computer desktop

10.3.3.4.2. Click Method, select 245.1_7470A, and select OK
10.3.3.4.3. On the main screen, click the StartUp icon. Wait 15 minutes before analyzing calibrating.
10.3.3.4.4. Click Sequence Tab on bottom of screen
10.3.3.4.5. Click Sequence on top of screen
10.3.3.4.6. Select Open, then select New
10.3.3.4.7. Using the Prep Batch Sheet and hand scanner, enter the sample barcodes into the Sample ID column. Include the Serial Dilution and all needed sample dilutions
10.3.3.4.8. Pour out the digested calibration standards and samples into the proper locations on the autosampler.
10.3.3.4.9. Click the Run Sequence icon to begin calibration and to run samples.

10.3.3.4.10. To shut down the instrument, click the Stop icon on the main screen.

11.0 Calculations / Data Reduction

11.1 Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2 Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Final results calculation in aqueous samples :

$$\text{Concentration = mg/ L} = \frac{C \times V1 \times D}{V2}$$

Where:
C= Element concentration from instrument (ppb)
V1= Final volume of sample digested (in liters)
D= Dilution performed on sample

V2= Initial volume of sample digested
(in liters).

11.4. Relative Error (%RE):

% Relative Error = (100) (MC-TC)/TC

MC = Measured Concentration of the calibration standard
TC = True Concentration for the calibration standard

11.5. Data Processing:

11.5.1. All data is recorded directly in TALS' Analyst Desktop II program.

11.5.2. Record standard/sample preparations in the Analyst Desktop II program located in the TestAmerica Laboratory System (TALS) Reagent module. The analyst must enter the following information: Source standard, Initial and final sample volume, spike name and amount used, all reagents and their corresponding lot numbers, creation and expiration dates.

11.5.3. Record the following reagents and the volume used for sample preparation in the batch information page under "batch comments" in TALS Analyst Desktop II: concentrated sulfuric acid, concentrated nitric acid, potassium permanganate, potassium persulfate and sodium chloride-hydroxylamine hydrochloride. Record reagents in TALS by opening the prep batch, click on "edit" and then right click to choose "view batch information." Enter the information in the "batch comments" section.

11.5.4. Import Data to TALS

Click the Analysis tab

11.5.4.1. Select the analytical run that needs to be imported
11.5.4.2. Select Statistics
11.5.4.3. Click Load and select TALS Import, click OK
11.5.4.4. Click Report, click CSV File
11.5.4.5. Name the import file (e.g., batch name, today's date)
11.5.4.6. The newly created import file is in the Import Folder on the desktop Send to TALS Import Folder

11.5.5. Creating the Raw Data PDF:

11.5.5.1. Click the Analysis Tab, select Detailed

11.5.5.2. Click Load, select Use This To Make PDF

11.5.5.3. Click Report, Click Printer

11.5.5.4. Include the calibration curve graph:

11.5.5.4.1. Go to Methods Tab and click Calibration, click Print

11.5.5.5. Combine both documents using the PDF Creator program. The new document is located in the Documents folder on the C:\ drive. Add this document to the "Doc's" location in the analytical batch.

11.5.6. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch.

11.5.6.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.5.6.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.6.3. Acknowledge by filling in responses to all unacknowledged findings.

11.5.6.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.6.3.2. Fill in appropriate comments in the response box, then hit 'OK.'

11.5.6.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer

12. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2 Instrument Detection Limit:

The IDL for each analyte must be determined for each wavelength used on each instrument. The IDL must be determined annually or if the instrument is adjusted in any way that may affect the IDL. For 245.1, the IDL is determined by multiplying the average of the standard deviations obtained from the analysis of 10 reagent blanks by 3. For 7470A, the IDL is determined by multiplying the average of the standard deviations obtained from the analysis of 7 reagent blanks by 3.14

12.3 Linear Dynamic Range (LDR)

The upper limit of the LDR must be established. It must be determined from a linear calibration prepared from a minimum of three different concentration standards, one of which is close to the upper limit of the linear range. The LDR should be determined by analyzing succeedingly higher standard concentrations of mercury until the observed analyte concentration is no more than 10% below the stated concentration of the standard. The determined LDR must be documented and kept on file. The LDR which may be used for the analysis of samples should be judged by the analyst from the resulting data. Determined sample analyte concentrations that are greater than 90% of the determined upper LDR limit must be diluted and reanalyzed. The LDR should be verified annually or whenever, in the judgement of the analyst, a change in analytical performance caused by either a change in instrument hardware or operating conditions would dictate they be redetermined.

12.4 Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.5 Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal

restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out.

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

15. References / Cross-References

15.1. Determination of Mercury in Water by Cold Atomic Absorption Spectrometry, EMSL-Cincinnati, EPA/600/R-94/11, May 1994; Method 245.1 Revision 3.0.

15.2. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.

15.3. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.6. Corporate Environmental Health and Safety Manual CW-E-M-001, most current revision.

15.7. Leeman Hydra II AA Operating Manual

16. Method Modifications:

Item	Method No.	Modification

Sample Preparation	SW 7470A	Stannous Chloride is automatically added via the instrument versus the manual addition of Stannous Chloride as stated in the method. This is an instrument manufacturer's improvement that will reduce error due to loss of Mercury.
Sample Preparation	SW 7470A EPA 245.1	The hotblock has replaced the hot-water bath for digestion. This modification has been made to reduce cross-contamination (the hotblock tubes are disposable).
Sample Preparation	SW 7470A EPA 245.1	The typical prep sample size is reduced to 30ml (previously 100ml). This modification was made to allow for limited available sample volumes. Reagent volumes were adjusted to maintain sample to reagent volume ratio
Sample Preparation	EPA 245.1	The Initial Calibration Verification (ICV) will be prepared from a secondary source (as required in Method SW7470A), rather than the calibration standard source. Method 7470A and 245.1 will be prepared and analyzed in the same batch which improves efficiency and reduces waste. CCV will be prepared using the same source as the calibration standards.

17. Attachments

Attachment 1: Example Certificate of analysis (10 ppm Hg)

18. Revision History

- Revision 12, dated 03 August 2020
  - Updated header with Eurofins logo.
  - Sec 6.1.1: Replaced Hydra AA with Hydra IIAA
  - Sec 6.1.2: Updated Hg software from WinHg to Envoy.
  - Sec 8.0: Revised the required sample volume from 500ml to 250ml.
  - Sec 9.1: Revised MB control limits for 245.1 and 7470A to <RL; added MSD to the QC table.
  - Sec 9.1.1: Updated the control criteria for 245.1 and 7470A from <MDL to <RL.
  - Sec 9.1.3: Updated the criteria for the matrix duplicate to reflect current laboratory practices.
  - Sec 9.1.5: Added MSD to the list of Sample QC.
  - Sec 9.2.2: Revised the CCV recovery limit for method 7470A to 10%.
  - Sec 10.2.3: Added calibration curve read-back criteria.
  - Sec 10.3.3.4: Updated instructions for the instrument/software operation.
  - Sec 11.4: Added Relative % error calculation.
  - Sec 11.5.2: Added reagent/standard information to document in TALS ADII.
  - Sec 11.5.3.: Added requirements to record reagent volumes in the batch information page of TALS ADII; subsequent sections adjusted accordingly.
  - Sec 11.5.4 & 11.5.5: Updated instructions for data import and raw data pdf generation.
  - Sec 11.5.6: Added Data Review Checker (DRC) instructions.
  - Sec 15.7 & 15.8: Deleted work instructions EDS-WI-007 (TestAmerica Edison Metals Data Review Checklist) and WI EDS-WI-125 (TestAmerica Edison Metals

Initial-Calibration Data Review Mercury checklist), not applicable.

- Revision 11, dated 25 April 2018
  - Sec 8: Added footnote 3 to clarify instructions for metals sample preservation (verify pH <2.0 prior to digestion).
  - Sec 10.1.2: Added procedure for samples which pH are >2.0 and acid preservation is performed in laboratory.
  - Sec 12.3: Added procedure for the determination of linear dynamic range.

- Revision 10, dated 05 February 2018
  - Sec 7.2.10: Added CRI to the list of standards.
  - Sec 9.2.6: Added CRI to the list of instrument QC.
  - Sec 10.3.2: Revised the instrument sequence list to include CRI.

- Revision 9, dated 09 December 2015
  - Sec 7.2.7: Revised preparation procedure for ICV, standard solution should be obtained from a source different from the calibration standard. Removed reference to CCV.
  - Sec 7.2.8: Added CCV preparation procedure; standard solution same source as the calibration standard. Subsequent sections adjusted accordingly.
  - Sect 9.2.1: Revised - ICV solution should be prepared from a separate source.
  - Section 16: Added Method Modifications for using the secondary source when preparing the ICV standard for method EPA 245.1.

- Revision 8, dated 13 January 2014
  - Sec 7.1.8: Added the stock standard Potassium Persulfate to the list of reagents; subsequent sections adjusted accordingly.
  - Sect 7.1.15: Added preparation instructions for the 5% Potassium Persulfate solution.
  - Sec 7.1: Revised to include recording of reagent prep information in TALS and discontinue the use of Mercury Prep Logbook.
  - Sec 7.2.5 & 7.2.6: Revised the spiking amount to add when preparing calibration standards in 30 ml final volume; also replaced the 100 ml flasks with 50 ml digestion cups.
  - Sec 9.0: The matrix spike (MS) frequency for Method 245.1 has been revised to 1 per 10 samples to comply with the method.
  - Sec 11.4.4: Added the Mercury calibration checklist (EDS-WI-125).
  - Sec 15.8: Added WI# ED-WI-125 on the list of references; subsequent sections adjusted accordingly.
  - Sec 17: Updated the attached COA for the Hg standards.

- Revision 7, dated 02 December 2011
  - Sec 1.1: Revised detection limit to 0.2 ug/L Hg to reflect actual laboratory limits.
  - Sec 1 & 12: Revised the LQM reference for DOC and Test Methods and Method Validation to Section 19.
  - Sec 3: Revised LQM reference for the definitions.
  - Sec 5: Revised in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002, Writing a Standard Operating Procedure (SOP), most current revision.

- Sec 7.1: Added requirements that all prepared reagents are recorded in TestAmerica Edison Mercury Std Prep Log.
- Sec 7.2 & 10.2.1: Revised the documentation of standard preparation from logbook to TALS.
- Sec 7.2.5: Replaced cal std 0.1 ug/L (Hg) with 0.2 ug/L.
- Sec 9.1 and 9.1.1: Expanded MB control limit for 245.1 to reflect method's criteria.
- Replaced PB (preparation blank) with MB (method blank) in various sections where applicable.
- Sec 10.1.1: Added procedure for filtering dissolved samples in the lab.
- Sec 10.1.2.1: Added procedure for pre-digestion dilutions.
- Sec 10.1.8: Added procedure for visually checking and adjusting final volumes for all standards and samples.
- Sec 10.3.3.11.7: Added procedure for post-digestion dilutions.

- Revision 6, dated 03 September 2009

  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Combined SOP ED-MT-014 and ED-MT-015 with SOP ED-MT-017; retired SOP ED-MT-014 and ED-MT-015 at the effective date of this SOP.
  - Sec 6.1.3: Replaced water bath with block digestor.
  - Sec 6.2.1: Replaced 300 ml BOD bottles with 50 ml hot block digestion cups
  - Sec 6.2.3. Added 'Rinse Black' and changed Drain 'Black' to Drain 'Blue' in the list of Reagent lines
  - Sec 7.1: Added 0.15% HNO3 to list of reagents. Deleted Potassium Persulfate, Magnesium Perchlorate, 0.5N H2SO4 & 5% Potassium Persulfate solution to list of reagents; Reagents deleted are not applicable to this method.
  - Sec 7.2 Standards: Revised the Hg stock standard concentrations and preparation of standards.
  - Sec 7.1.9 & 7.1.13: Revised preparation procedure to reflect actual lab practices.
  - Sec 7.2.6: Renamed the second source standard 'Initial Calibration Verification standard' to 'Quality control standard.' QCS is added in the Instrument QC and analytical run sequence.
  - Section 8: Updated the section into Table format and have included the sample container, sample size requirements and method reference.
  - Changed the verification standard concentration of ICV (3ppb) to 5ppb; CCV concentration remains 5ppb.
  - Revised control limits to comply with Method 245.1
  - Sec 9.1.1: Clarified QC limits for the Preparation Blank
  - Sec 9.1.2: Revised the LCS limits for wastewater samples analyzed via Method 245.1 from ±20% to ±15%.
  - Sec 9.1.4: Revised the MS limits for wastewater samples analyzed via Method 245.1 from ±20% to ±30%.
  - Sec 9.1.5: Added Serial Dilution (L) in Sample QC
  - Sec 9.2.1: Clarified the recovery limits of ICV for method 245.1; % Rec limits were revised from 10% to 5% to reflect actual laboratory practices.
  - Sec 10.3.2: Added MCL in the analytical run sequence.
  - Sec 10.3.3.2: Added 'Rinse Black' and changed Drain 'Black' to Drain 'Blue' in the

list of Reagent lines.
- Sample size reduced from 100 ml to 30ml; preparation of the LCS (Sec 9.1.2) and MS (Sec 9.1.4) were revised to reflect this change in sample volume.
- Sec 10.1: Adjusted reagent volume to maintain sample to reagent ratios.
- Sec 11: Updated data processing in accordance with the new TALS.
- Sec 15: Added applicable references.
- Sec 16: Described the elimination of stannous chloride in the sample preparation and replacement of hot water bath as a method modification.

Attachment 1

SCP SCIENCE
Providing Innovative Solutions to Analytical Chemists

ACCREDITED

Certificate of Analysis

1.0 DESCRIPTION : ***Plasma*** **CAL – Custom Standard**

Catalogue Number : **141-110-11X**
Lot Number : **S130418021**
Matrix: 10.0% HNO3
Expiration Date : **July 2014**

2691783
ID: ME_Hg_1st_00013
Exp: 07/01/14 Post DLE
Mercury Calibration Stand

2.0 CERTIFIED VALUES AND ASSOCIATED UNCERTAINTY:

Method of Analysis: Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)

Traceability: Applicable NIST Standard Reference Materials (see list below):

3101a	Al	3109a	Ca	3117a	Eu	3126a	Fe	3134	Mo	3142a	Pr	3151	Ag	3159	Th	3167a	Y
3102a	Sb	3110	Ce	3118a	Gd	3127a	La	3135a	Nd	3143	Re	3152a	Na	3160a	Tm	3168a	Zn
3103a	As	3111a	Cs	3119a	Ga	3128	Pb	3136	Ni	3144	Rh	3153a	Sr	3161a	Sn	3169	Zr
3104a	Ba	3112a	Cr	3120a	Ge	3129a	Li	3137	Nb	3145a	Rb	3154	S	3162a	Ti		
3105a	Be	3113	Co	3121	Au	3130a	Lu	3138	Pd	3147a	Sm	3155	Ta	3163	W		
3106	Bi	3114	Cu	3122	Hf	3131a	Mg	3139a	P	3148a	Sc	3156	Te	3164	U		
3107	B	3115a	Dy	3123a	Ho	3132	Mn	3140	Pt	3149	Se	3157a	Tb	3165	V		
3108	Cd	3116a	Er	3124a	In	3133	Hg	3141a	K	3150	Si	3158	Tl	3166a	Yb		

Certified Concentrations:

Hg 9.96 ± 0.06 µg/ml

Note: The uncertainty of the certified value has been calculated from applicable uncertainty contributors (u_i) such as the SRM inherited uncertainty, weighing and dilution errors and instrument variability. The combined uncertainty ($u_c = \sqrt{\Sigma u_i^2}$) has been multiplied by a coverage factor (k) of 2 to provide a 95% confidence interval.

3.0 REFERENCE VALUES:

Density: **1.051 g/ml** @ **20.9 °C**

4.0 APPROVAL AND DATE OF CERTIFICATION:

Certification Approval: Yaling Sui, Chemist Yaling Sui
Certification Date: **April 19, 2013**

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c.c. CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 863.01

ACCREDITED Reference Material Producer Certificate 863.02

2.0 **DESCRIPTION OF CRM** **10 µg/mL Mercury in 10% (v/v) HCL**

2035815
ID: ME_Hg_00019
Exp: 04/01/14 Prod: CDC
Mercury Calibration Stand

Catalog Number:	MSHG-10PPM
Lot Number:	F2-HG02097
Starting Material:	Hg metal
Starting Material Purity (%):	100.0000
Starting Material Lot No:	R307HGA1
Matrix:	10% (v/v) HCL

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9.990 ± 0.074 µg/mL

Certified Density: 1.026 g/mL (measured at 20 ± 1°C)

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Certified Value $(\bar{x}) = \frac{\Sigma x_i}{n}$ ($\bar{x}$) = mean
x_i = individual results
n = number of measurements

Uncertainty (±) = $2 [\Sigma(s_i)^2]^{1/2}$ 2 = the coverage factor.
$[\Sigma(s_i)^2]^{1/2}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed.,

Title: Ignitability, Powder Train Method for Determining the Ignitability of Solid Samples by Method SW846 1030

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Jasmine Parillo 06/27/19	Dan Helfrich 06/28/19
Jasmine Parillo Date	Dan Helfrich Date
Department Manager	Health & Safety Manager /Coordinator
Carl Armbruster 06/27/19	06/27/19
Carl Armbruster Date	Mark Acierno Date
Quality Assurance Manager	Laboratory Director

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

This method is suitable for the determination of the ignitability of solids and is appropriate for pastes, granular materials, solids that can be cut into strips, and powdery substances.

This method may be used to meet certain regulatory applications, with respect to the characteristic of ignitability in CFR 4 261.21, but is not required to determine whether a solid waste "when ignited, burns so vigorously and persistently that it creates a hazard".

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Samples are screened to determine if the sample is explosive or extremely flammable by taking approximately 1 g of sample and holding a flame to it for 2 minutes if the waste is non-metallic (5 minutes for metal or metal/alloy powders). Materials that do not ignite during this time period do not require further testing. Samples that ignite will be subjected to the burning rate test, which determines the rate of burning by measuring the burning time over a distance of 100 mm.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. In laboratory tests the burning rate of duplicate runs is usually repeatable to within 10%. However, large differences in burning rates may occur if experimental conditions are not held constant. Variation in airflow rates, particle size, and moisture content of the test material will affect test results. Therefore, at least triplicate determinations of the burning rate should be conducted.

4.2. Particle size of test material can affect not only the burning rate, but also the ignition of the material. Therefore, the particle size of the test material should be the same for each test run. The particle size of the test material should be reported in a simple descriptive format (e.g., fine powder, sand, coarse granular).

4.3. Temperature of some test material such as sulfur powder affects the burning rate. For reproducible results, all tests should be performed at approximately the same initial temperature (ambient room or laboratory temperature).

4.4. All tests must be carried out inside a fume hood with the test apparatus situated perpendicular (90°) to the direction of airflow. A irflow parallel (0°) to the test apparatus results in non-reproducible burning rates.

4.5. The rate of airflow through the fume hood affects the burning rate. Too high an airflow distorts the flame and retards its horizontal propagation. The optimum airflow appears to be in the range of 0.7-1 meter per second.

4.6. Materials that are moisture sensitive (i.e., readily absorb moisture from air) should be tested as quickly as possible after removal from the sample container. All materials should be tested as received by the laboratory.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Because of the unknown reactivity of the materials being tested, the sash of the hood should be lowered to shield the operator. As an alternative, the operator may use a face shield if using a sash is not possible.

5.2. Primary Materials Used

There are no materials with a health rating of 3 or 4 used in this method. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

6.0 Equipment and Supplies

6.1 Instrumentation

None

6.2 Supplies

- Low-heat conducting, non-combustible, impervious ceramic tile or equivalent material, of approximate dimension of 25 cm x 25 cm x 2.5 cm (the tile must be at least 25 cm in length to support a 250 mm test sample).

- High temperature marker or equivalent marking device for marking ceramic plates.

- Powder Train Mold for molding powdered and granular materials for the burn rate test. The material of construction can be aluminum, brass, stainless steel, or plastic. The mold is 250 mm in length and has a triangular cross-section, with a width of 20 mm, and a depth of 10 mm as measured from the bottom of the triangular opening to where the sides meet. On both sides of the mold, in the longitudinal direction, two sheets are mounted as lateral limitations which extend 2 mm beyond the upper edge of the triangular cross-section.

- Propane fuel torch with a minimum diameter of 5 mm capable of attaining a temperature of at least 1,000℃. The theoretical ma ximum temperature of air-only torch is 1995 ℃.

- Stop watch.

- Thermometer to measure initial temperature of material (i.e., room temperature).

- Anemometer to measure airflow in the fume hood.

- Fine excelsior - Pine wood shavings

7.0 Reagents and Standards

None

8.0 Sample Collection, Preservation, Shipment and Storage

8.1. All samples are tested on as-received basis unless requested otherwise. No sample preservation is required, but sample containers should be completely filled and tightly sealed to preserve sample integrity.

8.2. Samples should be tested as soon as possible after removal from the sample container (i.e., samples should not be allowed to dry or absorb moisture for excessive periods or to lose volatiles). Samples that are chilled or cooled upon receipt to the laboratory should be allowed to equilibrate to the ambient laboratory temperature in the sample container.

9.0 Quality Control

9.1. Each time a sample is analyzed fine excelsior sample must be analyzed to check method performance. Pine wood shavings will be used for the excelsior. The burning rate of the excelsior must be more than 2.2 mm/sec. If the burning rate is less than 2.2 mm/sec, ensure that the airflow through the fume hood is between 0.7 m/sec and 1 m/sec (or 138-197 ft/min) and the particle size is uniform.

9.2. Matrix Duplicate: Analyze a duplicate sample for each batch of 20 samples.

Materials with the same particle size distribution should be used for replicate tests.

10.0 Procedure

10.1 Sample Preparation

10.1.1. Ignitability Screening Test

10.1.1.1. All tests must be performed on a clean ceramic plate at room temperature.

10.1.1.2. The ignitability screening test is conducted on all waste materials. **If the sample displays explosivity or extreme flammability, do not conduct the burning rate test.**

10.1.1.3. Place approximately 1 g of sample on the ceramic plate. Place the ceramic tile with the sample in a fume hood about 20 cm (approx. 8 inches) from the front of the hood and in an area of laminar airflow. Position the sample perpendicular to the airflow. The airflow across the perpendicular axis of the sample should be sufficient to prevent fumes from escaping into the laboratory and should not be varied during the test. The air velocity should be approximately 0.7 meters/second. Measure the air velocity using an anemometer.

10.1.1.4. Hold the propane torch to the sample until the sample ignites or for a maximum of 2 minutes if the waste is non-metallic (5 minutes for metal/ metal-alloy wastes). If the sample does not ignite, no further testing is required and the result is reported as 0.0 mm/sec. If the sample does ignite, the sample must be subjected to the burning rate test (see Sec. 10.1.2).

10.1.2. Burning Rate Test

10.1.2.1. The preparation of the test sample for the burning rate test will depend on the physical characteristics of the waste. Wastes that exist in a powdered or granular state are molded in a powder train mold. Pasty materials are formed into a rope 250mm in length with a cross-section of 1 cm^2. All tests for the burn rate test are performed on clean, ambient temperature, ceramic plates.

10.1.2.2. On a clean, impervious ceramic tile, clearly mark a 250 mm long test path. Make two additional timing marks at 80 mm and 180 mm from the start of the sample path. The distance between the two marks (100 mm) will be used to calculate the rate of burn.

10.1.2.3. Pour the material to fill the triangular cross section of the powder train mold loosely.

10.1.2.4. Drop the powder train mold from a height of 2 cm onto a solid surface three times to settle the powder. Place the clean ceramic test plate with the appropriate timing marks face down on top of the mold. Invert the setup and remove the mold.

10.1.2.5. Pasty wastes are prepared by spreading the waste on a marked ceramic tile in the form of a rope 250 mm in length with a cross-section of 1 cm^2.

10.1.2.6. Place the ceramic tile with the loaded sample prepared in a fume hood about 20 cm (~8 inches) from the front of the hood and in an area of laminar airflow. Position the sample perpendicular to the airflow. The airflow across the perpendicular axis of the sample should be sufficient to prevent fumes from escaping into the laboratory and should not be varied during the test. The air velocity should be approximately 0.7 meters/second. Measure the air velocity using an anemometer. *Note*: if air velocity is measured in ft/min, the range for air velocity is 138-197 ft/min.

10.2. Calibration

Perform QC test (see Section 9.1) prior to sample analysis.

10.3. Sample Analysis - Burning Rate Test

10.3.1. Light the propane fuel torch and adjust the height of the flame (6.5 to 7.5 cm). Apply the tip of the flame to one end of the sample strip to ignite the test strip.

10.3.2. When the test strip or powder train has burned up to the 80 mm time marker, begin timing the rate of combustion with a stop watch. Stop the timer when the burned strip reaches the 180 mm time marker. Record the amount of time (in seconds) required to burn the 100 mm test strip. Calculate the rate of burning by dividing the length of the burn test strip (100 mm) by the total time (seconds). Results of the burn rate test should be reported in mm/sec. Wastes that have a rate of burning of more than 2.2 mm/sec (or burn time of less than 45 seconds for 100 mm) are considered to have a positive result for ignitability according to DOT regulations. For metals, this time is 10 minutes or less for 100 mm (or a burn rate of more than 0.17 mm/sec).

10.3.3. If the sample has a positive burning rate (i.e. greater than 2.2mm/sec for non-metallic samples and greater than 0.17 mm/sec for metals), the analysis should be performed in triplicate and greater number reported.

11.0 Calculations / Data Reduction

11.1. Burn Rate (mm/sec) = $\dfrac{\text{length of the burn test strip (100 mm)}}{\text{Total time (sec.) from the 80 mm mark to the 180 mm mark}}$

11.2. Report results in mm/sec; report '0' for non-ignitable.

11.3. Record special notes and observations in the "worksheet" tab (i.e. sample appearance).

11.4. Record the room temperature in ℃, air velocity in ft/min, air flow meter ID, and acceptable excelsior burn rate on the "batch information" page. If there is not enough space to record all of the reagent info, utilize the "worksheet" tab under "notes" to record pertinent information.

11.5. Fill out the batch information page in TALS which includes: balance/oven/thermometer ID, date/time in and out of oven and temperature, filter ID. Enter a '1' on the line 'Perform calculation.' Enter '1000' on the 'Nominal Amount Used' line.

11.5.1. Complete the Data Review Checker (DRC) in TALS: Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.5.1.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.5.1.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.1.3. Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.1.4. Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12.0 Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0 Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0 Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. Soil Retain Samples: These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium.

Teris Profile Number : (incineration) 50016710
Onyx Profile Number: (stabilization) 402535

15.0 References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW846 Method 1030.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.4. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.5. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0 Method Modifications:

Item	Method	Modification
1	SW 846 1030	The preliminary screening test as outlined in the method is replaced by the ignitability screening test. The ignitability screening test consists of holding the flame to a 1 gram of sample for two minutes. If the sample does not ignite, no further testing is required. If it does, the sample will be subjected to the burning rate test. If a 1 gram aliquot of sample in the ignitability screening test does not ignite, a 250 mm train of sample in the preliminary screening test should not ignite in a given amount of time.

17.0 Attachments

None

18.0 Revision History

- Revision 9, dated 28 June 2019
  - Updated SOP header with the Eurofins emblem
  - Sec 11.5 Added requirements to fill out DRC checklist in TALS during first level review.
  - Sec 11.6 & 15.8 – Deleted references to Data Review Checklist WI# CA-Q-WI-041, not applicable.
- Revision 8, dated 12 June 2017
  - Sec. 9.1: Clarified that pine wood shavings will be used for excelsior
  - Sec. 11.4: Added the requirement to record air flow meter ID in batch information page.
- Revision 7, dated 01 May 2013
  - Sec. 1 and 12: Updated LQM section references to reflect the most current LQM revision.
- Revision 6, dated 19 April 2011
  - Sec. 2.0: Revised to describe ignitability screening test as per actual laboratory practices.
  - Sec. 6.2 & 10: Replaced Butane fuel torch with propane fuel torch.
  - Sec. 10.0: Replaced procedures for preliminary screening test with ignitability screening test.
  - Sec. 10.3.2.3: Added requirement that samples with a positive burn rate should be analyzed in triplicate per the method.
  - Sec. 11.4: Revised to include the acceptable excelsior rate in the “batch information” page.
  - Sec. 16.0: Added Method modification: preliminary screening test replaced with the ignitability screening test.

- Revision 5, dated 06/02/10
  - Updated Sections 2, 5, 13 and 14 to comply with the most current version of TestAmerica Corporate Quality SOP No. CW-QS-002 (Writing a Standard Operating Procedure (SOP).
  - Sec 9.1 & 10.1.2.6: Revised to include the required air velocity when measured in ft/min.
  - Sec 11.3 – 11.5: Data reduction added
  - Sec 15: Applicable references added.
- Revision 4, dated 03/03/08
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Added procedure for Burning Rate test (Sections 10.1.2 and 10.3.2).

Title: Cyanide Reactivity using SW846 Method No. Vol. 1c 7.3.3 and SW846 9014

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Approvals (Signature/Date):

Jasmine Parillo 06/16/20	Dan Helfrich 06/17/20
Jasmine Parillo Date	Dan Helfrich Date
Department Manager	Health & Safety Manager /Coordinator
Carl Armbruster 06/16/20	Mark Acierno 06/17/20
Carl Armbruster Date	Mark Acierno Date
Quality Assurance Manager	Laboratory Director

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

Volume 1C Section of SW846 and SW846 Method 9014 are applicable to the determination of reactive cyanide in solid and aqueous matrices. The laboratory's reporting limit for CN reactive is 25 ppm.

The regulation in 40CFR 261.23 defines reactive wastes to include wastes that have any of the following properties: (1) readily undergo violent chemical change; (2) react violently or form potentially explosive mixtures with water; (3) generate toxic fumes when mixed with water or, in the case of cyanide- or sulfide-bearing wastes, when exposed to mild acidic or basic conditions; (4) explodes when subjected to a strong initiating force; (5) explode at normal temperatures and pressures; or (6) fit within the Department of Transportation's forbidden explosives, Class A explosives, or Class B explosives classifications. This definition is intended to identify wastes that, because of their extreme instability and tendency to react violently or explode, pose a problem at all stages of the waste management process. NOTE: In July 1985, EPA issued interim guidance describing certain threshold levels for cyanide- and sulfide-bearing wastes and laboratory methods for evaluating such wastes. In April 1998, EPA withdrew the July 1985 guidance. Therefore, EPA does not recommend use of the interim threshold levels or methods (including this method) to determine if a waste is hazardous based on the characteristic of reactivity.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

An aliquot of sample has acid added to it in a closed system. Any cyanide that is generated is trapped in a scrubber tube containing NaOH. The solution is then titrated with 0.0192N $AgNO_3$ to determine the concentration of Cyanide.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Interferences are undetermined.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the

assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Potassium Cyanide will form Hydrogen Cyanide (HCN) gas when combined with strong acids. Breathing HCN gas may result in death.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Potassium Cyanide	Poison Corrosive	5 Mg/M3 TWA as CN	This material will form Hydrogen Cyanide (HCN) gas when combined with strong acids. Breathing HCN gas may result in death. Corrosive to the respiratory tract. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heart beat, unconsciousness, convulsions, coma and death. Solutions are corrosive to the skin and eyes, and may cause deep ulcers, which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation. Symptoms may include redness, pain, blurred vision, and eye damage.
Sulfuric Acid	Corrosive Oxidizer Dehydra-dator	1 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of vapors will cause irritation of the nasal and respiratory system.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Sodium Hydroxide	Corrosive	2 Mg/M3-Ceiling	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

None

6.2. Supplies

- 500 ml Equalizing Separatory Funnel
- Flow Rate Tube
- 500 ml round bottom flask- 2-neck Flask with 24/40 glass joints
- Magnetic Stir Bar
- Stir Plate
- Scrubber Set Up
- Nitrogen Source
- 400 ml Beaker
- Analytical Balance, capable of weighing to 0.001g
- Various Class A volumetric flasks and pipettors
- Specimen cups
- Disposable transfer pipettes
- 50 ml graduated cylinder

7.0 Reagents and Standards

7.1 Reagents

7.1.1. Sodium Hydroxide Pellets - Store at room temperature. For stability information, refer to manufacturer's instructions.

7.1.2. Concentrated Sulfuric Acid - Store at room temperature. For stability information, refer to manufacturer's instructions.

7.1.3. Acetone - Store at room temperature. For stability information, refer to manufacturer's instructions.

7.1.4. p-Dimethlyaminobenzalrhodanine - Store at room temperature. Discard after two years or earlier if necessary.

7.1.5. 0.5M H_2SO_4: 28 ml concentrated Sulfuric Acid diluted to 1 L with deionized water. Store at room temperature. Stable for 6 months.

7.1.6. 0.005M H_2SO_4: 20 ml 0.5M H_2SO_4 diluted to 2 L with deionized water. Store at room temperature. Stable for 6 months.

7.1.7. Rhodanine Indicator: 20 mg p-dimethyl-aminobenzalrhodanine in 100 mLs acetone. Store at room temperature. Stable for 6 months.

7.1.8. 0.25N NaOH - 10 g NaOH diluted to 1 L with deionized water. Store at room temperature. Stable for 6 months.

7.2 Standards

7.2.1. Primary (Simple) Cyanide stock solution, 1000mg/L: Purchased commercially from ERA (Catalog No. 997). Follow manufacturer's instructions for storage and stability. Standardize the solution against 0.0192N silver nitrate solution quarterly.

If prepared in house, prepare standard as follows: Dissolve 2.5 g of KOH and 2.51 g of KCN in 900 ml deionized water and bring volume to 1 L. Standardize the solution against 0.0192N AgNO3 on a weekly basis. Solution is stable for 6 months, store at 4℃.

7.2.1.1. Standardize the solution as follows:

- Take 5.0 ml of the primary stock cyanide solution (Sec. 7.2.1) and dilute it to 50ml using the 0.25 N NaOH. Add 10-12 drops of the rhodanine indicator (Sec. 7.1.7) to produce a bright yellow color.
- Using the 10 ml micro buret, titrate the stock cyanide solution from a bright yellow color to a salmon hue endpoint. Record the volume of silver nitrate solution used for the titration in the Standardization logbook.

- Titrate a blank using 50mls of 0.25N NaOH, 10-12 drops of rhodanine indicator. Record the volume of silver nitrate solution used for the titration in the Standardization logbook.

- Calculate CN concentration as follows:

Based on the following: $Ag^+ + 2\ CN \rightarrow [Ag(CN)_2]^-$

$$CN^-(mg/L) = \frac{A-B}{C} \times N \times \frac{2\ mol\ CN}{1\ eq\ AgNO_3} \times \frac{26.02g\ CN}{1\ mol\ CN} \times \frac{1000mg}{1\ g}$$

Where:
A= ml $AgNO_3$ for titration of sample
B=ml $AgNO_3$ for titration of blank
C= ml or g of sample
N= normality of $AgNO_3$

7.2.2. Record the preparation in the reagent TALS. Record final concentration in the Standardization logbook.

7.2.2. Standard 0.0192N Silver Nitrate Solution: Prepared by weighing 3.2647g of dried $AgNO_3$ (ACS grade) dissolved in deionized water and diluted to 1000ml. Store at 4 deg C; Prepare fresh every 6 months. Standardize 0.0192N $AgNO_3$ solution against the NaCl every two weeks.

7.2.2.1. Prepare a 25ppm NaCl standard by adding 2.5 ml of the 1000 ppm Sodium chloride solution (Sec 7.2.3) in 100 ml volumetric flask and bring up to volume with deionized water.

7.2.2.2. Titrate following the TestAmerica SOP No. ED-WET-043 *(Analysis of Chloride in water and soil samples)* and use the 0.0192N Silver nitrate (Sec 7.2.2) as the titrant.

7.2.2.3. Calculate the normality of the AgNO3.

7.2.2.4. Affix label on the container to include the Normality, standardization date and expiration date and analyst initials.

7.2.2.5. Record standardization in the Standardization logbook.

7.2.3. 1000 mg/L Sodium Chloride-purchased commercially. Store at 4 deg C; for stability information, refer to manufacturer's instructions.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Waters	HDPE	50 mLs	Cool 4 ± 2°C	None	Vol. 1c 7.3.3
Soils	Glass	3 grams	Cool 4 ± 2°C	None	Vol. 1c 7.3.3

[1] Inclusive of digestion and analysis.

9.0 Quality Control

The following quality control samples are analyzed daily or with each batch of 20 samples or less, whichever is more frequent. Water and soil samples are batched separately. Up to 20 samples can be put in a batch; this does not include Matrix duplicate, Method blank and Laboratory control sample.

9.1. **Method Blank:** Use deionized water for the Method Blank. The results must be below the reporting limit. If not, all samples associated with the MB must be re-distilled and re-analyzed. The volume of $AgNO_3$ needed to titrate the method blank is subtracted when calculating the sample concentration.

9.2. **Laboratory Control Sample, 40 mg/L:** A spiked blank is prepared and distilled each time samples are distilled or every 20 samples, whichever is more frequent. Prepare the blank spike solution by adding 0.40 ml of the CN Reference solution (Sec. 7.2.1) into 9.6 ml of deionized water and extract. Recoveries must be within laboratory generated control limits. If not, all samples associated with the LCS must be re-distilled and re-analyzed.

9.3. **Matrix Duplicate:** A duplicate sample is analyzed daily or 1 per 20 samples, whichever is more frequent. The relative percent difference between the results of the sample and the duplicate must be within the laboratory generated control limit.

10.0 Procedure

10.1 Sample Preparation

10.1.1. Assemble distillation and scrubber apparatus; see attachment 1.

10.1.2. Weigh 10.0 g of sample into 500 ml round bottom flask and add a stir bar. (For liquid samples, pour 10.0 ml of sample into flask).

10.1.3. Pour 250 ml of 0.005M H_2SO_4 into the equalizing separatory funnel.

10.1.4. Pour 50 ml of 0.25N NaOH into the scrubber tube.

10.1.5. Attach the top of the separatory funnel to the N2 source and slide the bottom of funnel into one opening in the flask.

10.1.6. Slide the gas scrubber tube into the second opening of the flask.

10.1.7. Make sure all connections are sealed tightly so that Nitrogen gas will not escape from the system.

10.1.8. Adjust the N_2 flow rate to 1 ml/sec. Check the flow rate as the N_2 leaves the scrubber tube by using the flow rate tube.

10.1.9. Release the 250 ml 0.005M H_2SO_4 in the funnel to the flask while spinning the stir bar at a rate of approximately 30 rpm. Note: the stirring should not be fast enough to create a vortex.

10.1.10. Let run for 30 minutes.

10.1.11. After 30 minutes, stop the Nitrogen flow and let the sample sit for 5 minutes before disconnecting the scrubber apparatus.

10.1.12. Transfer 25ml of NaOH solution to a specimen cup.

10.2 Sample Analysis

10.2.1. Place a white paper towel under the cup to produce a reflecting background. Add 10-12 drops of Rhodanine indicator (Sec 7.1.7) to the sample extract to produce a bright yellow color. Swirl sample to mix.

10.2.2. Using a transfer pipet, add 0.0192N AgNO3 drop at a time into the sample until the sample changes to a light salmon color (one drop is 0.025 ml). Swirl sample while adding titrant.

When excess AgNO3 is added after all of the cyanide has complexed, the combination of rhodanine indicator and silver will produce a brownish-pink color.

Note: If reactive sulfide is present, interference may cause no light salmon color. Re-extract the sample after treatment with $Bi(NO_3)_2$. Record re-extraction in TALS.

10.2.3. Record the $AgNO_3$ volume used to reach the endpoint in TALS.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value} - \text{dup. sample value}|}{[(\text{orig. sample value} + \text{dup. sample value})/2]} \times 100$$

11.3. Concentration:

Based on the following: $Ag^+ + 2CN \rightarrow [Ag(CN)_2]^-$

$$CN^-(mg/L) = \frac{A-B}{C} \times N \times \frac{2 \text{ mol CN}}{1 \text{ eq } AgNO_3} \times \frac{26.02 \text{ g CN}}{1 \text{ mol CN}} \times \frac{1000 \text{ mg}}{1 \text{ g}} \times 2^*$$

where:

A = mL $AgNO_3$ for titration of sample
B = mL $AgNO_3$ for titration of blank
C = mL or g of sample
N = normality of $AgNO_3$

* A 2 times dilution factor used since the sample is divided in two parts one for reactive sulfide and one for reactive cyanide. The reactive cyanide detection limit is 25 ppm if the entire sample extract is used.

11.4. Data Reduction

11.4.1. All reagent information is recorded in the "Batch Information" page. Use the 'Worksheet tab' if additional pages are necessary.

11.4.2. Record special notes and observations in the "worksheet" tab (i.e. sample appearance and notes on why samples were rejected or diluted).

11.4.3. All raw data is attached as a pdf file. This includes logbook pages if data was recorded in the logbook prior to entry in TALS.

11.4.4. Analyst must fill out the Wet Chem Data Review checklist (WI# EDS-WI-008) during the first level review. The batch is second level reviewed and the checklist is filed in wetchem department.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW846 Volume 1C Chapter 7.3.4 and Method 9014.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.4. TestAmerica Edison SOP ED-WET-043, *Analysis of Chloride in Water, wastewater and soil,* most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal*

Procedures, current revision.

15.6. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.7. TestAmerica Edison Work Instruction # EDS-WI-008, Wetchem Data Review Checklist, most current revision.

16.0. Method Modifications:

N/A

17.0. Attachments

Attachment 1: Diagram for the Reactive Cyanide distillation set-up

18.0. Revision History

- Revision 9, dated 17 June 2020
  - Updated SOP header with Eurofins emblem.
  - Sec 9: Clarified QC section including frequency and method blank matrix.

- Revision 8, dated 01 August 2018
  - Sec 7.2.1: Revised primary stock solution vendor source.
  - Sec 7.2.1.1: Revised to include the correct section references.

- Revision 7, dated 13 June 2014
  - Document Title and Sec. 1.1: Added reference to method SW846 9014.
  - Sec 6: Added graduated cylinder to list of supplies.
  - Sec. 7.2.1: Added pre-made CN stock solution purchased from Accustandard.
  - Sec 7.2.1.1: Added procedure for the standardization of Cyanide standard; removed reference to SOP ED-WET-002.
  - Sec. 9.2: Changed LCS recovery from 70-130% to laboratory generated control limits.
  - Sec 15: Added Method 9014 reference to Sec 15.1; Deleted SOP No. ED-WET-002 reference in Sec 15.6 and SOP No. ED-WET-007 reference in Sec 15.4 (both are not applicable to this SOP); subsequent sections adjusted accordingly.

- Revision 6, dated 13 December 2012
  - Sec 1 and 12: Updated LQM section references to reflect the most current LQM revision.
  - Sec 6.2: Deleted micro-buret and added transfer pipettes to list of supplies.
  - Sec 7.1.6: Revised reagent preparation instruction to reflect actual laboratory practices.
  - Sec 10.2: Revised entire section of sample analysis procedure to reflect actual laboratory practices.

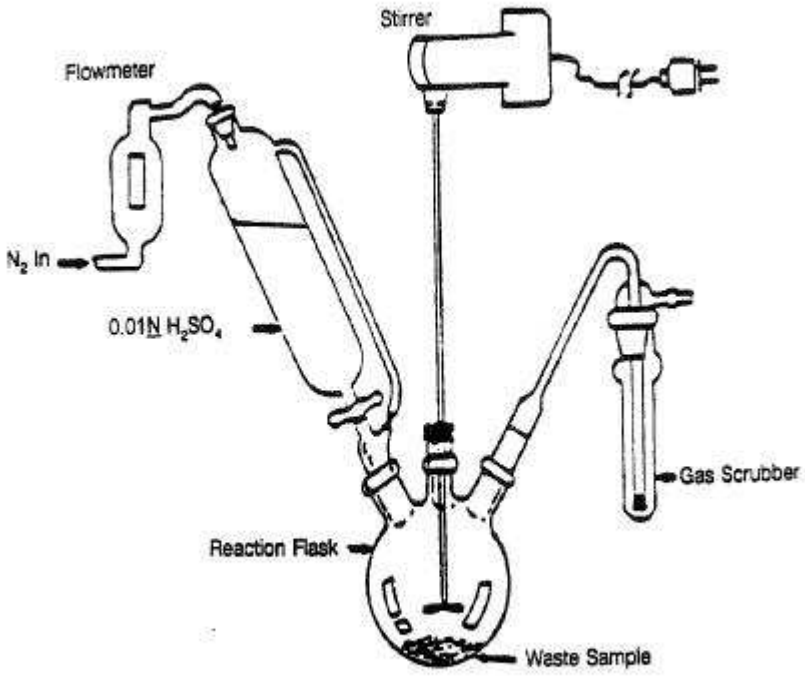
- Revision 5, dated 06 December 2010

- Sec 3: Updated LQM reference for the list of Definitions.
- Sec. 6.2: Added the following to the list of supplies: balance, various class A volumetric flasks and pipettors, specimen cups, and micro-buret.
- Sec 10.1.6: section added; subsequent sections adjusted accordingly.
- Sec 10.1.9: previously Sec 10.1.8, revised to add notes on sample stirring.
- Sec 10.1.11: previously section 10.1.10, revised to include procedure for disconnecting scrubber apparatus.
- Sec 11.4: Revised data reduction procedure to comply with TALS.
- Sec 13 & 14: Updated to comply with the most current version of TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
- Sec 15: Added applicable references.

- Revision 4, dated 15 September 2008
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 1.1: Included laboratory's reporting limit of 25 ppm.
  - Section 1.1: Added statement regarding USEPA withdrawal of this method for use in determining characteristic of reactivity.
  - Section 7.1: Added stability and storage information for all reagents.
  - Section 7.2: added stability, storage information and reagent grade where applicable.
  - Section 7.2.1: Added the SOP reference for the standardization of the CN stock.
  - Sec 7.2.3: Added procedure for standardizing the titrant 0.0192N AgNO3.
  - Sec 8.0: Changed the holding time from 14 days to no holding time.
  - Sec 9.2: Added the concentration, preparation and the recovery limit of Blank spike.
  - Added diagram in attachment 1.

Attachment 1

Reactive Cyanide distillation set-up



Note: Use a magnetic stir bar in the round bottom flask in place of the electric stirrer.

Title: Analysis of Sulfide Reactivity by Method SW846 Sec 7.3.4.2

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Jasmine Parillo 12/11/19	Dan Helfrich 12/12/19
Jasmine Parillo Date	Dan Helfrich Date
Department Manager	Health & Safety Manager /Coordinator
Carl Armbruster 12/12/19	12/11/19
Carl Armbruster Date	Mark Acierno Date
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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 Volume 1C Section of SW846 and SW-846 Method 9034 are applicable to the determination of reactive sulfide.

1.1.2 The reporting limit for soils is 20 mg/kg and the reporting limit for waters is 20 mg/l.

1.1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1 The regulation in 40 CFR 261.23 defines reactive wastes to include wastes that have any of the following properties: (1) readily undergo violent chemical change; (2) react violently or form potentially explosive mixtures with water; (3) generate toxic fumes when mixed with water or, in the case of cyanide- or sulfide-bearing wastes, when exposed to mild acidic or basic conditions; (4) explodes when subjected to a strong initiating force; (5) explode at normal temperatures and pressures; or (6) fit within the Department of Transportation's forbidden explosives, Class A explosives, or Class B explosives classifications. This definition is intended to identify wastes that, because of their extreme instability and tendency to react violently or explode, pose a problem at all stages of waste management.

2.2 An aliquot of sample has acid added to it in a closed system with the condition that the combination does not form explosive mixtures. Any hydrogen sulfide that is generated is trapped in a scrubber tube containing NaOH. The solution is then titrated with sodium thiosulfate and quantified.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Undetermined

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the

assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Sodium Sulfide will form Hydrogen Sulfide (HS) gas if combined with water moisture or strong acids. Inhalation of HS gas may be fatal.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Potassium Cyanide	Poison Corrosive	5 Mg/M3 TWA as CN	This material will form Hydrogen Cyanide (HCN) gas when combined with strong acids. Breathing HCN gas may result in death. Corrosive to the respiratory tract. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heart beat, unconsciousness, convulsions, coma and death. Solutions are corrosive to the skin and eyes, and may cause deep ulcers, which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation. Symptoms may include redness, pain, blurred vision, and eye damage.
Sulfuric Acid	Corrosive Oxidizer Dehydra-dator	1 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of vapors will cause irritation of the nasal and respiratory system.
Sodium Hydroxide	Corrosive	2 Mg/M3-Ceiling	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Sodium Sulfide	Corrosive	10 ppm-TWA 15 ppm-STEL	Will form Hydrogen Sulfide (HS) gas if combined with strong acids. Inhalation of HS gas may be fatal. Symptoms include painful conjunctivitis, headache, nausea, dizziness, coughing and, in extreme cases, pulmonary edema and possible death. Irritant. Contact with skin can produce serious caustic burns with painful inflammation and possible destruction of tissue. Inflammation, tearing and pain may be expected. Severe contact can cause destruction of tissue.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Supplies

- 500 ml separatory funnel
- Magnetic stir bar
- Magnetic stir plate
- Flow rate tube
- 500 ml round bottom flask with double neck
- Nitrogen source
- Scrubber set up
- Rotometer
- Analytical balance, capable of weighing to 0.001g

7.0 Reagents and Standards

7.1. Reagents

7.1.1. 0.5M H_2SO_4: In a 1 L flask, add approximately 500 ml of deionized water then add 28 ml concentrated sulfuric acid. Dilute to the mark with deionized water. Stable for 6 months. Store at room temperature.

7.1.2. 0.005M H_2SO_4: Dilute 10 ml of the 0.5M H_2SO_4 to 1 L with deionized water. Stable for 6 months. Store at room temperature.

7.1.3. 0.25N NaOH: Dissolve 10g NaOH in 1 L deionized water. Stable for 6 months. Store at room temperature.

7.1.4. 0.025N Iodine solution: purchased commercially. Add 2 ml of 6N HCl per liter of solution. Store at room temperature. Discard after one year of receipt or use manufacturer's expiration, whichever comes first. Standardize weekly against 0.025 N Sodium Thiosulfate and record in the standardization logbook.

7.1.4.1. Standardization of 0.025 N I_2 solution.

7.1.4.1.1. In a 500 ml Erlenmeyer flask, dissolve 2 g KI in 150 ml of deionized water. Add 20.0 ml of Iodine solution and dilute to 300 ml.

7.1.4.1.2. Titrate with 0.025 N Sodium Thiosulfate until the amber color fades to yellow. Add starch indicator and continue titrating until the disappearance of blue color.

7.1.4.1.3. Calculate normality based on the equation below:

$$\text{Normality } (I_2) = \frac{\text{Normality } (Na_2S_2O_3) \times \text{Volume } (Na_2S_2O_3)}{\text{Volume } (I_2)}$$

7.1.5. 0.025N Standard Sodium Thiosulfate Solution: purchased commercially. Store at room temperature. Discard after one year of receipt or use manufacturer's expiration, whichever comes first. Standardize quarterly against 0.025N Potassium Dichromate and record in the standardization logbook.

- To prepare sodium thiosulfate in house: dissolve 6.025±0.005 g $Na_2S_2O_3 \cdot 5H_2O$ in 500 ml DI water. Add 9 ml of 1 N NaOH and dilute to one liter.

7.1.5.1. Standardization of 0.025 N Sodium Thiosulfate Solution

7.1.5.1.1. In an Erlenmeyer flask, pipet 5.0 ml of 0.025 N K_2CRO_7 (Sec. 7.1.6) in 85 ml DI water. Add 3 g KI crystals. Add 1.0 ml concentrated H_2SO_4 and let stand in the dark for 10 minutes.

7.1.5.1.2. Titrate with 0.025 N Sodium Thiosulfate until the amber color fades to yellow. Add starch indicator and continue titrating until the disappearance of blue color.

7.1.5.1.3. Calculate normality based on the equation below:

$$\text{Normality } (Na_2S_2O_3) = \frac{\text{Normality } (K_2Cr_2O_7) \times \text{Volume } (K_2Cr_2O_7)}{\text{Volume } (Na_2S_2O_3)}$$

7.1.6. 0.025 N Potassium Dichromate- Add 0.123 grams of Potassium Dichromate, dried for an hour at 103-105° C, into a volumetric flask and dilute to 100ml with deionized water. Store at room temperature. Stable for 6 months.

7.1.7. Hydrochloric Acid, 6N: In a 500 ml flask, add approximately 200 ml of deionized water then add 250 ml of conc. HCl. Dilute to the mark with DI water. Stable for 6 months. Store at room temperature.

7.1.8. Starch solution: purchased commercially. Store at room temperature. Follow manufacturer's guidelines for stability information.

To prepare in house: Dissolve 20g soluble starch powder and 2g salicylic acid in a 100 ml freshly boiled and cooled deionized water. Pour into 900 ml freshly boiled deionized water and stir until homogenous.

7.2. Standards

7.2.1. Sodium Sulfide nonahydrate, ACS grade; Sulfide reference solution: Take a small crystal of the Sodium Sulfide and weigh on the analytical balance. If weight is around 0.8 g dilute to 200 ml with reagent water. If weight is close to 1.0 gram dilute to 250 ml. Store at 4ºC. Stable for 6 months.

7.2.1.1. To determine the concentration of Sulfide Reference Solution:

7.2.1.1.1. Pipet 1.0 ml stock and dilute to 100 ml with deionized water.

7.2.1.1.2. Determine concentration by titration using ED-WET-069 (Analysis of Sulfide in Water, Titrimetric by Standard Methods 4500-S2 E).

7.2.1.1.3. Calculate concentration of sulfide:

$$\text{mg/L Sulfide} = \frac{(AC-BD) \times 16000}{\text{ml of sample}}$$

Where:
A=ml of standard iodine
B=ml of standard sodium thiosulfate
C=normality of standard iodine
D=normality of standard sodium thiosulfate

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	HDPE	10 mLs	Cool 4 ±2°C	N/A	SW846 7.3.4.2
Soils	Glass	10 grams	Cool 4 ±2°C	N/A	SW846 7.3.4.2

Note: Collect samples with minimum aeration. Samples should be kept in a cool, dark place until analysis begins.

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

9.1.1. Method Blank: A method blank must be analyzed each time samples are analyzed at a frequency of 1 per 20 samples. Use deionized water for the blank. The results must be below the reporting limit.

9.1.2. Laboratory Control Sample: The laboratory control sample is purchased commercially from ERA and used to measure method performance on the matrix being analyzed. The LCS is prepared by adding 1.0 ml straight from the ampule to a 10.0 ml final volume with deionized water. The entire 10 ml is then distilled. The LCS is analyzed daily or at a frequency of 1 per 20

samples, whichever is more frequent. The result must be within 70-130% of the true value.

9.1.3. Matrix Spike/Matrix Spike Duplicate: The matrix spike/matrix spike duplicate are prepared by spiking two aliquots of the sample with 10 ml of the sulfide reference solution (Sec. 7.2.1). The sulfide reference solution is titrated daily as described in Section 7.2.1.1 and the value obtained is used for the MS/MSD as true value. The results for the MS/MSD must be within laboratory generated control limits.

9.2. Instrument QC

None

10.0 Procedure

10.1. Sample Preparation

10.1.1. Assemble the necessary glassware for performing analysis.

10.1.2. Weigh 10.0 g of sample into flask and add a stir bar. For liquid samples, pipet 10.0 ml into flask. Add stir bar.

10.1.3. Pour 250 ml of 0.005M H_2SO_4 into the equalizing separatory funnel.

10.1.4. Pour 50 ml of 0.25N NaOH into the scrubber tube.

10.1.5. Attach the Nitrogen source to the top of the separatory funnel then slide the bottom of funnel into one opening in the flask.

10.1.6. Connect the rest of the apparatus and make sure all connections are sealed tightly so that N_2 gas will not escape from the system.

10.1.7. Adjust flow of Nitrogen gas to 1 ml/sec and allow it to stabilize for about 2 minutes.

10.1.8. Release the 0.005M Sulfuric Acid to the flask while spinning the stir bar.

10.1.9. The stirring speed is set at 2 and must remain constant throughout the test. Note: The stirring should not be fast enough to create a vortex.

10.1.10. Let run for 30 minutes

10.1.11. After 30 minutes stop the stirring and let the nitrogen flow for 5 additional minutes.

10.1.12. Disconnect the scrubber apparatus and transfer the trapping solution to a labeled snap seal container.

10.2. Calibration

None

10.3. Sample Analysis

10.3.1. The following iodometric titration is used to quantify the sulfide concentration in the scrubber solution.

10.3.1.1. Rinse and fill a 25-ml burette with the standardized Sodium Thiosulfate solution.

10.3.1.2. In a 500 ml Erlenmeyer flask, put 95 ml DI water and a known amount of standardized I_2 solution. Add 2 ml of 6 N HCL.

10.3.1.3. Through the aid of a glass funnel with the end of stem below the surface of the I_2 solution, slowly pour 25 ml of the scrubber solution. If the I_2 color disappears or fades to yellow, add more 0.025 N I_2 in 5-ml increments. Record the total volume of I_2 solution used.

10.3.1.4. Titrate the solution until the amber color fades to yellow. Add a dropper full of starch indicator and titrate until the blue color disappears. Record volume of titrant used.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. $$\text{Sulfide (ppm)} = \frac{((A \times B) - (C \times D)) \times E}{F} \times 2^*$$

Where:

A = ML of standard I_2 solution
B = N I_2
C = ML $Na_2S_2O_3$
D = N $Na_2S_2O_3$

E = 16.03 (from 32.06g / 2 eq)
F = sample weight (in kg) or volume (in L)

- A two times dilution factor used since the sample is divided into two parts, one for reactive sulfide and the other for reactive cyanide.

11.4. Data Reduction

11.4.1. All data is recorded in the appropriate logbook and attached to the batch as a pdf file.

11.4.2. Record special notes and observations in the "worksheet" tab (i.e. sample appearance).

11.5.3. Record reagent information in the "batch information" page. If there is not enough space to record all of the reagent info, utilize the "worksheet" tab under "notes" to record pertinent information.

11.5.4. Analyst must fill out the Wet Chem Data Review checklist (WI# EDS-WI-008) during the first level review. After the batch is second level reviewed, the checklist is filed in wetchem department.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. There are no specific waste streams generated by this method.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW846 Volume 1C Chapter 7.3.4 and SW846 Method 9034.

15.2. TestAmerica Edison SOP ED-WET-069, Analysis of Sulfide in Water, Titrimetric by Standard Methods 4500-S2 E, most current revision.

15.3. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.6. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.7. TestAmerica Edison Work Instruction # EDS-WI-008, Wetchem Data Review Checklist, most current revision.

16.0. Method Modifications:

N/A

17.0. Attachments

None

18.0. Revision History

- Revision 7, 12 December 2019
  - Updated SOP header with the Eurofins emblem.
  - Sec. 7.1.7: Revised preparation of 6N HCl to reflect actual laboratory practices.

- Revision 6, 30 July 2013
  - Sec 1 and 12: Updated LQM section references to reflect the most current LQM revision.

- Revision 5, 15 July 2011
  - Sec. 6.1: Added analytical balance to list of supplies.
  - Sec. 7.1.5.1.1: Corrected typo error for the concentration Normality of 0.02 N K2CrO7.
  - Sec. 7.1.7: Changed amount of HCl added from 510ml to 490ml to comply with the method.
  - Sec. 9.1.2: Changed preparation of LCS to reflect actual laboratory practices.

- Revision 4, 06 July 2010

  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Sec. 1.1.2: Added laboratory's reporting limit for soils and waters.
  - Sec 7: Added storage and stability information.
  - Sec 7.1.4.1.3 & 7.1.5.1.3: Added calculation formula for determining the normality of I_2 and $Na_2S_2O_3$.
  - Sec 7.1.5 & 7.1.8: Revised to indicate that reagents are commercially purchased. Added storage and stability information.
  - Sec 7.2: Revised to include the specific name of the reference standard, spiking and calculation procedure.
  - Sec. 9.1: Expanded Sample QC to include preparation procedure, QC concentration and criteria limits.
  - Sec 9.1.2: Sec 9.1.2: Replaced LCS (vendor supplied ERA-QC sample) with BS (lab prepared QC sample).
  - Sec 11.5: Revised data reduction procedures in accordance with new TALS.
  - Sec 15: Added applicable references.

Title: Analysis of pH for Soils and Organic Samples Determined Electrochemically by Method SW-846 9045D

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 This SOP is applicable to the determination of pH for soils, sludges and non-aqueous liquid samples using Method SW846 9045D. If water is present, it must be less than 20% of the total volume of the sample.

1.1.2 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1 A soil sample is mixed with reagent water and the pH is measured using a pH meter.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Coatings of oily materials or particulates can impair electrode response. Any coatings may be removed by wiping and rinsing with distilled water. Additional cleaning may be necessary as stated in the manufacturer's manuals.

4.2 Samples with very low or high pH may give incorrect reading on the meter. For samples with pH over 10 the possibility of error may be minimized by using a low-sodium error electrode. Strong acid solutions that have pH <1 may give incorrectly high pH measurements.

4.3 Temperature fluctuations will cause measurement errors.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

None

5.2. Primary Materials Used

There are no materials with a health rating of 3 or 4 used in this method. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

6.0 Equipment and Supplies

6.1 Instrumentation

- pH meter (capable of calibrating to pH buffers 1.68-12.46 range): Thermo Scientific, Orion A211
- combination electrode: PerpHecT Ross Electrode
- Weighing balance capable of accurate weighing to 0.01 grams

6.2 Supplies

- Temperature compensating probe or combination electrode capable of temperature compensation
- Specimen cups; 100ml, plastic
- Teflon coated stir bars
- Wooden spatulas
- Magnetic stirrers
- Graduated cylinder, class A

7.0 Reagents and Standards

7.1 Reagents

7.1.1 Ross pH electrode filling solution, 3M KCl: Cat No. 810007; for storage and stability information, see manufacturer's instructions. Note: Do not use any filling solution that contains silver, as silver will damage the electrode.

7.1.2 pH cleaning solution: for storage and stability information, see manufacturer's instructions.

7.1.3 Reagent Water -18 megohm Reagent grade Type II water.

7.2 Standards

7.2.1 pH buffer solution of 1.68, 4, 7, 10, and 12.46: Purchased commercially; store at room temperature, for stability information refer to manufacturer's instructions.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Soils	Glass or plastic	50 g	Cool 4 ±2°C	Analyze immediately	SW846 9045D

9.0 Quality Control

9.1 Sample QC

9.1.1 Method Blank: A blank must be analyzed each time samples are analyzed or 1 per 20 samples, whichever is more frequent. Use deionized water for the blank. Two separate aliquots of the MB are analyzed and results must be within 0.1 pH units.

9.1.2 Laboratory Control Sample (LCSSRM): The LCS must be performed daily or for each batch of 20 samples, whichever is more frequent. The LCS is currently being purchased from an outside vendor, Phenova. The results must be within vendor specified QC limits. If not, all samples associated with the LCS must be re-analyzed following an acceptable LCS result. Two separate aliquots of the LCS are analyzed and results must be within 0.1 pH units.

9.1.3 Sample Duplicate: A duplicate is analyzed by using a second aliquot of sample. One duplicate sample must be analyzed for each batch of 20 samples. The relative percent difference (RPD) must be within laboratory generated control limits.

9.2 Instrument QC

9.2.1 Continuing Calibration Verification (CCV): A 7.0 pH buffer check is analyzed after the initial calibration of the pH meter and after every tenth sample or every 3 hours, as applicable. If the pH buffer reading differs by more than 0.05 units, the pH meter must be recalibrated and all samples analyzed after the last good CCV must be reanalyzed.

10.0 Procedure

10.1. Sample Preparation

10.1.1. Homogenize samples prior to analysis; refer to TestAmerica Edison SOP ED-GEN-007, Subsampling for details on procedure.

10.2. Calibration

10.2.1. Calibrate the meter at the expected pH of the samples. Calibration of the meter should include buffers that bracket the expected pH of the samples. The pH meter is calibrated at 1.68, 4, 7, 10, and 12.46.

10.2.2. Always use fresh pH buffer solution and check that the electrode is filled with filling solution to the appropriate level.

10.2.3. For Orion A211 meter calibrate as follows:

10.2.3.1. Orion A211 can be calibrated up to five point calibration. For pH analysis by this method, pH buffer solution 1.68, 4, 7, and 10 will be used to calibrate the meter. Note: Recalibrate meter if sample pH are outside of the calibration points.

Note: Where pH analysis is performed as part of method requirements and procedure (i.e. Method 5210B, 7196A, 3060A, 1311), pH meter should be calibrated at the appropriate calibration points. For example for Method 7196A, pH meter is calibrated at 4 points: 1.68,4,7 and 10.

10.2.3.2. Rinse the pH electrode and blot dry with lint-free tissue. In measurement mode, press F1 (cal). Place electrode in pH buffer 1.68.

10.2.3.3. When the electrode and buffer are ready, press F3 (start).

10.2.3.4. Wait for the pH value on the meter to stabilize and stop flashing and then perform one of the following actions:

10.2.3.4.1. Press F2 (accept) to accept the displayed pH value.

10.2.3.4.2. Press F3 (edit) to access the numeric entry screen and edit the pH buffer value.

10.2.3.4.3. If pH value is accepted, record pH reading in the pH meter calibration logbook under column ‘Calibration reading.’ Record the temperature of the calibration buffers in the pH meter calibration logbook.

10.2.3.5. Press F2 (next) to proceed to the next buffer and repeat procedure in Sec 10.2.3.2 through 10.2.3.4 except using pH buffer solution 4, 7, 10 and 12.46.

10.2.3.6. When calibration is done, press F3 (cal done) to save and end the calibration.

10.2.3.7. The meter will display the calibration summary including the average slope. Record the slope in logbook. The slope criteria should be within 92-102.

10.2.3.8. The meter will automatically proceed to the measurement mode. Read back each pH buffer solution used at calibration and record information in the pH meter calibration logbook under column 'buffer readback.' The buffer should be within +/- 0.05 pH units of the true value.

10.2.3.9. Calibrate the meter every 3 hours when only occasional measurements are performed.

10.2.3.10. For frequent measurements, recheck pH buffers after every 3 hours to check instrument stability; if necessary, recalibrate. Record pH buffer checks in the pH meter calibration logbook under column 'buffer readback.' ' Also record the temperature of the pH buffers during the buffer readback.

10.3. Sample Analysis

10.3.1. Sample temperature should not differ from the buffers by more than 2℃.

10.3.2. Place 20g of sample in specimen cup with 20ml deionized water.

10.3.3. Continuously stir sample for 5 minutes. (If the sample absorbs all the water, take fresh aliquot of sample using 20 g of sample and add 40ml of deionized water). Note dilution in pH logbook and TALS.

10.3.4. Let soil suspension stand undisturbed for one hour or filter or centrifuge off the aqueous phase for pH measurement, (decant off any oily phase and measure the pH of the aqueous phase).

10.3.5. Lower the well rinsed electrode just below the clear supernatant solution.

10.3.6. Wait for reading to stabilize and record result in the pH logbook and in TALS.

10.3.7. Thoroughly rinse and gently wipe the electrode between measurements. Rinse probe with acetone if grease or oil coats the glass electrode.

10.3.8. If the sample pH is outside of the calibration points, recalibrate meter that will bracket the expected pH of the samples.

10.3.9. If the pH is over 12.0, adjust the results by adding the correction value from the nomograph to the observed pH reading. See attachment 1 for the nomograph.

10.3.10. Record pH, temperature and the time of analysis in the pH logbook and in TALS.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Data Reduction

11.3.1. Record special notes and observations in the "worksheet" tab (i.e. sample appearance).

11.3.2. Record reagent information in the prep batch information (this can be viewed in the "batch information" page).

11.3.3. Complete the Data Review Checker (DRC) in TALS. Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.3.3.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.3.3.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.3.3.3. Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.3.3.4. Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for

analyses performed; these are verified at least annually unless method requirements require a greater frequency. ***MDL study is not required for this method.***

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. There are no specific waste streams generated with this method.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office: Washington, DC, Revision 4, August 2002, SW846 Method 9045D.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.4. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.5. Orion PerpHecT ROSS Electrode User Guide-Thermo Electron Corporation.

15.6. TestAmerica Edison SOP No. ED-GEN-007, Subsampling, current revision.

15.7. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0. Method Modifications:

N/A

17.0. Attachments

Attachment 1: Nomograph for pH values greater than 12.0

18.0. Revision History

- Revision 11, dated 29 June 2020
  - Revised SOP header with Eurofins emblem.
  - Removed method 9045C reference throughout the SOP.
  - Sec. 7.2.1: Replaced pH buffer solution 12 to 12.46.
  - Sec. 9.1.2: Updated LCS source vendor from ERA to Phenova.
  - Sec. 10.2.1, 10.2.3.1, 10.2.3.5: Added pH buffer solution 12.46.
  - 11.3: Replaced WI EDS-WI-008 with TALS DRC procedure.
  - Sec 15.7: Deleted WI# EDS-WI-008, Wetchem Data Review Checklist, not applicable.

- Revision 10, dated 07 May 2018
  - Sec 7.2: Replaced pH buffer 2.0 to buffer 1.68.
  - Sec. 10.2: Throughout the section, calibration range was updated to include buffer 1.68, making the range 1.68, 4, 7, and 10. Added the requirement to measure and record the temperature of the pH buffers at calibration and pH buffer readbacks.

- Revision 9, dated 13 April 2016
  - Sec 5.2: Replaced MSDS with SDS.
  - Sec 6.1: Updated pH meter model to reflect current pH meter.
  - Sec 10.2: Revised entire section to include new calibration procedure and requirements.
  - Sec 10.3.5-10.3.6: Revised to include recalibrating meter when sample pH are outside of the calibration range.
- Revision 8, dated 02 October 2014
  - Sec. 4.2: Added note in regards to strong acid solutions as described in SW method 9045D.
  - Sec. 9.1.1: Revised to include QC frequency for Method Blank.
- Revision 7, dated 03 August 2012

- Sec 6.1: Replaced pH meter model # to Orion Star LogR - capable of calibrating to pH buffers 4-10 range.
- Sec 10.2.1.1 - 10.2.1.6: Revised calibration procedures to reflect the new pH meter; subsequent sections adjusted accordingly.

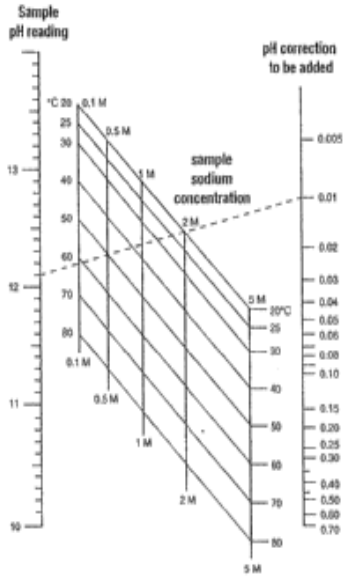
- Revision 6, dated 15 June 2012
  - Sec. 1.1: Added text "if water is present, it must be less than 20% of the total volume of the sample."
  - Sec. 9.1.2: Changed limits for LCS from 95-105% to vendor specified QC limits.
  - Revised throughout to include references to the most recent revision of the method, SW846 9045D, Revision 4, August 2002.
  - Updated references to Lab Quality Manual section numbers.
- Revision 5, dated 16 June 2011
  - Sec. 6.2: Added graduated cylinder to list of supplies.
  - Sec. 9.1.1 & 9.1.2: Clarified procedure for MB and LCS.
  - Sec. 10.2.1.5: Added slope requirement.
- Revision 4, dated 06 October 2009
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 7: Added storage and stability information.
  - Sec. 7.1: Replaced Ag/Ag Cl electrode filling solution with 3M KCl.
  - Sec 8: Revised holding time from 7 days to 'analyze immediately' to comply with method 9045C.
  - Sec 11.3: Revised new data reduction procedures in accordance with new TALS.
  - Sec. 15: Added applicable reference.
- Revision 3b, dated 08 July 2009
  - Section 9.1: Added detailed procedure for calibrating the pH meter.
  - Added text: *After calibrating the pH meter and prior to sample analysis, verify the calibration by reading back the 4.00, 7.00, and 10.00 buffers. Record readings in the analytical logbook.* Delete text: *After initial calibration, verify by recording values for all buffers used.*
- Revision 3a, dated 11 February 2009
  - Sec 9.4: Added text: If the pH of the soil is greater than 10, a buffer of 12.0 must be checked. **Note**: When measuring the buffer 12.0, ensure that it is measured at the manufacturer's specified temperature of 25ºC.
  - Sec 9.11: Added text: If the sample pH is over 12.0, adjust the results by adding the correction value from the nomograph to the observed pH reading. See attached nomograph.
  - Attachment added: Nomograph for pH reading > 12.0
  - Sec 15: Added reference: Orion PerpHecT ROSS Electrode User Guide- Thermo Electron Corporation.

Attachment 1

Nomograph for pH values > 12.0

Interferences

Sodium ion is the principal interference of the pH electrode, causing increasing error at higher pH (lower hydrogen ion activities) and at higher temperatures. Because the pH membrane is composed of special low sodium error glass, error due to sodium is negligible when measuring at pH values less than 12. When measuring at pH values greater than 12, add the correction value from the nomograph in **Figure 5** to observed pH reading.



Example:

pH reading	12.10
Sodium concentration	0.5 M
Temperature	50 °C
Correction	0.01
Corrected pH reading	12.11

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Title: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) by SW846 Methods 8260C and 8260D

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Approvals (Signature/Date):

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Facility Distribution No. ELECTRONIC **Distributed To: FACILITY INTRANET**

1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 USEPA SW846 Methods 8260C and 8260D are used for the determination of volatile organic compounds in a variety of aqueous and solid matrices by purge and trap gas chromatography (GC)/mass spectrometery (MS). The methods are applicable to the compounds listed in Table 1 (below). Actual target compound lists are determined through regulatory or project specifications. Method performance criteria for each target analyte will be determined prior to sample analysis.

1.1.2 This SOP also describes the optional procedure for analyses of compounds using 8260C/8260D Selected Ion Monitoring (SIM). SIM analyses is specific to target compounds: 1,2-dibromoethane, 1,2-dibromo-3-chloropropane, 1,2,3-Trichloropropane and 1,4-Dioxane. Benzene and Chloroform if needed.

Table 1: Method Analytes

Compound	CAS #	Compound	CAS #
1,1,1,2-Tetrachloroethane	630-20-6	cis-1,2-Dichloroethene	156-59-2
1,1,1-Trichloroethane	71-55-6	cis-1,3-Dichloropropene	10061-01-5
1,1,1-Trifluoro-2,2-dichloroethane	306-83-2	Cyclohexane	110-82-7
1,1,2,2-Tetrachloroethane	79-34-5	Cyclopentene	142-29-0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Dibromomethane	74-95-3
1,1,2-Trichloroethane	79-00-5	Dichlorobromomethane	75-27-4
1,1-Dichloroethane	75-34-3	Dichlorodifluoromethane	75-71-8
1,1-Dichloroethene	75-35-4	Dichlorofluoromethane	75-43-4
1,1-Dichloropropene	563-58-6	Dimethylnaphthalene (total)	28804-88-8
1,1-Difluoroethane	75-37-6	Epichlorohydrin	106-89-8
1,2,3-Trichlorobenzene	87-61-6	Ethanol	64-17-5
1,2,3-Trichloropropane **(1)**	96-18-4	Ethyl acetate	141-78-6
1,2,3-Trimethylbenzene	526-73-8	Ethyl acrylate	140-88-5
1,2,4,5-Tetramethylbenzene	95-93-2	Ethyl ether	60-29-7
1,2,4-Trichlorobenzene	120-82-1	Ethyl methacrylate	97-63-2
1,2,4-Trimethylbenzene	95-63-6	Ethylbenzene	100-41-4
1,2-Dibromo-3-Chloropropane **(1)**	96-12-8	Ethylene Dibromide **(1)**	106-93-4
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Hexachlorobutadiene	87-68-3
1,2-Dichloro-1,1,2-trifluoroethane	354-23-4	Hexane	110-54-3
1,2-Dichlorobenzene	95-50-1	Indan	496-11-7
1,2-Dichloroethane	107-06-2	Iodomethane	74-88-4
1,2-Dichloroethene, Total	540-59-0	Isobutyl alcohol	78-83-1
1,2-Dichloropropane	78-87-5	Isopropyl acetate	108-21-4
1,3,5-Trichlorobenzene	108-70-3	Isopropyl alcohol	67-63-0
1,3,5-Trimethylbenzene	108-67-8	Isopropyl ether	108-20-3
1,3-Dichlorobenzene	541-73-1	Isopropylbenzene	98-82-8
1,3-Dichloropropane	142-28-9	Methacrylonitrile	126-98-7
1,3-Dichloropropene, Total	542-75-6	Methyl acetate	79-20-9

Compound	CAS #	Compound	CAS #
1,4-Dichlorobenzene	106-46-7	Methyl acrylate	96-33-3
1,4-Dioxane **(1)**	123-91-1	Methyl methacrylate	80-62-6
1-Chloropropane	540-54-5	Methyl tert-butyl ether	1634-04-4
2,2,4-Trimethylpentane	540-84-1	Methylcyclohexane	108-87-2
2,2-Dichloropropane	594-20-7	Methylene Chloride	75-09-2
2,4,4-Trimethyl-1-pentene	107-39-1	Methylnaphthalene (total)	1321-94-4
2-Butanone (MEK)	78-93-3	Monochloropentafluoroethane	76-15-3
2-Chloro-1,3-butadiene	126-99-8	m-Xylene & p-Xylene	179601-23-1
2-Chloroethyl vinyl ether	110-75-8	Naphthalene	91-20-3
2-Chloropropane	75-29-6	n-Butanol	71-36-3
2-Chlorotoluene	95-49-8	n-Butyl acetate	123-86-4
2-Hexanone	591-78-6	n-Butyl acrylate	141-32-2
2-Methyl-1,3-butadiene	78-79-5	n-Butylbenzene	104-51-8
2-Methyl-2-propanol	75-65-0	n-Heptane	142-82-5
2-Nitropropane	79-46-9	n-Propyl acetate	109-60-4
2-Octanol	123-96-6	N-Propylbenzene	103-65-1
2-Octanone	111-13-7	o-Xylene	95-47-6
4-Chlorotoluene	106-43-4	p-Diethylbenzene	105-05-5
4-Ethyltoluene	622-96-8	Pentane	109-66-0
4-Isopropyltoluene	99-87-6	Propene	115-07-1
4-Methyl-2-pentanone (MIBK)	108-10-1	Propionitrile	107-12-0
Acetaldehyde	75-07-0	sec-Butylbenzene	135-98-8
Acetone	67-64-1	Styrene	100-42-5
Acetonitrile	75-05-8	Tert-amyl methyl ether	994-05-8
Acrolein	107-02-8	Tert-butyl ethyl ether	637-92-3
Acrylonitrile	107-13-1	tert-Butylbenzene	98-06-6
Allyl chloride	107-05-1	Tetrachloroethene	127-18-4
Amyl acetate (mixed isomers)	628-63-7	Tetrahydrofuran	109-99-9
Benzene **(1)**	71-43-2	Toluene	108-88-3
Benzyl chloride	100-44-7	Total BTEX	STL00431
Bromobenzene	108-86-1	trans-1,2-Dichloroethene	156-60-5
Bromoform	75-25-2	trans-1,3-Dichloropropene	10061-02-6
Bromomethane	74-83-9	trans-1,4-Dichloro-2-butene	110-57-6
Butadiene	106-99-0	Trichloroethene	79-01-6
Butyl Methacrylate	97-88-1	Trichlorofluoromethane	75-69-4
Camphene	79-92-5	Vinyl acetate	108-05-4
Camphor	76-22-2	Vinyl chloride	75-01-4
Carbon disulfide	75-15-0	Xylenes, Total	1330-20-7
Carbon tetrachloride	56-23-5	1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1
Chlorobenzene	108-90-7	1,4-Dioxane-d8 **(ISTD)**	17647-74-4
Chlorobromomethane	74-97-5	2-Butanone-d5 **(ISTD)**	24313-50-6
Chlorodibromomethane	124-48-1	Chlorobenzene-d5 **(ISTD)**	3114-55-4
Chlorodifluoromethane	75-45-6	Fluorobenzene **(ISTD)**	462-06-6
Chloroethane	75-00-3	TBA-d9 **(ISTD)**	25725-11-5
Chloroform **(1)**	67-66-3	1,2-Dichloroethane-d4 **(Surrogate)**	17060-07-0
Chloromethane	74-87-3	4-Bromofluorobenzene **(Surrogate)**	460-00-4

Compound	CAS #	Compound	CAS #
Chlorotrifluoroethene	79-38-9	Dibromofluoromethane **(Surrogate)**	1868-53-7
Chlorotrifluoromethane	75-72-9	Toluene-d8 **(Surrogate)**	2037-26-5

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).

1.1.3 Methods 8260C and 8260D can be used to quantitate most volatile organic compounds that have boiling points below 200°C, and that are insoluble or slightly soluble in water. Water-soluble compounds can be included in this method, but quantitation limits will be higher due to poor purging efficiency.

1.1.4 The standard reporting limit (RL) is established at or above the low-level standard in the calibration curve (1 ug/l for most compounds). For a complete list of method detection limits (MDLs) and RLs, please see reference the current TALS (LIMS) active Method Limit Group database.

1.1.5 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (*Review of Work Request*) and 20 (*Test Methods and Method Validation*) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

1.1.6 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in TestAmerica Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 Summary of Method

2.1 Methods 8260C and 8260D are used to determine volatile organic compounds in aqueous, non-aqueous and solid matrices. Sample preparation techniques vary, depending on the matrix and the level of contamination expected. Purge and trap techniques are used to introduce the sample to the GC/MS system. Refer to TestAmerica Edison SOP Nos. ED-MSV-001*, Purge and Trap for Aqueous Samples, SW846 Method 5030*, current revision and ED-MSV-002, *Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, SW846 Method 5035A,* current revision.

2.2 All samples extracts are screened by GC/FID static headspace analysis to provide the analyst with appropriate initial dilution factors. For additional details see

TestAmerica Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

2.3 An aliquot of sample containing internal standard and surrogate spiking solution is purged with nitrogen in a closed sparging vessel. The volatile compounds are transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatiles are trapped. After purging is complete, the sorbent column is heated and backflushed with helium to desorb the volatiles onto a gas chromatograph column.

2.4 Analytes eluted from the capillary chromatograhy column are introduced into the mass spectrometer via a direct connection. Identification of target analytes is accomplished by comparing their mass spectra with the electron impact spectra of authentic standards. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using a minimum of a five-point calibration curve.

2.5 For aqueous VOA samples submitted for New Jersey Groundwater Quality Standard (NJ GWQS) evaluation, a full scan analysis is initially performed using the 8260 methodology No further analysis by SIM is required if all of the following compounds are present above the full scan RL: 1,2-dibromoethane, 1,2-dibromo-3-chloropropane, 1,2,3-Trichloropropane and 1,4-dioxane, chloroform, vinyl chloride and benzene. If any of these compounds are undetected in the undiluted, full scan analysis, the sample must be analyzed via 8260C SIM or 8260D SIM for those compounds.

2.6 In order to meet lower reporting limits of 0.5ug/L for most analytes, 2.5 ug/L for ketones and generally lower limits for other non-routine analytical compounds, samples must be analyzed against an initial calibration with a low point at those levels. The corresponding TALS login method for low level aqueous analysis is 8260_LL. See Table 3b for initial calibration levels and spike amounts.

3.0 Definitions

3.1 For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 This method is susceptible to contamination from a number of sources, including organic solvents used in other laboratory procedures, impurities in the purge gas, improper cleaning of syringes or purge vessels, and carryover from high level samples. Samples can be contaminated by the diffusion of volatile organics through the septum during shipment or storage. Steps have been taken to ensure that these potential problems are eliminated from the laboratory.

4.2 The volatiles analytical laboratory is housed in a separate building, away from the organic extraction lab area where large quantities of organic solvents are used. No organic solvents are used or stored in the volatiles laboratory.

4.3 The nitrogen used as purge gas passes through a solvent trap prior to its inlet into the purge and trap units.

4.4 Trip Blanks are shipped to clients with aqueous bottle ware as requested. The purpose of the trip blank is to detect and identify any VOC contamination of the samples while in transit to and from the lab. The blank is created at the laboratory by completely filling the volatile vial container with lab grade organic free deionized water and sealing the container Trip Blanks accompany bottle ware and samples through the sampling, storage and analysis stages as a check on contamination that may occur at these points.

4.5 Individual samples are each handled with a unique syringe that has been baked in a drying oven at 105°C to ensure the absence of volatile compounds.

4.6 Carryover can occur anytime a high level sample is analyzed. Screening procedures are employed to ensure that a sample is analyzed at an appropriate dilution to minimize potential carryover. When a high level sample is analyzed, it is followed by the analysis of a reagent water blank. If another sample was analyzed after the high level sample, this sample is inspected carefully for signs of carryover. If this sample does not contain any of the compounds found in the high level sample, the system can be considered contamination free.

4.7 The analytical system is checked daily with the analysis of a method blank. This blank must meet all quality control criteria for the method before sample analysis may take place.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

Any questions pertaining to safety issues or procedures should be brought to the department manager or Edison Safety Officer.

5.1 Specific Safety Concerns or Requirements

5.1.1 Latex, nitrile and vinyl gloves all provide adequate protection against the methanol used in this method.

5.1.2 Purge vessels on purge-and-trap instruments can be pressurized by the time analysis is completed. Vent the pressure prior to removal of these vessels to prevent the contents from spraying out.

5.1.3 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.1.4 The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

5.1.5 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol (MeOH)	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1 Purge and trap units from several different manufacturers are used, depending upon the sample matrix and preparatory technique required. A purge and trap unit consists of three parts: the sample purge unit, the trap, and the concentrator. Unit configurations currently in use are:

- OI Analytical 4551, 4100 Automatic Sampler/4660,4760 concentrator;
- Archon 5100A Automatic sampler/ OI Analytical 4660,4760 concentrator;
- EST Centurion Autosampler/ EST Encon concentrator;

- Archon Autosampler/EST Encon concentrator.
- Archon/EST Evolution

6.1.2 A VOCARB 3000 trap from Supelco is used in the Encon concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed with 10.0cm Carbopack B, 6.0 cm Carboxin 1000, and 1cm Carboxin 1001.

6.1.3 An OI analytical purge trap #10 is used for the OI 4560,4660 and 4760 concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed to contain the following absorbents: Tenax/silica gel/carbon molecular sieve.

6.1.4 Alternate traps may be used provided the adsorption and desorption characteristics are equivalent to those of the trap recommended by the method.

6.1.5 Both the Encon and OI concentrators are capable of rapidly heating the trap to 260°C and holding at that temperature for the duration of the desorb time.

6.1.6 Gas chromatograph: HP Agilent 6890/7890 equipped with temperature programming capability.

6.1.7 GC column: 30M long x 0.25mm ID, 1.4um film thickness, 20M x 0.18mm x 1um DB-624 and 20M long x 0.18 mm ID Restek Rtx-VMS capillary column with 1um film thickness or similar phase.

6.1.8 Mass Spectrometer (Agilent 5973/5975/5977): scanning from 35-260 amu every 0.9 seconds, utilizing 70 volts (nominal) electron energy in the electron ionization mode and producing a mass spectrum which meets all EPA performance criteria when 50 ng of 4-Bromofluorobenzene (BFB) is injected through the gas chromatograph inlet.

6.1.9 GC/MS Interface: transfer lines heated to 180°C .

6.1.10 Data system: HP Chemstation II for data acquisition and TestAmerica Chrom for data processing.

6.2 Supplies

- Microsyringes: 10 ul to 1000 ul.
- Syringes: 5 ml to 25 ml gas-tight.
- Injection port liners: HP 18740-80200 or equivalent
- Volumetric flasks: Class “A” glassware, 5 ml to 500 ml.

- VOA vials: 20-ml and 40-ml glass with PTFE – faced septum.
- Vials: 2-ml amber glass with screw cap with Teflon-faced septa.
- Top loading analytical balance.
- Spatula: Narrow, stainless steel.
- Stir bars: PTFE coated, small enough to spin freely inside a VOA vial.

7.0 Reagents and Standards

7.1 Reagents

7.1.1 Organic free reagent water: High purity water that meets the requirements for a method blank when analyzed. (See section 9.1.1) Reagent water is obtained from Millipore system. Other methods of preparing reagent water are acceptable, provided that the water produced meets method blank criteria.

7.1.2 Methanol: Ultra Resi-Analyzed, purge and trap grade, purchased from JT Baker or equivalent. (Cat # 9077-02)

7.1.2.1 Each lot of methanol is screened for contaminants before being used for analysis as detailed in TestAmerica Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2 Standards

7.2.1 **Calibration Standards** Stock target compound analytical standard solutions are purchased mainly from Restek, Supelco, Inc, Absolute Standards and Spex although standards of similar quality from other suppliers may be substituted as required. Standards noted with an asterisk (*) are custom mixes made especially for TestAmerica Edison.

Target Analyte Standard Name	Concentration	Vendor	Catalog #
8260 List 1 / Std #3 Gases*	2500 ppm	Restek	569722
8260 List 1 / Std #3 Gases – (SS)*	2500 ppm	Restek	569722 sec
8260 List 1 / Std #1 MegaMix*	1250-62500 ppm	Restek	569720
8260 List 1 / Std #1 MegaMix (SS)*	1250-62500 ppm	Restek	569720 sec
8260 List 1 / Std #2 Ketones *	12500 ppm	Restek	569721
8260 List 1 / Std #2 Ketones * (SS)	12500 ppm	Restek	569721 sec
8260 List 1 / Std #5 Acrolein *	20,000 ppm	Restek	568720
8260 List 1 / Std #5 Acrolein (SS)	20,000 ppm	Restek	568720 sec
8260 List 1 /Std #4 2 CEVE *	2500 ppm	Restek	569723
8260 List 1 /Std #4 2 CEVE (SS) *	2500 ppm	Restek	569723 sec

Target Analyte Standard Name	Concentration	Vendor	Catalog #
8260 List 1 /Std #6 Vinyl Acetate *	5000 ppm	Restek	569724
8260 List 1 /Std #6 Vinyl Acetate (SS) *	5000 ppm	Restek	569724 sec
8260 List 2 / Std #1 Additions *	2500-62500ppm	Restek	568725
8260 List 2 / Std #1 Additions (SS) *	2500-62500 ppm	Restek	568725 sec
8260 List 3 / Std #1 Polar Additions *	2500-100000ppm	Restek	568728
8260 List 3 / Std #1 Polar Additions (SS) *	2500-100000 ppm	Restek	568728 sec
VOC Extra Standard 2015 *	2500-5000 ppm	Absolute	98593
VOC Extra Standard 2015 * (SS)	2500-5000 ppm	Absolute	98593
Epichlorohydrin	1000 ppm	Absolute	70377
Acrolein	5000 ppm	Restek	91980
Acrolein *	Neat	Sigma	110221
2-Freon Mix quote # 12258 *	2500ppm	Absolute	12258
2-Freon Mix quote # 12258 * (SS)	2500ppm	Absolute	12258
1,4-Dioxane	Neat	Sigma	360481
Epichlorohydrin	Neat	Sigma	45340
2-Chloroethylvinyl ether	Neat	Sigma	109983
1,4-Dioxane	1000 ppm	Absolute	70373
1,4-Dioxane	10000 ppm	Absolute	92785
Benzene	1000 ppm	Absolute	70025
Chloroform	1000 ppm	Absolute	70076

(1): The separate source for this material is not available as a distinct catalog number. Analyst must ensure that a separate lot of the material is selected and used as required.

An asterisk (*) indicates a custom standard mix.

7.2.1.1. Prepare stock solutions at volumes and concentrations indicated in Table 2 (Working Standards Preparation) by combining the indicated volumes of each stock solution into a volumetric flask corresponding to the total final volume. Dilute to the volume marker with methanol.

7.2.1.2. Prepare individual calibration standards as applicable per Section 9.2.2.1, Table 3, Initial Calibration Standards Preparation, Low Level Soil, Table 3a, Initial Calibration Standards Preparation (Low Level), Aqueous or Table 3B Initial Calibration Standards Preparation, Aqueous.

7.2.1.3. The 'Second Source' standards listed are used in the preparation of the Initial Calibration Verification (ICV) standard (see Tables 4 and 4a for ICV preparation instructions) and the Laboratory Control Standard (LCS) (see Section 9.1.3 and Tables 4 and 4a).

7.2.2 **Surrogate Standards:** Surrogate standard solutions are prepared from the stock solution (2500ppm)

Surrogate Standard Name	Concentration	Vendor	Catalog #
4-Bromofluorobenzene	2500ppm	Restek	567650
Toluene-d8			
1,2-Dichloroethane-d4			
Dibromofluoromethane			

7.2.2.1 A primary surrogate stock solution (2500 ppm each) is prepared from the neat standards as follows:

7.2.2.2 Secondary surrogate standard solutions are prepared at two (2) levels using the 2500 ppm primary stock solution as detailed in the table below:

Standard Name	Vendor	Catalog #	Volume added	Concentration of Stock Std.	Concentration of Standard	Total Volume Volume in MeOH/Total volume of MeOH
8260 Surrogate Mix: 4-Bromofluorobenzene Toluene-d8 1,2-Dichloroethane-d4 Dibromofluoromethane	Restek	567650	1ml	2500ppm	250ppm	10mL 9.0mL TV/M
8260 Surrogate Mix: 4-Bromofluorobenzene Toluene-d8 1,2-Dichloroethane-d4 Dibromofluoromethane	Restek	567650	1ml	2500ppm	50ppm	50mL 9.0mL TV/M

7.2.2.3 Methanol/Surrogate solution (2.5ug/mL): For methanol sampling field kits. Prepared by adding 1mL of 2500 ug/ml primary surrogate stock solution (see Section 7.2.2.1) to 1 L purge and trap grade methanol.

7.2.3 **Internal Standards:** Internal Standards Solutions are purchased from Restek:

Standard Name	Concentration	Vendor	Catalog #
8260 Internal Standard Mix: *Chlorobenzene-d5 *1,4-Dichlorobenzene-d4 *Fluorobenzene *1,4-Dioxane-d8 *TBA-d9	250-5000ppm	Restek	567649

7.2.4 **Internal Standard/Surrogate Mix (125 ppm each):** A solution containing both Internal Standards and Surrogates at 125 ppm is prepared in a 10ml volumetric flask as detailed below using the 2500

ppm surrogate stock solution prepared in Section 7.2.2.1 and the 2500 ppm internal standard mix detailed in Section 7.2.3:

Standard Name	Concentration of Stock Std.	Volume added to final volume of 20ml MeOH	Final Concentration of Standard
8260 Internal Standard/Surrogate Mix (125 ppm) For Aquatek Autosampler	2500 ppm Surrogate Mix	1.0ml	125 ppm each component
	250 Internal Std Mix	10 ml	

7.2.5 **Internal Standard/Surrogate Mix (SIM) (2.5/50 ppm each):** A solution containing both Internal Standards and Surrogates at 25 ppm is prepared in a 10ml volumetric flask as detailed below using the 2500 ppm surrogate stock solution prepared in Section 7.2.2.1 and the 250 ppm internal standard mix detailed in Section 7.2.3:

Standard Name	Concentration of Stock Std.	Volume added to final volume of 10ml MeOH	Final Concentration of Standard
8260 Internal Standard/Surrogate Mix (25 ppm) (SIM)	2500 ppm Surrogate Mix	10ul	2.5/50 ppm each component
	250 Internal Std Mix (Restek)	10ul	
1,4-Dioxane-d8	10000 ppm	50ul	

7.2.6 **GC/MS Instrument Performance Check (BFB):** The instrument performance check solution consists of 4-Bromofluorobenzene in addition to the other three surrogates in methanol. Prepare the solution at **50ppm as specified in section 7.2.2.2.** Assign an expiration date of 6 months.

7.2.7 All standards preparation information must be logged into the TALS Reagent Module. All pertinent information must be entered: Date prepared, Lot #'s, Expiration dates, Solvents used, Lab Lot # (expiration date), Manufacturer and Verification signature. Additionally, all prepped standards are typically given a unique Lot# and all information pertaining to standard preparation is entered into the GC/MS VOA Standard Preparation Log Book. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.8 Please refer to TestAmerica Edison SOP No. ED-GEN-008, *Standard Operating Procedure for Preparation, Purity and Storage of Reagents and Standards*, current revision. For Method 8260C and 8260D::

- Shelf Life of Standard:
  - Stock standards (Non-gases) - 6 months after opening vendor stock of up to 2000ppm, 3 years for 10,000ppm, 5 years for over 50,000ppm, or manufacturer's expiration date whichever comes first.
  - Stock Standards (Gases) - 2 months after opening vendor stock, or manufacturer's expiration date whichever comes first.
  - Working/Secondary dilution Standards (Non-gases) – 6 months after preparation, or manufacturer's expiration date whichever comes first.
  - Working/Secondary dilution Standards (Gases) – 1 week from the date of preparation for 50ppm and 2 weeks for 500ppm, or manufacturer's expiration date whichever comes first.
  - Daily Calibration Standards – 24 hours after preparation.

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- Storage Requirements:

  Aqueous standards are stored at 4°C and Methanol standards are stored at -10°C to -20°C.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Glass 40 ml vials	40 mLs	HCl, pH < 2; Cool 4 ^{o}C ± 2^{o}C	14 Days / preserved 7 Days / unpreserved	SW846 Method 5030
Waters	Glass 40 ml vials	40mLs	TSP,pH>11 Cool 4 ^{o}C ± 2^{o}C	14 Days / preserved	SW846 Method 5030

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Soils (Low)	Encore or Terracore (40 ml vials)	5 grams in 5 mls DI H_2O	Frozen Stored -7°C to -20°C	14 Days	SW846 Method 5035A
Soils (Med)	Encore or Terracore (40 ml vials)	5 grams in 10 mls MeOH	Cool 4 °C ± 2°C	14 Days	SW846 Method 5030
Soils (High)	Glass (Lab Prepared Kits)	10 grams in 25 mls MeOH	Cool 4 °C ± 2°C	14 Days	SW846 Method 5030

8.1.1 There are several methods of sampling soil. The recommended method is to take samples using an EnCore™ sampler or using a Terra Core™ sampling kit. At specific client request, unpreserved soil samples in 4oz jars may be accepted. For EnCore and Terra Core sampling, a separate jar is required for percent solids/moisture determination, unless one is supplied for another analysis.

8.1.2 For EnCore™ samplers, the 5g sample is extruded into a pre-weighed 40mL vial containing 5mL of methanol (medium level analysis) or reagent water (for low level, <50 µg/kg, analysis). The exact samples weight is determined as the difference between the vial + preservative weight and weight after the sample is added.

- Samples must be transferred (extruded from the sampler) and preserved within 48 hours of sampling.
- Water preserved samples are then frozen at <10°C. Methanol preserved samples may be stored at > 0.0 °C but < 6° °C or frozen.
- Methanol preserved samples are shaken for at least 2 minutes, and a portion of the methanol extract after settling may be transferred to a smaller Teflon-lined capped vial for storage below 6 °C
- Normally one (1) medium level and two (2) low-level samples are taken and preserved.
- One vial with a clean matrix of each preservation type is prepared at the same time as samples, to be used for LCS analysis. Spikes are not added until the time of analysis.
- Samples are spiked with internal standards and surrogates at the time of analysis.

8.1.3 Terra Core™ sampling kits are pre-preserved for use and immediate samples preservation in the field. Kits are shipped that include one (1) methanol preserved and two (2) reagent water preserved vials, along with a 4oz jar for solids/moisture analysis volume.

- Terra Core™ vials are immediately placed in the freezer (<-10°C) upon receipt at the lab. Methanol preserved vials are shaken for at least two (2) minutes to break up the solid and create the methanol extract.

- Terra Core™ vials are labeled with the weight of the vial and preservative. The vials are re-weighed prior to analysis to determine the weight of the solid sample added. It is important that labels NOT be added to these vials prior to weighing, because the weight of the label will add to the sample weight. Vials may be marked with indelible marker, or placed in a labeled, sectioned box until ID labels can be added after weighing.

8.2 Unpreserved soils - At client request, unpreserved soils packed into glass jars or brass tubes may be accepted and subsampled in the lab. A 5g portion of the sample is transferred to a 40mL vial and mixed with reagent water and/or methanol for analysis. Since this procedure is not compliant with SW5035A an NCM and case narrative statement describing the non-conformance must be included with any resulting data reported to the client.

8.3 Aqueous samples are stored in 40mL glass vials with Teflon lined septa at >0 and ≤ 6.0℃. Vials are required to have no headspace lar ger than a small pea.

8.3.1 Regulatory requirements for 2-Chloroethyl vinyl ether:

- 2-Chloroethyl vinyl ether: The stability of this compound is reduced when subjected to low pH, therefore samples for analysis to include 2-CEVE must be taken without acid preservation. Unpreserved samples must be analyzed within 7 days.

- SW846 Update V removed special preservation requirements for Acolein and Acylonitrile. These compounds may be analyzed for using a preserved sample vial.

8.4 Soil samples and water samples preserved to pH <2 with HCl have a maximum holding time is 14 days from sampling until the sample is analyzed. If water samples are known to be unpreserved, the holding time is 7 days from sampling to analysis.

8.4.1 Preserved water samples are checked to confirm the preservation pH AFTER analysis because the vials must not be opened prior to analysis. If the pH is found to be >2, this must be addressed in the case narrative.

8.5 Medium level solid methanol extracts, if taken at the time of preservation, are aliquoted into 4 mL glass vials with Teflon lined caps and stored at > 0.0 °C but ≤6.0℃ or frozen. The extracts are stored with minim um headspace.

8.6 Storage blanks are prepared by filling 40 mL VOA vials with reagent water and placing one in each refrigerator. After 1-2 weeks, the storage blanks are removed and analyzed. Additional details can be found in TestAmerica Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision.

9.0 Quality Control

9.1 **Sample QC** - The following quality control samples are prepared with each batch of samples:

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every samples	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into LIMS.

9.1.1. **Method blanks** are analyzed every 12 hours immediately after successful calibration verification (ICV and CCV) and before any samples are analyzed during the 12 hour clock. Analyze the blank in the same manner as the associated samples.

9.1.1.1. Prepare an aqueous blank by filling a 40 mL vial with reagent water and placing it in the autosampler. The autosampler will add the internal standard and/or surrogate standard.

9.1.1.2. Prepare a medium or high level blank in a 50 mL volumetric flask by adding 1.0 mL of purge and trap grade methanol to reagent water and bringing up to volume with the reagent water. The appropriate volume of this mix is added to the purge vessel. The autosampler will automatically internal standard and/or surrogate standard.

9.1.1.3. Prepare a low- level soil blank in a 40 ml VOA vial by adding a magnetic stir bar and 5 ml of reagent water and placing the vial in the autosampler tray. An additional 5mL of reagent water plus 1uL of 250ppm Internal Standard/Surrogate Mix (see Section 7.2.4) will be added by the Archon prior to purging.

9.1.1.4. To be considered acceptable, the method blank must not have any target analytes above the reporting limit. For method 8260D method blank is acceptable when target analyte concentrations are less than one-half of the reporting limit. Method blanks may contain analyte concentrations greater than acceptance limits if the associated samples in the batch are unaffected or sample

concentrations/responses are >10x the blank If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Re-analysis is not necessary if the analyte concentration falls well below the action or regulatory limit or if the analyte is deemed not important for the project. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed. Method blanks, trip blanks and other field blanks must be carried out through all stages of sample preparation and analysis.

9.1.1.5. Surrogate recoveries for the method blank must be within the laboratory generated limits. (Method 8260C /8260D requires the use of a minimum of three (3) surrogates. Since we are spiking with four (4) surrogates, either 1,2-Dichloroethane-d4 or dibromofluoromethane can be recovered outside of control limits without corrective action) .Internal standard area counts in the method blank must be within method specified limits. If any surrogate or internal standard is outside the limits, the method blank must re-analyzed.

9.1.2. Matrix Spike (MS)/Matrix Spike Duplicate (MSD): A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch which may contain up to 20 samples, and additional samples can be added to the batch for 14 days after the first sample was analyzed). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared (as described in Section 9.1.2.1) concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria which are updated annually. For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database.

9.1.2.1. Prepare the MS/MSD as follows:

9.1.2.1.1 Low Level Soil: The low level soil MS/MSD is prepared as detailed in the following table. This is prepared in duplicate (one for the MS, the other for the MSD) in a 5 ml syringe filled with reagent water. Once prepped the solution is added to separate 40 ml vials each containing 5 gram aliquots of the sample to be spiked :

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 5.0 ml of Reagent Water	Final Concentration (ug/kg)
Gas Mix Li	50ppm	2	20

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 5.0 ml of Reagent Water	Final Concentration (ug/kg)
8260 combined	50ppm	2	20
Acrolein	500 ppm	3	300
Propenes	50ppm (varied)	2	20 (varied)
Freons	50 ppm	2	20

9.1.2.1.2 Aqueous Samples: The MS/MSD for aqueous samples is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 50 ml volumetric flasks filled with an aliquot of sample to be spiked. Once prepped the solution is poured into a 40 ml VOA vial and loaded onto the purge and trap autosampler:

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 50 ml of Sample	Final Concentration(ug/L)
Gas Mix Li	50ppm	20	20
8260 combined	50ppm	20	20
Acrolein	500 ppm	4	40
Propenes	50ppm (varied)	20	20 (varied)
Freons	50	20	20

9.1.2.1.3 Medium & High Level Soils: The MS/MSD for medium/high level soils is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 50 ml volumetric flasks filled with reagent water which has been previously spiked with the methanol sample extract. Once prepped the solution is poured into a 40 ml VOA vial, the and loaded onto the purge and trap autosampler:

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 50 ml of Reagent Water containing sample methanol extract	Final Concentration (ug/L)
Gas Mix Li	50ppm	20	20
8260 conbined	50ppm	20	20
Acrolein	500ppm	4	40
Propenes	50ppm (varied)	20	20 (varied)
Freons	50 ppm	20	20

9.1.2.1.4 SIM: The MS/MSD for SIM samples is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 100 ml

volumetric flasks filled with an aliquot of sample to be spiked. Once prepped, two separate 10ml solution is poured into 40 ml VOA vials, 2ul of SIM IS/S is then added to each vial and loaded onto the purge and trap autosampler:

Standard Solution	Concentration	Volume of Standard Added to 100 ml of Sample (ul)	Final Concentration (ug/L)
8260SIM Mix1	10ppm	0.5	0.05
1,4-Dioxane	50ppm (varied)	10	5
Benzene/Chloroform	10ppm	0.5	0.05

9.1.2.2. An Laboratory Control Sample (LCS) /Laboratory Control Sample Duplicate (LCSD) may be substituted for the MS/MSD if insufficient sample volume is available (see Section 9.1.3).

9.1.3. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD): A Laboratory Control Sample (LCS) (aka blank spike) must be prepared analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (see For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference. If the LCS recovery results are outside the method specified, the LCS is reanalyzed. If, upon reanalysis, the LCS is it is still outside of limits the entire batch must be reanalyzed. For 8260D, when an LCS is prepared in the same manner as CCV, the same standard can be used as both the LCS and CCV.

9.1.3.1 For LCS preparation instructions please refer to Section 9.1.2.1 for low level soil introduction technique (note: use reagent water only, no solid matrix is used when preparing the LCS) and Sections 9.1.2.1.2 and 9.1.2.1.3 as applicable for aqueous/medium or high level solids introduction (note: use reagent water only, no sample or sample extract is used when preparing the LCS).

9.1.3.2 The LCS for SIM samples is prepared as detailed in the following table. This is prepared in a 200 ml volumetric flasks filled with organic free reagent water. Once prepped, 10ml of the solution is poured into a 40 ml VOA vial and 2ul IS/SS added manually and loaded onto the purge and trap autosampler

Standard Solution	Concentration	Volume of Standard Added to 200 ml of Reagent Water (ul)	Final Concentration (ug/L)
8260 Mix1	10ppm	1	0.05
1,4-Dioxane	50ppm	20	5
Benzene/Chloroform	10ppm	1	0.05

9.1.3.3 A Laboratory Control Sample Duplicate (LCSD) is analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with a four (4) component surrogate standard mix (see Section 7.2.2). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database).

9.1.4.1. Surrogate recovery limits are lab generated and are updated annually.

9.1.4.2. Surrogate recoveries are calculated for the blank, samples, and QC samples. Surrogate recovery is calculated as:

$$\frac{\text{Concentration found}}{\text{Concentration added}} \times 100 = \%\ \text{RECOVERY}$$

9.1.4.3. If the surrogate recoveries of any blank, sample, or QC sample fails to meet the current recovery criteria, the sample must be re-analyzed. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary. Methods 8260C and 8260D requires the use of a minimum of three (3) surrogates. As we spike with four (4) surrogates, one can be recovered outside of control limits without corrective action.

9.1.5. Internal Standards: All samples, blanks, standards and QC samples are spiked with a five (5) component internal standard mix (See Section 7.2.3). The response (area count) and retention time of each internal standard in all samples, standards, blanks and QC samples are monitored.

9.1.5.1. The internal standard responses must be within -50 +100% of its corresponding internal standard in the mid-level calibration standard or the active calibration curve. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.1.5.2. Internal standard retention time is evaluated immediately after acquisition. The retention times of the internal standards must be within ±30 seconds of the internal standards from the mid point standard of the initial calibration or the calibration verification standard. Any blank, sample, or QC sample that fails to meet these criteria must be re-analyzed.

9.2 Instrument QC

9.2.1 GC/MS Instrument Performance Check (BFB): The GC/MS system is tuned using Perfluortributylamine (PFTBA) such that an injection or purging of 50ng of 4-Bromofluorobenzene (BFB) meets the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all BFB key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. For method 8260D tune checks are only required prior to initial calibration. (**NOTE**: see Method Modifications in Section 16.0).

BFB Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
50	15.0-40.0 percent of the base peak
75	30.0-60.0 percent of the base peak
95	Base peak, 100% relative abundance
96	5.0-9.0 percent of the base peak
173	Less than 2.0% of mass 174
174	Greater than 50% of the base peak
175	5.0-9.0 percent of mass 174
176	Greater than 95.0% but less than 101% of mass174
177	5.0-9.0 percent of mass 176

9.2.1.1. The BFB mass spectrum may be evaluated using one of the procedures listed below. The spectrum may be background subtracted using a single peak no more than 20 scans before the peak apex. The BFB spectrum must meet the technical acceptance criteria listed in the table above:

- A single scan on the peak;
- An average of the peak;
- Use of three scan averaging and background subtraction techniques. Select the scan at the BFB peak apex, add +1 scan from the apex and -1 scans from the apex;

9.2.1.2. BFB parameter settings are stored in a tune file, which ill be used in all subsequent analysis of standards and samples.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. **Initial Calibration:** The initial calibration range consists of a five-point concentrations (six points for second order regression) of analytical standards prepared as described in Tables 3, 3A and 3B as applicable (attached). The initial calibration range must be analyzed only after the BFB instrument performance check has met the criteria in Section 9.2.1. A separate initial calibration range is analyzed for each sample introduction technique. The last initial calibration standard may be used to be the start of the 12 hour clock for samples analyzed after initial calibration. Verify closely eluting isomers resolution in the mid-point concentration of the ICAL. Isomers are considered resolved if the peaks are at least 50% resolved (i.e., the height of the valley between two isomer peaks is less than or equal to 50% of the average of the two peak heights. This should also be checked in the daily CC's.

9.2.2.2. If analysis by the SIM technique is required, prepare calibration standards for, Vinyl Chloride, Chloroform, Benzene 1,2-dibromoethane, 1,2,3-Trichloropropane and 1,2-dibromo-3-chloropropane at concentrations of 0.02, 0.04, .05, 0.10, 0.20, 0.50, 1.0 and 2.0 ppb; 1,4-Dioxane at 0.4, 1, 5, 10, 20, 30, 40 and 50ppb. See Table 5 that summarizes the preparation information.

9.2.2.3. **Initial Calibration Verification (ICV):** An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2.1.3 and Tables 4 and 4a (full scan) and Table 6 (SIM) (attached). The ICV must be from a source separate from the standards used in the Initial Calibration Range.

9.2.3 **Continuing Calibration Verification (CCV):** A approximately mid-point (20ug/ml and 0.050/5ug/ml for SIM) Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the BFB instrument performance check. BFB is not a requirement for 8260D CCV verification. The CCV is prepared as detailed in Section 7.2.1.1 and Table 3 (attached).

9.2.4 **Calibration Acceptance Summary**

9.2.4.1. **Retention Time:** The relative retention times of each compound in the five calibration standards must agree within 0.06 relative retention time units.

9.2.4.2. **Initial Calibration Range:** Internal standard calibration is employed for this method. After the initial calibration range has been analyzed as detailed in Section 10.3.3 the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion for the compound (see attached Table 7)
Ais = Area characteristic ion of internal standard (see attached Table 7)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound using the five or six RFs from the initial calibration range.

9.2.4.2.2. The average RFs of the target analytes listed in the table below must meet the indicated minimum RF criteria:

Minimum Relative Response Factor	
Common Target Analytes	**Minimum RF**
Dichlorodifluoromethane	0.100
Chloromethane	0.100
Vinyl Chloride	0.100
Bromomethane	0.100
Chloroethane	0.100
Trichlorofluoromethane	0.100
1,1-Dichloroethene	0.100
1,1,2-Trichloro-1,2,2-trifluoroethane	0.100
Acetone *	0.050
Carbon disulfide	0.100
Methyl Acetate *	0.005
Methylene chloride	0.100
trans-1,2-Dichloroethene	0.100
cis-1,2-Dichloroethene	0.100
Methyl tert-Butyl Ether	0.100
1,1-Dichloroethane	0.200
2-Butanone *	0.050
Chloroform	0.200
1,1,1-Trichloroethane	0.100
Cyclohexane	0.100
Carbon tetrachloride	0.100
Benzene	0.500
1,2-Dichloroethane	0.100
Trichloroethene	0.200
Methylcyclohexane	0.100
1,2-Dichloropropane	0.100
Bromodichloromethane	0.200
cis-1,3-Dichloropropene	0.200
trans-1,3-Dichloropropene	0.100
4-Methyl-2-pentanone *	0.050
Toluene	0.400

Minimum Relative Response Factor	
Common Target Analytes	**Minimum RF**
1,1,2-Trichloroethane	0.100
Tetrachloroethene	0.200
2-Hexanone*	0.050
Dibromochloromethane	0.100
1,2-Dibromoethane	0.100
Chlorobenzene	0.500
Ethylbenzene	0.100
meta-/para-Xylene	0.100
ortho-Xylene	0.300
Styrene	0.300
Bromoform	0.100
Isopropylbenzene	0.100
1,1,2,2-Tetrachloroethane	0.300
1,3-Dichlorobenzene	0.600
1,4-Dichlorobenzene	0.500
1,2-Dichlorobenzene	0.400
1,2-Dibromo-3-chloropropane	0.050
1,2,4-Trichlorobenzene	0.200

Note: Alternate ions chosen for the analytes in the table above may result in lower than recommended value

* These values are lower than method recommended values.

9.2.4.2.3. Any individual analyte that fails the minimum response factor above must have a demonstration of sensitivity in the analytical batch to report non-detects. The demonstration of sensitivity is analysis of a low level CCV (at or below the reporting limit). The criterion for a passing LLCCV is detection only, and a passing LLCCV allows non-detects to be reported without flagging. The low level CCV would normally be analyzed immediately after the mid-level CCV

9.2.4.2.4. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

The % RSD of the common target compounds listed above must be ≤20% in order for the calibration range to be acceptable. If more than 10% of the compounds exceed the 20%RSD limit and do not meet the minimum correlation coefficient (0.99) for alternative curve fits, appropriate instrument maintenance like source cleaning should be performed. Any compound that do not meet the 20%

RSD or 0.99 correlation coefficient criteria must be flagged as estimated for detects.

9.2.4.2.5. For all compounds (including those analyzed by SIM): in order to assume linearity, the % RSD of the RRF's for each target analyte must be ≤20%.

9.2.4.2.6. If the above listed criteria is met, the system can be assumed to be linear, sample analysis may begin and the average RF from the initial calibration range may be used to quantitate all samples.

9.2.4.2.7. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.6.1 **Linear regression**: Calculate the first order linear regression for any compound which did not meet the 20% RSD criteria. The r value (Correlation Coefficient) of the equation must be ≥0.99 for linear regression to be employed.

9.2.4.2.6.2 **Quadratic (or second order) regression**: may be used if the linear regression correlation coefficient exceeds criteria. Quadratic regression requires the use of a minimum six calibration points. If second order regression calibration is used, the r^2 (Correlation Coefficient) value must be $\geq$ 0.99

9.2.4.2.8. If neither of the alternative calibration techniques meets acceptance criteria i.e for more than 10% of the analytes fail both 20%RSD and 0.990 the calibration is not valid. Corrective action must be taken and the initial calibration range reanalyzed.

9.2.4.2.9. Non-detect results for any analyte that fails both 20%RSD and 0.990 correlation coefficient may be reported without flagging if (and only if) there has been a successful analysis of a LLCCV (CCV at the reporting limit) in the same analytical batch. The criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative criteria in the method must be met. Flagging of detected analytes results as estimated is discouraged when the 20%RSD and 0.990 criteria fails. In general no more than one or two of the poorest performing analytes should fail both criteria.

9.2.4.2.10. Due to significant bias to the lower portion of a calibration curve using the linear regression fit model a quantitation check on the viability of the lowest calibration point should be performed by re-fitting the

response from the low concentration calibration standard back into the curve as if it were an unknown sample (rename the lower point calibration file as a separate data file before re-processing). The results should be within ±30% of the standard's true concentration. This is not required for average RF or quadratic fits. Additionally forcing a linear regression through zero will meet the requirement of not re-fitting. Analytes which do not meet the minimum quantitation calibration re-fitting criteria should be considered 'out of control'. Report those target analyte outliers as estimated when the concentration is at or near the lowest calibration point and/or report to the next reporting level (i.e., the next higher calibration point for the analyte).

9.2.4.2.11. For additional detail refer to TestAmerica Edison Work Instruction No. EDS-WI-096, *8260C ICAL Procedure*, latest revision.

9.2.4.3. Calibration Point Read-back Criteria: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be < 50%. Relative standard error (RSE) can also be used and must be ≤ 20% for each calibration point. See section 11.10 for the Calculation of the %Error.

9.2.4.4. Initial Calibration Verification (ICV): Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 9.2.2.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed this criteria as long as their recoveries are within 65-135%. For the poor performers the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria

proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.5. Continuing Calibration Verification (CCV): A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a BFB instrument performance check, and analysis of a calibration verification standard.

9.2.4.4.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of BFB. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to "control" demonstrated before continuing with the calibration verification process. For method 8260D, tune verification is not required for daily CCV.

9.2.4.4.1.1 Calibration Verification: Analyze the calibration verification standard immediately after a BFB that meets criteria. For method 8260D, BFB is not needed. Use the mid point calibration standard (20ug/L). **NOTE:** The same sample introduction technique employed for the initial six-point calibration must be used for the calibration verification.

9.2.4.4.1.2 Calculate response factors (RF) for each compound using the internal standard method.

9.2.4.4.1.3 The RFs must meet the minimum RF criteria listed in the table in Section 9.2.4.2.2.

9.2.4.4.1.4 Calculate the % Difference for each response factor in the calibration check standard vs. the response factors from the initial calibration.

9.2.4.4.1.5 If the percent difference/drift (%D) for the compounds listed in the table in Section 9.2.4.2.2 is ≤20%, the initial calibration is assumed to be valid. If the ≤20% D criteria is not met for more than 20% of the compounds

in the initial calibration, corrective action/ investigation may be taken. After corrective action, another calibration verification standard may be injected. If the response for the analyte is still not ≤20%, a new initial calibration range must be generated.

9.2.4.4.1.6 For the poor performing compounds listed below that fail the 20%D or 50%D criteria adequate sensitivity may be demonstrated by including a low level standard (LLCCV) in the analytical batch.

Poor Performers	
Acetone	Acrolein
Carbon disulfide	1,4-Dioxane
2-Butanone	Cyclohexane
2-Hexanone	Methyl cyclohexane
4-Methyl-2-pentanone	Benzyl chloride
Chlorodibromomethane	Naphthalene
1,2-Dibromo-3-chloropropane	Cis-Dichloropropene
Bromomethane	Trans-Dichloropropene
Chloroethane	All Alcohols

When samples have non-detects for an analyte that fails the SOP criteria with low recovery a low level CCV must be analyzed in the batch as a demonstration of adequate sensitivity. The criterion for a passing LLCCV is detection only, and a passing LLCCV allows non-detects to be reported without flagging. Any sample detects for an analyte that fails the SOP criteria must be flagged as estimated, or detailed in the case narrative. In all cases every effort should be made to re-analyze on an instrument with a passing CCV.

9.2.4.4.1.7 Percent drift is used instead of percent difference in calibrations employing either the linear or second order regression modes.

9.2.4.4.1.8 For the compounds not listed in the table in Section 9.2.4.2.2: No one individual compound of interest may exceed 50%D. For SIM analysis the %D is 20%.

9.2.4.4.1.9 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the

latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.4.1.10 Internal standard area response is also evaluated immediately after acquisition. The response (area count) of each internal standard in the calibration verification standard must be within 50% - 100% of its corresponding internal standard in the mid-level calibration standard of the initial calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% to +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The instrument operating parameters are set as follows at the beginning of a method of analysis and remain constant throughout the entire analytical procedure

10.1.1.1 Full Scan Operating Mode

Purge and trap unit

Purge Time:	11 minutes
Dry Purge:	1 Minutes
Purge Gas:	Nitrogen
Purge Flow:	40-45 ml/min
Purge Temp:	Water: Ambient; Solids: 40°C
Trapping Temp:	Ambient, <30°C
Desorb Time:	1 Minute
Desorb Temp:	VOCARB: 260°C, #10: 190°C

Gas chromatograph

Injector:	180°C

Carrier Gas:	Helium
Carrier Flow:	6 ml/min, 6890: 0.8 ml/min
Oven Program:	40°C for 1 min, 8°C/min to 90°C, 20°C/ min to 250°C for 3 min; 6890: 40°C for 1 min, 8°C/min to 100°C, 24°C/min to 220°C for 2 min
Run Time:	15 - 20 Minutes

Mass Spectrometer

Electron Energy:	70 volts (nominal)
Mass range:	35-260 AMU
Scan time:	0.9 sec./scan
Source Temp:	200°C
Separator Temp:	180°C

10.1.1.2 SIM Operating Mode

Purge and trap unit

Purge Time:	11 minutes
Dry Purge:	1 Minutes
Purge Gas:	Nitrogen
Purge Flow:	40-45 ml/min
Purge Temp:	Water: Ambient; Solids: 40°C
Trapping Temp:	Ambient, <30°C
Desorb Time:	1 Minute
Desorb Temp:	VOCARB: 260°C, #10: 190°C

Gas chromatograph

Injector:	180°C
Carrier Gas:	Helium
Carrier Flow:	6 ml/min, 6890: 0.8 ml/min
Oven Program:	40°C for 1 min, 8°C/min to 90°C, 20°C/ min to 250°C for 3 min; 6890: 40°C for 1 min, 8°C/min to 100°C, 24°C/min to 220°C for 2 min
Run Time:	15 - 20 Minutes

Mass Spectrometer

Electron Energy:	70 volts (nominal)
Mass range:	35-260 AMU
Scan time:	0.9 sec./scan
Source Temp:	200°C
Separator Temp:	180°C

SIM Parameters:

Group 1
Plot 1 Ion: 51.0/96

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	51.0	100	58.0	100	65.0	100
	67.0	100	70.0	100	88.0	100
	96.0	100	78.0	100	83.0	100
	85.0	100	62.0	100	64.0	100

Group 2
Group Start Time: 6.20
Plot 1 Ion: 82/117

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	82.0	100	107.0	100	109.0	100
	117.0	100				

Group 3
Group Start Time: 8.50
Plot 1 Ion: 75/157

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	75.0	100	95.0	100	150.0	100
	152.0	100	152.0	100	157.0	100
	174.0	100				

10.2. Sample Preparation

10.2.1. Screening: All samples extracts must be screened by GC/FID static headspace analysis to provide the analyst with appropriate initial dilution factors. For additional details see TestAmerica Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

10.2.2. Aqueous Samples: Unopened 40 mls vials with aqueous samples are placed in an Archon autosampler. 1 uL of Internal Standard/Surrogate Mix (see Section 7.2.4) is added by the Archon as the 5 mL of the sample passes through the sample loop.

10.2.3. Medium or high level soils: Medium or high level extracts that will be run on an Archon autosampler are prepared in 50mL volumetric flasks. The Archon can be set up to add 1uL of 250ppm Internal Standard/Surrogate separately (see Section 7.2.3 and 7.2.2.2) to each sample as the 5mL portion passes through the sample loop.

10.2.4. Low level soils: Low level soils must be run on an Archon autosampler. 1uL of 250ppm Internal Standard/Surrogate separately (see Section 7.2.3

and 7.2.2.2) and 5mL reagent water is added to each sample vial by the Archon immediately before the sample is purged.

10.2.5. **SIM analysis:** Aliquot 10ml of sample and manually add 2ul of 2.5/50ppm of internal standard/surrogate mix. Load to soil section of the autosampler for heated purge.

10.3. Instrument Performance and Calibration Sequence

10.3.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.3.2. Analyze the Instrument Performance Check Standard (BFB) as discussed in Section 9.2.1.

10.3.3. A unique initial calibration is then prepared for each sample introduction technique.:

10.3.3.1 **40 ml VOA Vial (Aqueous/Medium-High Level Soils):** Prepare aqueous calibration standards at six concentration levels for each parameter by adding the volumes of working standards listed in Table 3 to a 50mL volumetric flask of reagent water. Pour the calibration standards into 40mL VOA vials and load into the autosampler tray. If the internal standard is to be added by the Archon/OI autosamplers the addition of internal standard into the 50ml volumetric flaks may be omitted.

10.3.3.2 **40 ml VOA Vial (Low Level Soils):** If the calibration is for low-level soils prepared according to Method 5035AA, the calibration standards must be prepared by adding the volumes of working standards listed in Table 3 into a 5 mL syringe filled with reagent water and pouring the prepared standards into 40 mL VOA vials containing a magnetic stir bar.

10.3.4. Purge the standard for 11 minutes.

10.3.5. After purging is complete, desorb the sample onto the GC column by rapidly heating the trap to 260°C for VOCARB, 190°C for #10 and backflushing it with helium.

10.3.6. Begin the GC temperature program and data acquisition.

10.3.7. Re-condition the trap by baking for 12 minutes at 260°C for VOCARB, 210°C for #10.

10.3.8. Cool the trap to (<31°C). The trap is now ready for the next sample.

10.3.9. Transfer data to network, and process using CHROM software.

10.4. Sample Analysis Sequence

10.4.1. Once the initial calibration has been verified by successful analysis of an ICV and Method Blank, analysis of samples may begin.

10.4.2. Samples must be analyzed under the same instrument conditions and using the same injection volume as the calibration standards.

10.4.3. Equilibrate all samples to room temperature prior to analysis.

10.4.4. If the sample concentration exceeds that of the range, the sample must be diluted and re-analyzed.

10.4.5. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.5. Data Processing

10.5.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled in the Chrom system. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.5.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.5.3. Data is transferred from the acquisition PC to the network for auto-processing with CHROM software.

10.5.4. Each data file is checked for correct information including sample number, job number, QA batch, dilution factor, initial volume, final volume, and % moisture.

10.5.5. The data processing service from Chrom queries LIMS for the sample processing parameters.

10.5.6. Each data file is processed using calibration factors from the most recent initial calibration, quantitation from the daily calibration verification standard is not permitted.

10.5.7. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW8260C and 8260D are listed in Table 7.

10.6. Interpretation and Qualitative Identification:

10.6.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.6.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.6.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.6.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.6.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.6.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.6.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.6.1.7. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Otherwise, structural isomers are identified as isomeric pairs.

10.6.1.8. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.6.2 Non-Target Analytes: Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of

greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.6.2.1 Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.6.2.2 The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.6.2.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.6.2.4 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.6.2.5 Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.6.2.6 If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be made, the compound will be reported as 'Unknown'. If the compound can be further classified the analyst may do so (i.e, 'Unknown hydrocarbon', 'Unknown acid' , etc..).

10.7. Data Reporting

10.7.1. Final Report. LIMS TALS system automatically produces a data report consisting of key, hardcopy reports corresponding to specific data reporting requirements.

10.7.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.7.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.7.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.7.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.7.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.7.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

11.0. Calculations / Data Reduction

11.1. Target Compounds: are quantitated using the internal standard method.

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3.. See Section 9.2.4.2 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.1.4. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RRF)(Vs)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Ais	=	Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Vs = Volume of sample purged (ml)

11.1.5. Low Level Solid Samples

$$\text{Concentration (µg/Kg) (dry wt)} = \frac{(As)(Cis)}{(Ais)(RRF)(Ws)(DW)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample

Cis = Concentration of the internal standard (ug/L)

DW = Dry wt correction = $\frac{100 - \%\ \text{moisture}}{100}$

Ais = Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Ws = Weight of sample purged (g)

11.1.6. Medium Level Solid Samples

$$\text{Concentration (µg/Kg) (dry wt)} = \frac{(As)(Cis)(Vt)(1000)(D)}{(Ais)(RRF)(Va)(Ws)(DW)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample

Cis = Concentration of the internal standard (ug/L)

D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1

DW = Dry wt correction = $\frac{100 - \%\ \text{moisture}}{100}$

Ais = Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Va = Volume of the aliquot of sample methanol extract added to reagent water for purging in ul

Vt = Total volume of methanol extract in milliliters

Ws = Weight of sample purged (g)

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method . For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 7)
Ais = Area characteristic ion of associated internal standard (See Table 7)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.4. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.2. (Initial calibration):

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.5. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\% D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} X\ 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.6. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.7. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

11.8. Accuracy:

$$\text{ICV , CCV and LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.9. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.10. Calculation of Percent (%) Error:

$$\%Error = \frac{x_i - x_i'}{x_i} x\,100$$

Where:

x_i [1] = Measured amount of analyte at calibration level *i*, in mass or concentration units

x_i = True amount

12.0 Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the TestAmerica corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure.

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The LLOQ shall be verified annually on each instrument used for client sample analysis.

12.3.4 Recovery of each analyte must meet the laboratory established LCS

recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0 Pollution Control

13.1. It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0 Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Practices*, current revision. The following waste streams are produced when this method is carried out.

- Laboratory Generated Aqueous Waste (aqueous VOA vials – used and unused). This waste may have a pH of less than 2.0. These vials are collected in satellite accumulation. The vials are then transferred to the waste room. These vials are passed through a vial crusher and the liquid portion is separated from the solid portion. The solid is dumped into the municipal garbage. The liquid is pumped into the neutralization system where it is neutralized to a pH of 6 to 9 with sodium bicarbonate (Seidler Chemical SC-0219-25). When neutralization is complete, the material is transferred to the municipal sewer system**.**

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These

boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

Teris Profile Number (incineration): 50016710
Onyx Profile Number: (stabilization) 402535

- Methanol Preserved Samples/Returned Methanol Preservative - Methanol preserved sample vials are collected in satellite accumulation and then transferred to a 55 gallon open top steel waste drum in the waste room. This drum is then removed by a waste vendor for incineration.

  Teris Profile Number: 50016652
  Onyx Profile Number: 282493

15.0 References / Cross-References

15.1. United States Environmental Protection Agency, “Method 8260C, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)”, Test Methods for Evaluating Solid Wastes, SW846, August 2006.

15.2. .United States Environmental Protection Agency, “Method 8260D, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)”, Test Methods for Evaluating Solid Waste, SW846, Update VI, Revision 4, June 2018.

15.3. United States Environmental Protection Agency, “Method SW8000D: Determinative Chromatographic Separations”, Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012.

15.4. U.S. EPA. 2003. "Method 5030C (SW-846): Purge-and-Trap for Aqueous Samples," Revision 3. Washington, DC.

15.5. U.S. EPA. 2002. "Method 5035A (SW-846): Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples," Draft Revision 1. Washington, DC.

15.6. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.7. TestAmerica Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.8. TestAmerica Edison SOP Nos. ED-MSV-001*, Purge and Trap for Aqueous Samples, SW846 Method 5030*, current revision.

15.9. TestAmerica Edison ED-MSV-002, *Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, SW846 Method 5035A,* current revision.

15.10. TestAmerica Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

15.11. TestAmerica Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.12. TestAmerica Edison SOP No. ED-GEN-023, *Bulk Solvent Testing and Approval*, current revision.

15.13. TestAmerica Edison SOP No. ED-GEN-008, *Standard Operating Procedure for Preparation, Purity and Storage of Reagents and Standards*, current revision

15.14. TestAmerica Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision

15.15. TestAmerica Edison Work Instruction No. EDS-WI-096, *8260C ICAL Procedure*, current revision.

15.16. TestAmerica Edison SOP No. ED-GEN-022, *Training*, current revision.

15.17. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Practices*, current revision

15.18. TestAmerica Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.19. TestAmerica Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.20. TestAmerica Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision

16.0 Method Modifications:

16.1 Method 8260D requires the BFB tune standard to be analyzed once prior to an ICAL and not daily after that prior to sample analysis. The laboratory will analyze the BFB tune daily, prior to QC and sample analysis. The laboratory will use the tighter criteria from Methods 8260B/8260C for tune evaluation, rather than the criteria suggested in Table 3 of Method 8260D.

17.0 Attachments

N/A

18.0 Revision History

- Revision 8, dated 07/16//2020

    - Updated throughout to include requirements of SW 8260D and 8000D.
    - Updated Table 1 with full current analyte list.
    - Add text to Section 1.1.6 detailing procedures for documenting method variations via NCMs.
    - Section 2.6: clarified text regrading lower than standard RLs.
    - Section 4.4: clarified text regarding trip blanks.
    - Section 7.1.1: revised source and details of organic free water.
    - Section 8.0: added handling and preservation details for various soil and aqueous sample types.
    - Section 9.1.1.4: Added that concentrations allowed in blanks (one half of RL), how blank concentration relates to sample concentration (<1/10) and some guidance on re-analysis when concentration exceeds criteria.
    - Section 9.1.3: added that CCV/LCS can be the same run.
    - Tune verifications as not required for daily CCV updated throughout.
    - Section 9.2.2.1.: Allowance for last calibration standard to be the start of 12-hour clock for samples analyzed after initial calibration. Calculations for verifying peak resolution
    - New Section 9.2.4.2 added: Calibration Point Read Back Criteria
    - Section 11.10: added formula for calculation of Percent Error.
    - Section 12 (Method Performance) updated to include new MDL procedure and annual LLOQ procedure.
    - Updated references in Section 15 as necessary.

- Revision 7, dated 04/01/2020:

    - Updated formatting and branding to Eurofins
    - Sec 7.2.8: Revised Expiration dates based on concentration level and corrected storage requirements.
    - Sec 8.1: Changed Storage Blanks storage period from 1 week to 1-2 weeks.

- Revision 6, dated 01/17/2018:

    - Revised Table 5 and 6: revised to add additional levels plus Benzene and chloroform and to updated concentration level of ICV to current level.

    - 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items.

    - Section 7.2.5: SIM IS/SS mix corrected to reflect lower concentration of IS mix .

    - Section 9.1.2.1.4: SIM MS/MSD preparation revised.

    - Section 9.1.3.2: SIM LCS/LCSD preparation revised.

    - Section 9.2.2.2: additional SIM levels added.

- Section 9.2.3: SIM CCV level concentration revised to reflect lower concentration.
- Section 10.2.5: New SIM analysis preparation narrative added
- Section: 6.1: New instrumentation added.
- Section: Section: 9.1.4.3: Revised to have any one surrogate out without the need for corrective action. This corrects previous narrative of one surrogate out of two.

- Revision 5, dated 12/11//2015:
  - Revised Table 5: new concentration of low standard (1,4-dioxane only).
- Revision 4, dated 12/08//2014:
  - Section 9.2.4.2.2: Table revised to reflect minimum RF of 0.050 for following compounds: acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone.
  - Section 9.2.4.3: added statement 'for poor performers the range is 50-150%'.
- Revision 3, dated 11/10/2014:
  - Tables 1 and 7: added 1,2,4,5-Trimethylbenzene, 1,4-Diethylbenzene, Butadiene, 1,4-Difluorobenzene, 1-Chlorohexane, Freon 114, Freon 123a, Isooctane, 4-Ethyltoluene, t-Amyl Alcohol, Chlorofluoroethylene to list of target compounds and list of standard sources.
  - Section 2.5: added chloroform, vinyl chloride and benzene to the list of SIM analytes addressed in this section.
  - Section 2.6: revised the concentration of the low ketone standard to 2.5 ug/l.
  - 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items. All standards prep tables revised to reflect current standard prep instructions.
  - Section 8. Preservation by TSP and holding time is added.
  - Section 9.1.2.1: updated source of standards used in various spiking solutions.
  - Section 9.1.3: LCS/MS/MSD. Preparation tables now indicate using calibration mix and not the second source mix.
  - Sections 9.1.4.3 and 9.1.1 : Revised to indicate that we are now spiking with 4 surrogates instead of the method required 3. One surrogate is now allowed to be out of limit criteria for either 1,2-Dichloroethane-d4 and Dibromofluoromethane.
  - Section 9.2.2: Chloroform, Vinyl Chloride and Benzene added as SIM compounds.

- Section 9.2.4.2.3.1. A list of 'poor performing compounds' is added with a ICAL RSD criteria of 50%.

- Section 9.2.4.3: now specifies that up to 10% of the compounds are allowed to exceed the 70-130% ICV recovery criteria as long as their recoveries are within 65-135%..

- Section 9.2.4.4.1.6: Added the following to the first sentence: '…or 50%D for the poor performing compounds'.

- Section 10.1.1.2: updated masses/dwell time for Group 1 under SIM Parameters.

- Throughout document as appropriate: Replaced references to Target with references to CHROM

- Added Section 10.5.5: "The data processing service from Chrom queries LIMS for the sample processing parameters."

- Revision 2, dated 11/04/2013:

  - Tables 1 and 7: added methyl acrylate, 1-methylnaphthalene and 2-methylnapthalene.

- Revision 1, dated 09/16/2011:

  - Tables 1 and 7: added cyclopentene, 2-chloro-1,3-butadiene, methacrylonitrile, propionitrile, ethyl methacrylate, 2-nitropropane, indan and isobutyl alcohol to list of target compounds and list of standards sources.

  - Section 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items.

  - Table 3: Initial Calibration Standards Preparation: is now split into three tables to include aqueous low level analysis.

  - Table 5: added following footnote:

    Levels 1 and 2 respectively are prepared in 500ml and 100ml final volumes
    [1]This level is also used as the Continuing Calibration Verification.

- Revision 0, dated 02/15/2011: New

Table 2: Working Standards Preparation

Target Compound Standard Name	Lab Name	Vendor	Cat. #	Vol. Std. Added	Conc. of Stock Std.	Concentration of Standard	Final Vol/ Total vol of MeOH
Gas Mix Hi	Gas (Hi)	Restek	567645	5ml mL	2000 ppm	500 ppm	20mL 15mL TV/M
Gas Mix Li	Gas (Li)	Restek	567645	500 uL	2000 ppm	50 ppm	20mL 19.5mL TV/M
8260Mix 1	Mix 1 (Hi)	Restek	567641 567646 567642 568022	2.5ml 2.5 ml 2.5 ml 2.5 ml	2000 ppm	500 ppm	10ml
8260 combined	Mix 1 (Li)	Restek	567641 567646 567642 568022 567643 568018 568713 568722 568723	1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml	2000 ppm	50 ppm	40ml 31ml TV/M
Acrolein	AC	Restek	82402	1.0ml	20000 ppm	500 ppm	40ml 39ml TV/M
8260 Mix 2	Mix 2 (Hi)	Restek	567643 568722 568019-fl 568713-fl	2.5ml 2.5 ml 2.5 ml 2.5 ml	2000 ppm	500 ppm	10mL
8260 Mix 3	Mix 3 (Hi)	Restek	568723 568021-fl	2.5ml 2.5ml	2000 ppm	500 ppm	10ml 5ml TV/M
1,4-Dioxane	1,4-Dioxane	Supelco	360481	483.6ul	Neat	50000 ppm	10ml/9.52TVM
1,4-Dioxane	1,4-Dioxane	Supelco	NA	100ul	50000 ppm	500 ppm	10ml/9.90TVM
Propenes*	Propenes	Supelco	21240202	NA	1000/2000 ppm	NA	NA
Propenes*	Propenes	Supelco	21240202	1ml	1000/2000 ppm	50 ppm (varied)	20ml/ 19ml
Gas SS	Gas SS	Restek	567645.sec	1ml	2000ppm	50 ppm	40ml 39ml/TV/M
8260 Mix 1 SIM	8260 Mix 1 SIM	Supelco	5-02111	50 ul	2000ppm	10 ppm	10ml 9.95 TV/M
1,4-Dioxane SIM	1,4-Dioxane	Supelco	NA	100 ul	50000 ppm	500 ppm	10ml/9.90TVM

Table 2: Working Standards Preparation

Target Compound Standard Name	Lab Name	Vendor	Cat. #	Vol. Std. Added	Conc. of Stock Std.	Concentration of Standard	Final Vol/ Total vol of MeOH
8260 SS	8260 SS	Restek	567641.sec 567646.sec 567642.sec 568022- sl 567643.sec 568019- sl 568713- sl 568722.sec 568723.sec 568021- sl	1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml	2000 ppm	50 ppm	40 ml 30 ml TV/M
Acrolein SS	AC SS	Restek	568720.sec	1 ml	20000 ppm	500 ppm	40 ml 39 ml TV/M
Propenes SS	Propenes SS	Supelco		1 ml	1000/2000 ppm	50/100 ppm	40 ml 39 ml TV/M
8260Mix 1 SIM SS	SIM MIX1 SS	Supelco	5S-02111	50ul	2000 ppm	10 ppm	10ml 9.95 TV/M
Benzene/ Chloroform	Ben/chl	Absolute	70025/ 70076	100ul each	1000ppm	10ppm	10ml 9.90 TV/M
1,4-Dioxane (SS)	1,4-Dioxane	Absolute	70373	1ml	1000 ppm	500 ppm	2ml/1ml TV/M

Asterisk (*) indicates a custom standard mix.

Table 3: Initial Calibration Standards Preparation, Low Level Soil

Standard Solution	Final Volume Reagent Water (ml)	Volume of Standard Added to Reagent Water (ul)					
		1ppb *	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (50ppm)	5	-	-	2.0	5	-	-
	50	1.0	5.0			-	-
Gas Mix (500ppm)	5	-	-	-		2.0	5.0
		-	-	-			
Mix 1 (combined) (50ppm)	5	-	-	2.0	5	-	-
	50	1.0	5.0			-	-
Mix 1 (Hi) (500ppm)	5	-	-	-	-	2.0	5.0
		-	-	-	-	-	-
Freon Mix							
AC (500ppm)	5	-	-	3.0	4.0	5.0	6.0
	50	10	20			-	-
Mix 2 (Hi) (500ppm)	5	-	-	-	-	2.0	5.0
		-	-	-	-		
Mix 3 (500ppm)	5					2.0	5
Propenes (50ppm)	-	-	-	-	-	-	-
	50	10.0	20.0		-	-	-
Propenes (Hi)(500ppm)	5	-	-	2.0	5.0	20	50
	-	-	-	-	-	-	-

[1]This level is also used as the Continuing Calibration Verification.

Table 3a: Initial Calibration Standards Preparation, Aqueous (LOW LEVEL)

Standard Solution	Volume of Standard Added to Reagent Water (ul)						
	0.5ppb*	1ppb*	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (500ppm)	0.5	1	1	2	5	20	50
Mix 1 (Hi) (500ppm)	0.5	1	1	2	5	20	50
Mix 2 (Hi) (500ppm)	0.5	1	1	2	5	20	50
Mix 3 (varied)	0.5	1	1	2	5	20	50
AC (500ppm)	2	4	4	4	10	20	40
1,4-Dioxane (500ppm)	15	30	-	-	-	-	-
Freons mix	0.5	1	1	2	5	20	50
Propenes (1000/2000ppm)	0.5	0.5	0.5	1	2.5	10	25
Methanol Compensate	3000	2800	610	300	280	190	0
Final vol. (reagent water)	500ml	500 ml	100ml	50 ml	50ml	50ml	50ml

[1]This level is also used as the Continuing Calibration Verification.

Table 3b: Initial Calibration Standards Preparation, Aqueous

Standard Solution	Volume of Standard Added to Reagent Water (ul)					
	1.0ppb*	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (500ppm)	1	1	2	5	20	50
Mix 1 (Hi) (500ppm)	1	1	2	5	20	50
Mix 2 (Hi) (500ppm)	1	1	2	5	20	50
Mix 3 (varied)	1	1	2	5	20	50
AC (500ppm)	4	4	4	10	20	40
1,4-Dioxane (500ppm)	30	-	-	-	-	-
Freons Mix	1	1	2	5	20	50
Propenes (1000/2000ppm)	0.25	0.5	1	2.5	10	25
Methanol Compensate	2800	610	300	280	190	0
Final vol. (reagent water)	500 ml	100ml	50 ml	50ml	50ml	50ml

[1]This level is also used as the Continuing Calibration Verification.

Table 4 : ICV Standard Preparation, Low Level Soil

Standard Solution	Concentration	Volume of Standard Added to 5.0 ml of Reagent Water (ul)	Final Concentration (ug/L)
GAS SS (Separate lot)	50ppm	2	20
8260 SS (Separate lot)	50ppm (+varied)	2	20
AC SS (separate lot)	500ppm	3	300
Freon SS (Separate lot)	50ppm	2	20
Propenes SS(separate lot)	50ppm (varied)	2	20 (varied)

Table 4a: ICV Standard Preparation, Aqueous

Standard Solution	Concentration	Volume of Standard Added to 50 ml of Reagent Water (ul)	Final Concentration (ug/L)
GAS SS (Separate lot)	50ppm	20	20
8260 SS (Separate lot)	5000ppm (varied)	20	20
AC SS (separate lot)	500ppm	4	400
Freons SS (Separate lot)	50ppm	20	20
Propenes (second source)	50ppm (varied)	20	20 (varied)

Table 5: SIM Initial Calibration Standards Preparation

Standard Solutions	Volume Standard Solution Added to Reagent Water (Final Concentration)							
8260 Mix 1 SIM (10ppm)	1 ul (0.02 ppb)	2 ul (0.04 ppb)	1 ul (0.05 ppb)	1 ul (0.1 ppb)	1 ul (0.2 ppb)	2.5 ul (0.5 ppb)	5 ul (1 .0 ppb)	10 ul (2.0 ppb)
1,4-Dioxane (500ppm)	4 ul (0.4 ppb)	2 ul (1.0 ppb)	1 ul (5.0 ppb)	1 ul (10 ppb)	1 ul (20 ppb)	2.5 ul (30 ppb)	5 ul (40 ppb)	10 ul (50 ppb)
SIM (ben/chl) 10ppm	1 ul (0.02 ppb)	1 ul (0.02 ppb)	1 ul (0.05 ppb	1 ul (0.1 ppb)	1 ul (0.2 ppb)	2.5 ul (0.5 ppb)	5 ul (1.0 ppb)	10 ul (2.0 ppb)
Final Vol. (reagent water)	**500ml**	**500ml**	**200ml**	**100ml**	**50ml**	**50ml**	**50ml**	**50ml**

levels 1 and 2 are respectively prepared in 500ml and 100ml final volumes
[1]**This level is also used as the Continuing Calibration Verification.**

Table 6 : SIM ICV Standard Preparation

Standard Solution	Concentration	Volume of Standard Added to 200 ml of Reagent Water (ul)	Final Concentration (ug/L)
SIM MIX1 SS (Second source)	10ppm	1	0.05
1,4-Dioxane SS	50ppm	20	5

TABLE 7
Characteristic Ions of Volatile Organic Compounds

Parameter	Primary ion	Secondary ion
1,1,1-Trichloroethane	97	99,117,119
1,1,2,2-Tetrachloroethane	83	85,131,133,166
1,1,2-Trichloroethane	97	83,85,99,132,134
1,1-Dichloroethane	63	65,83,85,98,100
1,1-Dichloroethene	96	61,98
1,1-Dichloropropene	75	110. 77
1,2,3-Trichlorobenzene	180	182
1,2,3-Trichloropropane	110	75
1,2,4-Trichlorobenzene	180	182, 145
1,2,4-Trimethylbenzene	105	120
1,2-Dibromo-3-Chloropropane	75	155, 157
1,2-Dibromomethane	107	109
1,2-Dichloroethane	62	64,100,98
1,2-Dichloroethene	96	61,98
1,2-Dichloropropane	63	65,114
1,2-Dichlorotrifluoroethene	67	117
1,2-Difluorotetrachloroethene	101	103, 167
1,3,5-Trimethylbenzene	105	120
1,3-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene	146	148, 111
1,4-Dioxane	88	58
1-Chloropropane	63	78
1-Methylnaphthalene	142	141
1-Propene	41	42
2,2-Dichloropropane	77	97

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
2,4,4-trimethyl-1-pentene	41	57, 97
2-Butanone	72	57
2-Chloroethyl vinyl ether	63	65, 106
2-Chloropropane	78	63
2-Chlorotoluene	91	126
2-Chloro-1,3-butadiene	88	53
2-Hexanone	43	58,100
2-Methylnaphthalene	142	141, 115
2-Nitropropane	39	42, 44
2-Octane	43	58
2-Octanol	45	55
4-Chlorotoluene	91	126
4-Methyl-2-Pentanone	43	58,100
Methacrylonitrile	67	41
Acetone	43	58
Acetonitrile	39	40, 41
Acrolein	56	55
Acrylonitrile	53	52
Allyl Alcohol	57	40, 39
Allyl Chloride	76	41
Amyl Acetate	43	70, 61
Benzene	78	--
Benzyl Chloride	91	126, 65
Bromobenzene	156	77, 158
Bromochloromethane	129	49, 130
Bromodichloromethane	83	85
Bromoform	173	171,175,
Bromomethane	94	96
Butyl Acetate	73	56, 43
Butyl Acrylate	73	56, 55
Butyl methacrylate	87	69
Camphene	93	121
Camphor	95	81
Carbon disulfide	76	78
Carbon tetrachloride	117	119,121
Chlorobenzene	112	114
Chloroethane	64	66
Chloroform	83	85
Chloromethane	50	52
Chlortrifluoroethene	116	118
cis-1,3-Dichloropropene	75	77

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
Cyclohexane	56	84, 69
Cyclopentene	67	68, 68, 53
Dibromochloromethane	129	208,206
Dibromomethane	93	95, 174
Dichlorodifluoromethane	85	87
Dimethylnaphthalene (total)	141	156, 155
Epichlorohydrin	57	62, 49
Ethanol	46	45
Ethyl Acetate	70	61, 43
Ethyl Acrylate	55	56
Ethyl Ether	59	74, 75
Ethylbenzene	106	91,
Ethyl methacrylate	69	41, 99
Freon TF	101	103, 151, 85
Hexachlorobutadiene	225	223
Hexane	56	57, 86
Indan	117	118, 58
Iodomethane (methyl iodide)	142	127
Isobutyl Alcohol (Isobutanol)	43	41, 42
Isoprene	67	53, 59
Isopropanol	45	59
Isopropyl Acetate	43	61, 87
Isopropyl Ether (DIPE)	45	87
Isopropylbenzene	105	120
Methyl Acetate	43	74
Methyl Acrylate	55	85, 42
Methyl cyclohexane	83	55, 98
Methyl Methacrylate	100	69
Methyl tert-butyl ether (MTBE)	73	57
Methylene chloride	84	49,51,86
Methylnaphthalene (total)	142	141, 115
Naphthalene	128	--
n-Butanol	56	41, 43
n-Butylbenzene	91	92, 134
n-Heptane	57	43, 71
n-Pentane	72	57
N-Propanol	60	59
n-Propylbenzene	91	120
P-Isopropyltoluene`	119	134, 91
Propyl Acetate	43	61, 73
Propionitrile	54	52, 54

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
sec-Butylbenzene	105	134
Styrene	104	78,103
Tert-Amyl Methyl Ether	73	55, 87
Tert-butyl Alcohol	59	--
Tert-Butyl Ethyl Ether	59	87
Tert-Butylbenzene	119	91, 134
Tetrachloroethene	164	129,131,166
Tetrahydrofuran	42	72, 71
Toluene	92	91
Total Xylenes	106	91
trans,-1,3-Dichloropropene	75	77
Trans-1,4-dichloro-2-butene	53	75
Trichloroethene	130	95,97,132
Trichlorofluoromethane	101	103
Vinyl acetate	43	86
Dichlorofluoromethane	67	69
Chlorotrifluoroethene	116	118
1,2-tetrachlorodifluoroethane	101	103,167
1,2-Dichlorotrifluoroethane	67	117
Vinyl chloride	62	64
Isooctane	57	41, 56
1- Chlorohexane	91	93, 55, 56
1,2,4,5-Tetramethylbenzene	119	134, 91
4-EthylToluene	105	120, 77
Chlorotrifluoroethylene	66	116,118,85
Freon 114	85	87,135,137
t-Amyl Alcohol	59	55, 73, 43
1,4-Difluorobenzene	114	63
1,4-Diethylbenzene	119	105,134
Freon 123a	67	69, 117, 119
Butadiene	54	53, 39
4-Bromofluorobenzene (sur)	95	174,176
1,2-Dichloroethane-d4 (sur)	65	102, 104
Toluene-d8 (sur)	98	70,100
Fluorobenzene (istd)	96	77
Chlorobenzene-d5 (istd)	117	82,119
1,4-Dichlorobenzene-d4 (istd)	152	115,150

Title: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometery (GC/MS), SW846 Methods 8270D and 8270E

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

USEPA Methods 8270D and 8270E are analytical methods which employ the use of GC/MS to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, and water samples

TestAmerica Edison has the capability to analyze and report the compounds listed in Table 1 via Methods 8270D and 8270E.

Table 1

Compound	CAS No.	Compound	CAS No.
1,1'-Biphenyl	92-52-4	Anthracene **(1)**	120-12-7
1,2,4,5-Tetrachlorobenzene	95-94-3	Atrazine	1912-24-9
1,2,4-Trichlorobenzene	120-82-1	Benzaldehyde	100-52-7
1,2-Dichlorobenzene	95-50-1	Benzidine	92-87-5
1,2-Diphenylhydrazine	122-66-7	Benzo[a]anthracene **(1)**	56-55-3
1,3-Dichlorobenzene	541-73-1	Benzo[a]pyrene **(1)**	50-32-8
1,3-Dimethylnaphthalene	575-41-7	Benzo[b]fluoranthene **(1)**	205-99-2
1,4-Dichlorobenzene	106-46-7	Benzo[g,h,i]perylene **(1)**	191-24-2
1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1	Benzo[k]fluoranthene **(1)**	207-08-9
1,4-Dioxane **(1) (2)**	123-91-1	Benzoic acid	65-85-0
1-Methylnaphthalene	90-12-0	Benzyl alcohol	100-51-6
1-Naphthylamine	134-32-7	Bis(2-chloroethoxy)methane	111-91-1
2,2'-oxybis[1-chloropropane]	108-60-1	Bis(2-chloroethyl)ether **(1)**	111-44-4
2,3,4,6-Tetrachlorophenol	58-90-2	Bis(2-ethylhexyl) phthalate	117-81-7
2,3,7,8-TCDD	1746-01-6	Bisphenol-A	80-05-7
2,3-Dihydroindene	496-11-7	Butyl benzyl phthalate	85-68-7
2,3-Dimethylaniline	87-59-2	Caprolactam	105-60-2
2,4,5-Trichlorophenol	95-95-4	Carbamazepine	298-46-4
2,4,5-Trimethylaniline	137-17-7	Carbazole	86-74-8
2,4,6-Tribromophenol **(Surrogate)**	118-79-6	Chrysene **(1)**	218-01-9
2,4,6-Trichlorophenol	88-06-2	Chrysene-d12 **(ISTD)**	1719-03-5
2,4-Dichlorophenol	120-83-2	Coumarin	91-64-5
2,4-Dimethylphenol	105-67-9	Dibenz(a,h)anthracene **(1)**	53-70-3
2,4-Dinitrophenol	51-28-5	Dibenzofuran	132-64-9
2,4-Dinitrotoluene	121-14-2	Diethyl phthalate	84-66-2
2,4-Xylidine	95-68-1	Dimethyl phthalate	131-11-3
2,6-Dinitrotoluene	606-20-2	Di-n-butyl phthalate	84-74-2
2-Chloronaphthalene	91-58-7	Di-n-octyl phthalate	117-84-0
2-Chlorophenol	95-57-8	Fluoranthene **(1)**	206-44-0
2-Ethylaniline	578-54-1	Fluorene **(1)**	86-73-7
2-Fluorobiphenyl **(Surrogate)**	321-60-8	Hexachlorobenzene **(1)**	118-74-1
2-Fluorophenol **(Surrogate)**	367-12-4	Hexachlorobutadiene	87-68-3
2-Methylnaphthalene	91-57-6	Hexachlorocyclopentadiene	77-47-4
2-Methylphenol	95-48-7	Hexachloroethane	67-72-1
2-Naphthylamine	91-59-8	Indeno[1,2,3-cd]pyrene **(1)**	193-39-5
2-Nitroaniline	88-74-4	Isophorone	78-59-1
2-Nitrophenol	88-75-5	n,n'-Dimethylaniline	121-69-7
2-tertbutyl-4-methylphenol	2409-55-4	Naphthalene **(1)**	91-20-3
2-Toluidine	95-53-4	Naphthalene-d8 **(ISTD)**	1146-65-2

Table 1

Compound	CAS No.	Compound	CAS No.
3 & 4 Methylphenol	15831-10-4	n-Decane	124-18-5
3,3'-Dichlorobenzidine	91-94-1	Nitrobenzene	98-95-3
3,4-Dimethylaniline	95-64-7	Nitrobenzene-d5 **(Surrogate)**	4165-60-0
3,5-di-tert-butyl-4-hydroxytol	128-37-0	N-Nitrosodimethylamine **(1)**	62-75-9
3-Nitroaniline	99-09-2	N-Nitrosodi-n-propylamine	621-64-7
4,6-Dinitro-2-methylphenol **(1)**	534-52-1	N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl phenyl ether	101-55-3	n-Octadecane	593-45-3
4-chloro-2-methylaniline	95-69-2	o-Toluidine-d9 **(Surrogate)**	194423-47-7
4-Chloro-3-methylphenol	59-50-7	Pentachloronitrobenzene	82-68-8
4-Chloroaniline	106-47-8	Pentachlorophenol **(1)**	87-86-5
4-Chloroaniline–d4 **(Surrogate)**	191656-33-4	Perylene-d12 **(ISTD)**	1520-96-3
4-Chlorophenyl phenyl ether	7005-72-3	Phenanthrene **(1)**	85-01-8
4-Methylphenol	106-44-5	Phenanthrene-d10 **(ISTD**)	1517-22-2
4-Nitroaniline	100-01-6	Phenol	108-95-2
4-Nitrophenol	100-02-7	Phenol-d5 **(Surrogate)**	4165-62-2
Acenaphthene **(1)**	83-32-9	Phenyl ether	101-84-8
Acenaphthene-d10 **(ISTD)**	15067-26-2	Pyrene **(1)**	129-00-0
Acenaphthylene **(1)**	208-96-8	Pyridine	110-86-1
Acetophenone	98-86-2	Terphenyl-d14 **(Surrogate)**	1718-51-0
Aniline	62-53-3	Total Cresols	STL00160
Aniline-d5 **(Surrogate)**	4165-61-1		

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).
(2) Compound can also be analyzed by Isotope Dilution/SIM.

1.2 For a listing of method detection limits (MDLs) and Reporting Limits (RLs) please refer to the currently active Method 8270 Method Limit Groups in TALS (TestAmerica LIMS).

1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work)*, and Section 19 (*Test Methods and Method Validation)* in TestAmerica Edison's Quality Assurance Manual (TestAmerica Edison Document No. ED-QA-LQM).

1.4 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP ED-GEN-003. The NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 Summary of Method

2.1 This method is used for the analysis of aqueous and solid matrices for semi-volatile base, neutral and acid organic compounds that are extracted from the sample matrix with an organic solvent.

2.2 An aliquot of sample containing surrogate spiking compounds is extracted with an organic solvent. The extract is concentrated on a steam bath to a suitable volume. Internal standards are added to the extract.

2.3 Sample extraction techniques are specified for each matrix in the following TestAmerica Edison SOPs:

- ED-ORP-002 (*Extraction of Semivolatile Organic Compounds in Water by Separatory Funnel, SW846 Method 3510C*);
- ED-ORP-043 (*SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270);*
- ED-ORP-0044 (*Microwave Extraction for Solids, SW846 Method 3546*);

2.4 A small aliquot of the extract is injected into a gas chromatograph (GC) equipped with a capillary column. The GC is temperature programmed to separate the compounds which were recovered during the extraction step by boiling point. The effluent of the gas chromatograph is interfaced to a mass spectrometer (MS) which is used to detect the compounds eluting from the GC. The detected compounds are fragmented with an electron beam to produce a mass spectrum which is characteristic of the compound introduced into the MS. Identification of target analytes is accomplished by comparing their mass spectra with the electron ionization spectra of authentic standards. Quantitation is accomplished by comparing the response of a major ion (quantitation ion) relative to an internal standard established through a five-point calibration (six points for second order regression). Specific calibration and quality control steps are included in the method that must be performed and must meet the specifications of SW846 Methods 8270D or 8270E as applicable.

2.5 The standard preparation procedure for aqueous samples involves use of a Reduced Volume Extraction (250 ml) (RVE) followed by analysis using a Large Volume Injection (LVI). Optionally, a full volume (1000 ml nominal) may be employed. The details of the extractions are outlined in the applicable prep SOPs while the analytical details for 8270D and 8270E are presented in this SOP.

2.6 These methods are also applicable to the analysis of samples by Selected Ion Monitoring (SIM) for the purpose of obtaining lower reporting limits for the following compounds:

Table 2 – SIM Analytes

SIM Analytes	CAS #
1,4-Dioxane	123-91-1
4,6-Dinitro-2-methylphenol	534-52-1
Acenaphthene	83-32-9

Table 2 – SIM Analytes	
SIM Analytes	**CAS #**
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[g,h,i]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Bis(2-chloroethyl)ether	111-44-4
Chrysene	218-01-9
Dibenz(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-74-1
Indeno[1,2,3-cd]pyrene	193-39-5
Naphthalene	91-20-3
N-Nitrosodimethylamine	62-75-9
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0

2.7 An isotope dilution selected ion monitoring (SIM) technique for the analysis of 1,4-dioxane in water at a reporting level of 0.4 ug/l is also described in this SOP. Using this technique 1,4-dioxane-d8 is added prior to sample extraction and is used as an internal standard to calculate the concentration of 1,4-dioxane present. Additionally, 1,4-dichorobenzene-d4 is added to the extract prior to analysis to monitor the recovery of 1,4-dioxane-d8.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of the Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Analysts must take steps to determine the source of the interference and take corrective action to eliminate the problem.

4.1.1 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce

carryover, the sample syringe is automatically rinsed with solvent between sample injections. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross-contamination. Alternately, verify that the sample analyzed after the high concentration sample does not show any carryover through inspection of chromatogram and target results.

4.1.2 Contaminants from the extraction process detected in the method blank should be evaluated to determine the impact on the analysis. Interferences from any target analyte must not be present in the method blank above the reporting limit for that compound. If these types of interferences occur, corrective action is required. The source should be identified and corrective action initiated to eliminate the interference from the extraction process. Affected samples must be re-extracted and re-analyzed.

4.1.3 The analyst must take precautions to make sure that contaminants do not enter the analytical system. These precautions include systematic procedures designed to eliminate interferences.

4.2 Some compounds analyzed by this method are unstable or sensitive to extraction and/or instrument conditions:

- Benzidine is easily oxidized during extraction. Neutral extraction may enhance the recovery of this compound.
- Hexachlorocyclopentadiene breaks down photochemically and can decompose from high temperatures, particularly in the injection port of the GC. This compound can also react with acetone in solution.
- 1,2-Diphenylhydrazine is unstable even at room temperature and readily converts to azobenzene.
- Phenols are sensitive to active sites and can give a low response or exhibit poor chromatography by tailing. Therefore, it is important the GC is maintained in the best possible condition. See Section 10.1 for proper daily maintenance.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method. They are reported as 3 and 4-methylphenol.
- Pyridine may perform poorly at the GC injection port temperatures listed in this SOP. Lowering the injection port temperature may reduce the amount of degradation.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Toluene	Flammable Poison Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Causes severe eye and skin irritation with redness and pain. May be absorbed through the skin.
Dimethyl-dichloro-silane	Flammable	none	Can be corrosive to the respiratory tract causing severe irritation and tissue damage. Harmful if absorbed through the skin. May cause severe irritation and systemic damage. Severely irritating to the skin and eyes. Harmful if swallowed. Can cause abdominal discomfort, nausea, vomiting, diarrhea, and irritation to the mouth, throat and stomach.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Gas chromatograph/mass spectrometer system

6.1.1 Gas chromatograph: An Agilent/HP 6890/7890/900 Intuvo (or equivalent) houses the capillary column. The GC provides a splitless injection port and allows the column to be directly coupled to the mass spectrometer. The oven is temperature programmable to meet the requirements of the method. An HP/Agilent 7673/7683/7963 autosampler (or equivalent) with a 10 ul syringe provides automatic injection of sample extracts while the instrument is unattended.

6.1.2 Analytical Column: 30m x 0.25mm ID, 0.25 um film thickness, Restek Rxi-5Sil MS, Catalog #13623

6.1.3 Mass spectrometer: Agilent (HP) 5972, 5973, 5975 or 5977A Mass Selective Detector (MSD) Capable of scanning from 35 to 500 amu every 1 sec or less, using 70 volts electron energy in the electron ionization mode. The mass spectrometer must be capable of producing a mass spectrum for 50 ng of decafluorotriphenylphosphine (DFTPP) which meets the criteria in Section 9.2.1 when 2 ul of the 25 ug/ml GC/MS tuning standard is injected through the GC.

6.1.4 GC/MS interface: Any GC-to-MS interface may be used that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria.

6.1.5 Data system: The data system is interfaced to the mass spectrometer and accommodates continuous acquisition and storage of GC/MS data throughout the duration of the chromatographic program. The data system consists of a Hewlett-Packard Chemstation equipped with Mustang software used for instrument control and data acquisition. This, in turn, is interfaced to TestAmerica's Chrom software for data processing. Data from sample extract analysis can be accessed in real-time, while sample data reports and library searches can be performed on data files from previously run samples. The software is also capable of searching any GC/MS data file for ions of a specific mass whose abundances can be plotted versus time or scan number which allows integration of abundances for any extracted ion between specified times or scan-number limits. Library searches utilize a NIST 02.1 Mass Spectral Library.

6.2 Bottles, glass with polytetrafluoroethylene (PTFE)-lined screw caps or crimp tops.

6.3 Injection port liners, splitless

6.4 Injection port septa

6.5 Injection port graphite seals

6.6 Pre-silanized glass wool (Supelco 2-0411 or equivalent)

6.7 Syringes, Assorted sizes 10ul - 1000ul; gas-tight

6.8 Bottles, 10 and 5ml amber screw cap with Teflon liner

6.9 Vials, 2ml amber screw cap with Teflon liner

6.10 Wheaton microvials 100ul (or equivalent)

6.11 Volumetric Flasks, Class A with ground glass stoppers (2ml - 100ml)

6.12 Analytical balance, ASP Model SP-180 (or equivalent), capable of accurately weighing to 0.0001 gr.

7.0 Reagents and Standards

The following items are recommended for performing this procedure. Equivalent items should only be used when they result in an improvement in quality, efficiency, productivity, or cost. An item can be considered equivalent if with its use, the analytical and QA/QC requirements in this SOP can be met. Please refer to the MSDS prior to the use of any reagent or standard.

The preparation of standards, surrogates and spiking solutions is documented in the TALS Reagent Module. Formulary reports can be generated upon request.

7.1. Reagents:

7.1.1. Methylene Chloride: J.T.Baker Resi-Analyzed, used for Organic Residue Analysis (P/N 9266-V8 or equivalent).

7.1.2. Methanol: J.T.Baker Purge and Trap Grade (P/N 9077-02 or equivalent).

7.1.3. Sylon-CT: Supelco (P/N 33065-U or equivalent). Sylon-CT is a highly reactive silanizing reagent consisting of 95% Toluene and 5% Dimethyldichlorosilane (DMDCS).

7.1.4. Each lot of solvent is screened for contaminants before being used for analysis as detailed in TestAmerica Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2. Standards:

7.2.1. **Calibration Standards (Full Scan Analysis)**: Stock analytical standard solutions are purchased mainly from Restek Corporation. Other standards are prepared in the laboratory as needed using neat compounds or prepared solutions purchased from Agilent, SPEX CertiPrep, Chem Service,

Accustandard, Supelco or other suppliers. Standards prep instructions are detailed for the following full scan analyte list options:

- Full Volume Aqueous Prep; and,
- Reduced Volume Aqueous Prep and Soils

Secondary dilutions are either made from purchased stock solutions as listed below or from prepared solutions as listed in the following table:

NOTE: Second sources (from certified separate lots) are used for ICV standards.

Table 3 – Full Scan Stock Standards			
Target Analyte Standard Name	**Conc. (PPM)**	**Vendor**	**Catalog #**
1,2,3,4-TCDD	50	SPEX	SVO-TANJ-12
Agilent Mix (contains compounds listed in Table 4 below)	2000 *	Agilent	Cus 0456
8270 List 1/ Std #1 Megamix	Varied	Restek	571995
8270 List 1/ Std#9	2000	Restek	569730
8270 List 1/ Std#11	2000	Restek	569732
8270 Surrogate Standard	5000*	Restek	567685
8270 Internal Standard	2000	Restek	567684
8270 List 1/ Std#10	2000	Restek	569731
Bisphenol-A	1000	Agilent	Cus-0457

*Agilent Mix, 8270 list1/std#9 and 8270 Surrogate standard are diluted to 100ppm prior to the preparation of the 1.0ppm and 0.5ppm standards.

Table 4	
Agilent Mix Catalog No. Cus-0456	
Analyte	**Concentration (PPM)**
Pentachloronitrobenzene	2000
2 -tert-butyl-4-Methylphenol	2000
2,6-Di-tert-butyl-4-Methylphenol	2000
Coumarin	2000
Phenyl ether	2000
N,N'-Dimethylaniline	2000
N-Methylaniline	2000
Carbamazepine	2000
Benzonitrile	2000
1,3-Dimethylnaphthalene	2000

7.2.1.1. Individual calibration standards for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 5
Full Volume Aqueous Prep and Soils
Working Standards Preparation

Solution Name	120 PPM	80 PPM	50 PPM	20 PPM	10 PPM	5 PPM	2 PPM	1 PPM	0.5 PPM
8270 List 1/ Std #1 Megamix	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	50ul	25ul
8270 List 1/ Std #9	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
8270 List 1/ Std #10	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	-	-	-
Agilent custom Mix	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
1,2,3,4-TCDD	-	-	500ul	-	-	-	-	-	-
8270 Surrogate Standard	600ul	400ul	500ul	100ul	50ul	50ul	20ul	500ul*	250ul *
8270 Internal Standard	500ul	500ul	1000 ul	500ul	500ul	1000 ul	1000 ul	1000 ul	1000 ul
Bisphenol-A	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	-	-
8270 List 1/ Std #11	400ul	300ul	500ul	200ul	125ul	125ul	50ul	25ul	-
Final Volume (ml)	**25**	**25**	**50**	**25**	**25**	**50**	**50**	**50**	**50**

Note: The 1.0ppm and 0.5pmm standards (above) are prepared using the 100ug/ml standard for Agilent custom Mix, 8270 List1/std#9 and 8270 Surrogate Standard.

Table 6
Reduced Volume Extraction/LVI
Working Standards Preparation

Solution Name	24 PPM	16 PPM	10 PPM	4 PPM	2 PPM	1 PPM	0.4 PPM	0.2 PPM	0.1 PPM
120 ppm (see Table 5)	2.0mL								
80 ppm (see Table 5)		2.0 mL							
50 ppm (see Table 5)			2.0 mL						
20 ppm (see Table 5)				2.0 mL					

Table 6 Reduced Volume Extraction/LVI Working Standards Preparation									
Solution Name	**24 PPM**	**16 PPM**	**10 PPM**	**4 PPM**	**2 PPM**	**1 PPM**	**0.4 PPM**	**0.2 PPM**	**0.1 PPM**
10 ppm (see Table 5)					2.0 mL				
5.0 ppm (see Table 5)						2.0 mL			
2.0 ppm (see Table 5)							2.0mL		
1.0 ppm (see Table 5)								2.0 mL	
0.5 ppm (see Table 5)									2.0mL
Final Volume (ml)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**

7.2.1.2. **Initial Calibration Verification (full scan)**: Second source ICVs for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of ICVs for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 7 8270/625 ICV Working Standards Preparation	
Solution Name	**25 PPM**
8270 List 1/ Std #1 Megamix (2nd Lot)	250ul
8270 List 1/ Std #9 (2nd Lot)	125ul
8270 List 1/ Std #10 (2nd Lot)	125ul
Agilent custom Mix (2nd Lot)	125ul
8270 Internal Standard	200ul
8270 List 1/ Std#11	125ul
Bisphenol-A (2nd Lot)	250ul
Final Volume (ml)	**10**

7.2.1.3. **Surrogate Standards (Full Scan Analysis):** A 5000ppm Surrogate Standard is purchased from Restek for use in spiking blanks, samples and associated QC prior to extraction (reference the applicable sample prep SOPs for spiking instructions).

Table 8 Full Scan Surrogate Standards Solution Restek Catalog No. 567685	
Surrogate Standard Compounds	**Concentration (PPM)**
Nitrobenzene-d5	5000
p-Terphenyl-d14	5000
2,4,6-Tribromophenol	5000
Phenol-d5	5000
2-Fluorobiphenyl	5000
2-Fluorophenol	5000

7.2.1.4. **Internal Standards** (**Full Scan Analysis**): The Internal Standards Solution at 2000ppm is purchased from Restek (Catalog # 567684). The Internal Standard solution is stored in 10ml amber screw cap bottles with Teflon liners in the dark at 4°C. The Internal standard solution is used in preparing all analytical standards. Inject 20ul of this solution (2000ppm) per ml of sample extract prior to analysis resulting in a concentration of 40ppm (ug/ml) in the extract.

Table 9 Full Scan Internal Standards Solution Restek Catalog No. 567684	
Internal Standard Compounds	**Concentration (PPM)**
1,4-Dichlorobenzene-d4	2000
Phenanthrene-d10	2000
Naphthalene-d8	2000
Chrysene-d12	2000
Acenaphthene-d10	2000
Perylene-d12	2000

7.2.2. **Calibration Standards (SIM analysis)**: The Edison lab currently analyzes only a select list of compounds by 8270D/8270E SIM (see Sections 1.0 and 2.0). Stock analytical SIM standard solutions are purchased mainly from Accustandard. Working standards are prepared from these solutions as listed in the tables in Section 7.2.2.1:

Table 10 Stock SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
Pentachlorophenol	100ppm	Accustandard	App-9-176
n-Nitrosodimethylamine	100ppm	Accustandard	APP-9-149
Hexachlorobenzene	100ppm*	Accustandard	APP-9-112
PAH Mix	100ppm	Accustandard	M-610
Bis(2-chloroethyl)ether	100ppm*	Accustandard	App-9-027
4,6-Dinitro-2-methylphenol	100ppm	Accustandard	P-3845
1,4-Dioxane	1000ppm**	Accustandard	APP-9-096

*Hexachlorobenzene and Bis(2-chloroethyl)ether are diluted to 10ppm prior to SIM Standards prep

** 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

NOTE: Second sources (from separate lots are used for ICV standards).

7.2.2.1 Individual calibration standards for SIM analysis are prepared in one of two ways depending upon the technique (full volume aqueous prep or reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 11
Full Volume Aqueous Prep – SIM
Working Standards Preparation

	0.025 PPM	**0.05 PPM**	**0.1 PPM**	**0.5 PPM**	**1.0 PPM**	**5.0 PPM**
Pentachlorophenol	10uL	25uL	50uL	50uL	100uL	250uL
n-Nitrosodimethylamine	10uL	25uL	50uL	50uL	100uL	250uL
PAH mix	2.5uL	5uL	100uL	25uL	50uL	100uL
Hexachlorobenzene	10uL	25uL	100uL	500uL	1000uL	2500uL
Bis(2-chloroethyl)ether	10uL	25uL	100uL	500uL	1000uL	250uL*
4,6-dinitro-2-methylphenol	50ul	100ul	200ul	200ul	250ul	500ul
1,4-Dioxane	20ul	50ul	100ul	100ul	200ul	500ul
ISTD	200uL	200uL	200uL	100uL	100uL	100uL
Final Volume (ml)	**10**	**10**	**10**	**5**	**5**	**5**

*For Bis(2-chloroethyl)ether the 5.0 ppm level is prepared using the 100ppm standard.

Table 12
Reduced Volume Extraction/LVI – SIM
Working Standards Preparation

	0.005 PPM	**0.01 PPM**	**0.02 PPM**	**0.10 PPM**	**0.20 PPM**	**1.0 PPM**
0.025 PPM Std (see Table 11)	1.0 mL					
0.05 PPM Std (see Table 11)		1.0 mL				
0.1 PPM Std (see Table 11)			1.0 mL			
0.5 PPM Std (see Table 11)				1.0 mL		
1.0 PPM Std (see Table 11)					1.0 mL	
5.0 PPM Std (see Table 11)						1.0 mL
Final Volume (ml)	**5**	**5**	**5**	**5**	**5**	**5**

7.2.2.2 Initial Calibration Verification (SIM): A 0.1 ppm separate lot SIM ICV is prepared as detailed in Table 13 using the stock standards detailed in Section 7.2.2 (above)

Table 13 0.1ppm SIM ICV preparation	
Pentachlorophenol	25uL
n-Nitrosodimethylamine	25uL
PAH mix	5uL
Hexachlorobenzene	5uL
1,4-Dioxane	5ul
4,6-Dinitro-2-methylphenol	100ul
ISTD	**100uL**
Final Volume	**5 ml**

7.2.2.3 Internal Standard solution (SIM): A 50 ppm Internal Standard solution for SIM analysis is prepared by adding 125ul of the 2000ppm stock ISTD (see Section 7.2.1.4) and bringing to volume with Methylene Chloride in a 5ml volumetric flask.

7.2.2.3.1 For SIM analysis inject 20ul of this solution (50ppm) per ml of sample extract prior to analysis resulting in a concentration of 1ppm (ug/ml) in the extract.

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7.2.3. Calibration Standards (Isotope Dilution SIM – 1,4-Dioxane): The Edison lab currently analyzes only for 1,4-dioxane by 8270D/8270E isotope dilution SIM (see Sections 1.0 and 2.0). Stock analytical isotope dilution SIM standard solutions are purchased mainly from Accustandard and Restek. Working standards are prepared from these solutions as listed in the tables below.

Table 14 - Stock 1,4-Dioxane Isotope Dilution SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane	1000ppm*	Accustandard	APP-9-096

* 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

Table 15 - Stock Labeled 1,4-Dioxane SIM Surrogate/Internal Standard (added at prep)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane-d8	2000ppm	Restek	30614

Table 16 - Stock 1,4-Dioxane Isotope Dilution SIM Internal Standard (added to extract)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dichlorobenzene-d4	2000ppm	Accustandard	AZ-014J-3

7.2.3.1 Individual calibration standards for 1,4-dioxane isotope dilution SIM analysis are prepared at the concentrations detailed in the following tables. Prepare by combining the appropriate volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 17
Reduced Volume Extraction/LVI – 1,4-Dioxane Isotope Dilution SIM
ICAL Standard Concentrations (ug/ml)

	Lev 1	Lev 2	Lev 3	Lev 4	Lev 5	Lev 6	Lev 7	Lev 8	ICV*
1,4-Dioxane	0.02	0.04	0.1	0.2	0.5	1	2	10	0.2
1,4-Dioxane-d8	4	4	4	4	4	4	4	4	4
1,4-Dichlorobenzene-d4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

***:** The ICV is prepared from the second source stock in Table 13.

7.2.4. GC/MS Instrument Performance Check (DFTPP): The DFTPP standard is prepared by is prepared at 25 ppm by adding 2.5ml of EPA 8270 GC/MS Tuning Solution II (Restek Catalog # 31615) to a 100ml volumetric flask and bringing to volume with Methylene Chloride.

7.2.5. Information on prepared standard solutions must be recorded in the TALS Reagent Module. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Standards must be remade every 6 months, or sooner, if the standards expire or begin to show signs of unacceptable degradation. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.6. Please refer to TestAmerica Edison SOP No. ED-GEN-008, Standard Operating Procedure for Preparation, Purity and storage of Reagents and Standards.

- Shelf Life of Standard: 1 year after preparation or stock standard manufacture expiration, whichever comes first;
- Storage Requirements: Stock standards are stored at 4℃ and Working Standards stored at -10℃ to -20℃.

8.0 Sample Collection, Preservation, Shipment and Storage

8.1 All samples must be stored at 4ºC (± 2ºC) upon receipt.

8.2 Sample Extract Storage. Samples extracts must be protected from light and refrigerated at 4ºC (± 2ºC) from time of extraction until analysis.

8.3 Sample Extract Holding Time. All sample extracts must be analyzed within 40 days of extraction.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 1L	1000 ml or 250 ml (1)	Cool 4 ± 2°C	7 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E
Solids	Wide mouth glass, 8 or 16 oz.	50g	Cool 4 ± 2°C	14 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270D/8270E

(1) : Reduced volume extraction (RVE) LVI option

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every sample	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD, Method Blank)
[4] Statistical control limits are determined annually and are updated into TALS limit group..

9.1.1. **Method blanks** are extracted with every sample batch on each day that samples are extracted. To be considered acceptable, the method blank must contain less than the reporting limit of all target compounds except for phthalates, which can be present at up to 5x the MDL. For method 8270E

the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.

If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed.

9.1.1.1. Surrogate recoveries for the method blank are compared to laboratory generated limits. If two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference.. If any surrogate is still outside limits, all samples and QC samples associated with that method blank must be re-extracted (volume permitting).

9.1.2. Matrix Spike (MS)/Matrix Spike Duplicate (MSD): A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared and extracted concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria. See the current active TALS 8270 Method Limit Group for QC limits. The MS/MSD spiking solution should the same as used for the calibration standards.

9.1.2.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.2.2 An LCS/LCSD may be substituted for the MS/MSD if insufficient sample volume is available.

9.1.3. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD): A Laboratory Control Sample (LCS) (aka blank spike) must be extracted and analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference.

9.1.3.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.3.2 Spike recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.4. Surrogate Standards: All full scan samples, blanks and QC samples are spiked with a six (6) component surrogate standard mix (see Section 7.2.1.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits).

If any two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary.

9.1.4.1 Surrogate recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.5. Internal Standards: The response (area count) of each internal standard in the sample must be within -50 +100% of its corresponding internal standard in the CCV or, the ICAL midpoint for samples analyzed under the initial calibration range. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.2. Instrument QC

9.2.1 GC/MS Instrument Performance Check (DFTPP): (**Note**: the DFTPP performance check applies only to full scan analyses and is not evaluated for SIM analysis). The GC/MS system is tuned using Perfluortributylamine (PFTBA) such that an injection of 50ng of Decafluorotriphenylphosphine (DFTPP) meet the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all DFTPP key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. Daily tune verification is not required for 8270E CCV.

DFTPP Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
51	30-60% of mass 198
68	<2% of mass 69
69	reference only
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base Peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

9.2.1.1. Evaluate DFTPP using three scan averaging and background subtraction techniques. Select the scan at the peak apex, add +1 scan from the apex and -1 scans from the apex.

9.2.1.2. The mass spectrum of DFTPP may be background subtracted to eliminate column bleed or instrument background ions. Background subtract DFTPP by selecting a scan for subtraction ≤20 scans before the apex scan of DFTPP.

9.2.1.3. Check column performance using pentachlorophenol and the benzidine peaks (these compounds are included in the DFTPP solution). Benzidine & Pentachlorophenol should respond normally without significant peak tailing (Tailing Factor should be <2 measured at 10% peak height). If responses are poor and excessive peak tailing is present, corrective action for the GC/MS instrument may be required. Corrective actions may include:

9.2.1.3.1 Retune the GC/MS;
9.2.1.3.2 Clip the injector end of the GC column;
9.2.1.3.3 Replace the septum and injection port liner;
9.2.1.3.4 Change the injection port seal;
9.2.1.3.5 Replace the GC column;
9.2.1.3.6 Clean the injection port with MeCl2
9.2.1.3.7 Clean the MS ion source;
9.2.1.3.8 Place a service call.

9.2.1.4. The breakdown of 4, 4-DDT into 4,4-DDD and 4,4'DDE may also be used to assess GC column performance and injection port inertness. If so evaluated the breakdown must be <20%.

9.2.1.5. DFTPP parameter settings are stored in a tune file, which will be used in all subsequent analysis of standards and sample extracts.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. Initial Calibration: The initial calibration range consists of a minimum of five concentration levels of analytical standards (six for second order regression) prepared as described in Section 7.2. and analyzed once the DFTPP instrument performance check has met the criteria in Section 9.2.1. .

9.2.2.2. Initial Calibration Verification (ICV): An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2. The ICV must be from a source (or lot) separate from the standards used in the Initial Calibration Range.

9.2.3 Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV): A mid-point Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the DFTPP instrument performance check (when applicable).. The CCV is prepared as detailed in Section 7.2. (typically, 50 ug/ml for full volume aqueous and soils, 10 ug/ml for LV, 0.02 ug/ml for LVI SIM) and 0.2 for isotope dilution SIM). Additionally a Low Level Continuing Calibration Verification (LLCCV) is analyzed after the CCV for full scan analysis. The LLCCV is the same as the lowest calibration level analyzed with the initial calibration range (See Section 7.2).

9.2.4 Calibration Acceptance Summary

9.2.4.1. Retention Time Windows: Retention time windows must be established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. Obtain the retention time for all compounds from the analysis of the midpoint standard for the calibration curve. Establish the center of the retention time window by using the absolute retention time for each analyte, internal standard and surrogate from the calibration verification standard at the beginning of the analytical shift. For samples run during the same shift as an initial calibration, use the retention time of the mid-point standard of the initial calibration. For qualitative identification to be acceptable the retention time of the relative retention time (automatically calculated in Chrom) must be within 0.8 - 1.2 RRT units of its assigned internal standard. The relative retention times of each compound in the five calibration standards must agree within .06 relative retention time units.

9.2.4.2. Initial Calibration Range: Internal standard calibration is employed for this method. After the initial calibration range has been analyzed the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion (see Table 21) for the compound
Ais = Area characteristic ion (see Table 21) of associated internal standard
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound. Minimum response factors must be met for each of the compounds listed in Table 18 (below). Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity in the analytical batch to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met.

Table 18:
Minimum Response Factors

Compound	Minimum Response Factor
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl) ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200
Naphthalene	0.700

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
4-Chloroaniline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800
2-Nitroaniline	0.010
Dimethyl phthalene	0.010
2,6-Dinitrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroanailine	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenyl ether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalene	0.010
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3'-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010
Benzo(b)fluoranthene	0.700

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010
Pentachloronitrobenzene	0.050

9.2.4.2.2. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

9.2.4.2.3. The % RSD of the RRF's must be ≤20% for each target analyte listed in Table 18. The % RSD of each target analytes must be ≤20% in order for the calibration range to be acceptable. Additionally for 8270E, the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit or do not meet the minimum correlation coefficient (0.99) for alternate fits (see below) then appropriate corrective maintenance action must be performed. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit **AND** do not meet the minimum correlation coefficient (0.99) then recalibration is necessary.

9.2.4.2.4. If the above listed criteria is met, the system can be assumed to be linear and sample analysis may begin and the average RF from the initial calibration range is used to quantitate all samples.

9.2.4.2.4.1 Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.2.5. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.5.1 Calculate the first order linear regression for any compound which did not meet the 20% criteria. First order linear regression calibration may be employed if alternative average response calibration procedures were not applicable. The r value (Correlation Coefficient) of the equation must be ≥0.99 for the calibration to be employed.

9.2.4.2.5.2 Second order regression calibration can be used for any compound that has an established history as a non-linear performer.

9.2.4.2.5.3 If second order regression calibration is used a minimum of six (6) calibration levels must be analyzed.

9.2.4.2.5.4 If second order regression calibration is used, the r^2 (Correlation Coefficient) value must be $\geq$ 0.99

9.2.4.2.5.5 Any compound that fails to meet the 20% RSD or or 0.99 correlation coefficient criteria must be flagged as estimated for detects (or must be noted in the narrative). If there are non-detects the compounds may be reported if there is adequate sensitivity to detect at the quantitation limit. To demonstrate adequate sensitivity analyze the low level point of the initial calibration in each analytical batch (LLCCV) The criteria for demonstrating adequate sensitivity is detection in the LLCCV using the standard qualitative identification criteria.

9.2.4.2.5.6. When calculating the calibration curve using the linear calibration model a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration back into the curve. The recalculated concentration of the low calibration point should be within ±50% of the standard's concentration. This evaluation can be checked using the Initial Calibration %Drift Report in Chrom. Any detects for analytes calibrated using the linear model and failing this readback criterion must be flagged as estimated or detailed in the narrative.

9.2.4.3. Calibration Point Read-back Criteria: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration

point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD / Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be <50%.

- See Section 11.8 for the Calculation of Percent (%) Error.

9.2.4.4. **Initial Calibration Verification (ICV):**.Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 7.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds with the exception of the poor performing compounds listed in Attachment 1 which are allowed to be within 50-150% : An NCM must be initiated to denote any ICV non-conformances.

9.2.4.5. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed these criteria as long as their recoveries are within 65-135%. For the poor performers (see Attachment 1) the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.6. **Continuing Calibration Verification (CCV):** A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a DFTPP instrument performance check (not required for 8270E), and analysis of a calibration verification standard. **Note:** Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration

evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.5.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of DFTPP. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to "control" demonstrated before continuing with the calibration verification process. For 8270E analysis only, tune verification is required just prior to ICAL.

9.2.4.5.2 Calibration Verification: Analyze the calibration verification standard immediately after a DFTPP that meets criteria. Daily analysis of the DFTPP is not required as part of the CCV for 8270E analysis. .When samples are analyzed after an ICAL the last ICAL standard may be used as the starting time reference for evaluation. Use the mid point calibration standard (approximately 50ug/l). NOTE: The calibration standard contains internal standards; Dichlorobenzene d_4, Naphthalene d_8, Acenaphthene d_{10}, Phenanthrene d_{10}, Chrysene d_{12}, and Perylene d_{12} at 40ug/l (0.1ug/L for SIM). The calibration check standard must also include all the target analytes from the original calibration.

9.2.4.5.3 The RFs must meet the criteria for the compounds in Table 18. Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met

9.2.4.5.4 The percent difference (when using average response factor) or percent drift (when using linear regression) of the compounds in Table 18 must be ≤20% for at least 80% of the total analyte list. If more than 20% of the compound list fail to 20% difference or drift criterion then appropriate corrective action must be taken prior to the analysis of the samples. Any individual compound that fails must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The

criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative identification criteria in the method must be met.

9.2.4.5.5 **CCV Poor Performers**: Refer to Attachment 1 for the identification of poor and/or erratic performing analytes. These analytes are allowed a %D >20% but must be <50 %D to be acceptable. If there are poor performers that exceed 50%D, the data may be reported provided results are noted as estimated. An NCM must be initiated to denote this situation.

9.2.4.5.6 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.5.7 The response (area count) of each internal standard in the calibration verification standard must be within 50 - 100% of its corresponding internal standard in the mid-level calibration standard of the active calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

9.2.4.5.8 The relative retention times of each compound in the calibration verification standard must agree within .06 relative retention time units of its value in the initial calibration.

9.2.4.5.9 Use the average response factors from the original five-point calibration for quantitative analysis of target analytes identified in field samples.

9.2.4.5.10 Prepare a calibration summary or list indicating which compounds did not meet the 20% average percent difference criteria. Record this information in that run log.

9.2.4.7. **Low Level Continuing Calibration Verification (LLCCV):** An LLCCV consisting of the low level standard from the initial

calibration range is analyzed every 12 hours of instrument operation after the CCV. The purpose and evaluation of the LLCCV is described in Section 9.2.4.4.4.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The sequence of events for GC/MS analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed.

10.1.2. Preparation of the Injection Port Liner and Installation Procedure: Prior to the start of initial calibration and each daily analysis of sample extracts, a new liner for the injection port must be prepared. Once a liner has been used it is no longer inert and will cause serious chromatography problems with phenols and other compounds. When preparing the liner, proper laboratory protection must be worn and the liner must be prepared in a well-ventilated hood. When the procedure is completed all traces of toluene, Sylon-Ct and methanol will be removed immediately so that extraction solvents and preparation of sample extracts will not come into contact with these solvents and become contaminated.

10.1.2.1 Remove one liner from a 40ml VOA bottle containing other liners immersed in Sylon-Ct solution. Rinse off the liner with Toluene and wipe dry. Insert 1cm of pre-silanized glass wool partially into one end of the liner and trim neatly. Push the glass wool into the center of the liner so that it is 1 1/4" from the bottom. Do not use glass wool or solvents that are dirty (i.e. suspended particles) or use liners which are chipped on the ends, deformed or fractured. Inspect the glass wool for cleanliness after it has been inserted.

10.1.2.2 Using a Pasteur pipette flush out the interior of the liner containing the glass wool with Sylon-Ct. Rest the liner horizontally on a small beaker and allow the Sylon-Ct to re-deactivate the interior surfaces and the glass wool. There should be no air bubbles caught in the glass wool. After several minutes flush out the Sylon-Ct with toluene and finally with methanol. Dry the outer surface of the liner and rest it on the injection port housing until the remaining methanol is boiled off

10.1.2.3 Insert the liner with the newly silanized glass wool plug into the injection port. Verify that the column extends up into the injection port and is perpendicular. Inspect the graphite seal and replace it if the edges are knife-shaped.

10.1.2.4 The septum is always replaced daily. Bake out the column at 300^{o}C for 15 minutes after the vacuum in the analyzer has returned to normal.

10.1.2.5 Performance may enhanced by clipping a small portion of the column at the injection port end. Document this activity in the maintenance record.

10.1.3. Prior to calibration or sample analysis always verify that the analyzer is under sufficient vacuum and that the column has proper carrier gas flow.

10.1.4. Establish the following GC/MS operating conditions:

10.1.4.1 Full Scan Operating Mode

Full Scan Mode – Standard Injection Volume
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300^{o}C
Source Temperature: Preset by H.P. at 280^{o}C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45^{o}C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310^{o}C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275^{o}C
Injector: Grob-type, pulse, splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

Full Scan Mode – Large Volume Injection (LVI)
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300^{o}C
Source Temperature: Preset by H.P. at 280^{o}C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45^{o}C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C

25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse, splitless
Injection Volume: 5ul
Splitless Valve Time: 0.3 minutes

10.1.4.2 SIM Operating Mode

SIM Mode
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300°C
Source Temperature: Preset by H.P. at 280°C
Scan start time: 1.5 minutes
Initial Column Temperature and Hold Time: 40°C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310°C for 3 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275°C
Injector: Grob-type, pulse splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

10.1.4.3 Isotope Dilution Selected Ion Monitoring Mode :

SIM Parameters

Group 1
Plot 1 Ion: 74.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	42.0 50	43. 0 50	68.0 50
	74.0 50	128.0 50	129.0 50
	136.0 50	150.0 50	152.0 50
	93.0 50	66.0 50	
	58.0 50		
	88.0 50		

Group 2
Group Start Time: 6.00
Plot 1 Ion: 152.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	151.0 50	152.0 50	153.0 50
	154.0 50	162.0 50	164.0 50
	165.0 50	166.0 50	

Group 3
Group Start Time: 7.80
Plot 1 Ion: 188.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	94.0 50	101.0 50	142.0 50
	178.0 50	179.0 50	188.0 50
	202.0 50	264.0 50	266.0 50
	284.0 50		

Group 4
Group Start Time: 10.50
Plot 1 Ion: 228

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	120.0 50	228.0 50	229.0 50
	240.0 50		

Group 5
Group Start Time: 12.00
Plot 1 Ion: 252.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	138.0 50	139.0 50	252.0 50
	253.0 50	260.0 50	264.0 50
	267.0 50	276.0 50	278.0 50

Table 19: Target Compound - Primary and Monitoring Ions

Compound	1	2	3
1,4-Dioxane-d8	96	64	62
1,4-Dioxane	88	58	57
1,4-Dichlorobenzene-d4	152	150	

10.1.5. The above listed instrument conditions are used for all analytical standards for calibration and for all sample extracts analyzed by this method.

10.1.5.1 The column conditions, scan start time, and splitless valve time for analysis of DFTPP only are as follows are as follows:

Initial Column Temperature and Hold Time: 140^{o}C for 0.5 minutes
Column Temperature Program: 140^{o} to 320^{o}C at 22^{o}C/minute
Final Column Temperature Hold: 320C for 0.5 minutes
Scan Start Time: approx. 5 minutes
Splitless Valve Time: 0.3 minutes
Injection Volume: 2 ul

10.2. Analytical Sequence

10.2.1. Dilutions are made based on initial GC/MS analysis. Dilutions are made in 1-ml vials using microsyringes. Calculate the dilution factor using the equation below:

DF= Ph / 5 x Is

Where:

DF = Dilution Factor
Ph = Sample Peak Height
Is = Internal Standard Peak Height

When DF >1 but <2, combine 500ul of sample extract with 500ul methylene chloride in a 1 ml amber vial, add20 ul internal standard and crimp seal

Use **Table 20** to determine dilution and internal standard amount.

Table 20
Dilution Factor Calculations

DF Value	Volume of Sample (ul)	Volume of Methylene Chloride (ul)	Volume of ISTD (ul)
<1	1,000	None	None
>1, <2	500	500	10
>4, <5	200	800	16
>10, <20	100	900	36
>20	500*	500	10

*Prepare this dilution by serially diluting the >10, <20 dilution

10.2.2. Instrument Performance and Calibration Sequence

10.2.2.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.2.2.2. Analyze the Instrument Performance Check Standard (DFTPP) as discussed in Section 9.2.1.

10.2.2.3. Initially and as required, analyze the Initial Calibration Range (minimum 5 points, six points for second order regression) as detailed in Sections 7.2.1 and 9.2.4.2. Evaluate the acceptability of the Initial Calibration Range as detailed in Section 9.2.4.2.

10.2.2.4. Immediately after the Initial Calibration Range only, analyze the Initial Calibration Verification (ICV) as detailed in Sections 7.2. and 9.2.4.3. Evaluate the acceptability of the ICV as detailed in Section 9.2.4.3.

10.2.2.5. Every 12 hours, reanalyze and evaluate the Instrument Performance Check Standard (DFTPP), not required for 8270E followed by the Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV) as detailed in Section 9.2.3, 9.2.4.4 and 9.2.4.5. Evaluate the acceptability of the CCV and LLCCV as detailed in Section 9.2.4.4

10.2.2.6. Client samples and QC samples are analyzed (as detailed in Section 10.2.3) after acceptable Instrument Performance and Calibration Checks and until the 12 hour clock expires. Repeat the sequence as required. The automation of GC/MS runs is accomplished via the “SEQUENCE” macro of the ChemStation.

10.2.3. Sample Analysis Sequence

10.2.3.1. Sample extracts are normally prepared on the same day as analysis. The GC/MS operator will prepare the extracts that will be run on his or her instrument. Volume adjustments to the extracts will be made at the discretion of the supervisor.

10.2.3.2. Prior to the start of sample analysis the GC/MS operator will generate a sequence program containing the list of the sample extracts to be analyzed, the position on the autosampler tray, and the proper acquisition and tune methods that are to be used. This sequence program contains all the necessary information on the samples to be analyzed and how the GC/MS system is to analyze them. The sample extracts are loaded onto the autosampler (ALS) tray. Their position is verified by checking them against the ALS number on the sequence. This batch analysis will be performed automatically over the 12-hour period.

10.2.3.3. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.3. Data Processing

10.3.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled. Chrom's auto-processing system queries TALS (LIMS) for each sample's processing parameters (including target compounds lists) and downloads the required processing methods from LIMS to analyze data. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.3.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.3.3. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW8270D and 8270E are listed in Table 21..

10.4. Interpretation and Qualitative Identification: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.4.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.4.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.4.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.4.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.4.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.4.1.7. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.4.2 Non-Target Analytes: Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.4.2.1. Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.4.2.2. The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.4.2.3. Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.4.2.4. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.4.2.5. Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.4.2.6. If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be

made, the compound will be reported as 'Unknown'. If the compound can be further classified the analyst may do so (i.e, 'Unknown hydrocarbon', 'Unknown acid' , etc.).

10.5. Data Reporting

10.5.1. Final Report. The Chom data system automatically produces a data report consisting of hardcopy reports corresponding to specific data reporting requirements, which is uploaded to the TALS LIMS System for the report production group.

10.5.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.5.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.5.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.5.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.5.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.5.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

10.6. The low-level calibration standard establishes the reporting limit. All reported data must be at a concentration at or above the low concentration standard. Any quantitative values below the report limit must be qualified as estimated.

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11.0. Calculations/Data Reduction

11.1. Target Compounds: are quantitated using the internal standard method (see the formula in Section 11.3).

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3. See Section 9.2.4 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method (see formula in Section 11.3). For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Internal Standard Calculation:

11.3.1. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vs	=	Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.2. Solid Samples

$$\text{Concentration } (\mu g/KG) = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
Ws	=	Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml.

11.4. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 21)
Ais = Area characteristic ion of associated internal std (See Table 21)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.4 (Initial calibration):

$$\%\ RSD = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\%\ D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.7. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.8. Calculation of Percent (%) Error

$$\%Error = \frac{x_i - x_i'}{x_i} x\,100$$

Where:

x_i [1] = Measured amount of analyte at calibration level *i*, in mass or concentration units

x_i = True amount

11.9. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the TestAmerica corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure.

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The LLOQ shall be verified annually on each instrument used for client sample analysis.

12.3.4 Recovery of each analyte must meet the laboratory established LCS recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0. Pollution Control

13.1 It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and*

Associated Laboratory Waste, current revision) and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

14.1. Pollution Prevention

14.2.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

14.2.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, “Method SW8270D, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Laboratory Manual, Physical/Chemical Methods, Revision 5, July 2014..

15.2. United States Environmental Protection Agency, "Method SW8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry", Test Methods for Evaluating Solid Wastes, SW846 Update IV, Laboratory Manual, Physical/Chemical Methods, Revision 6, June 2018.

15.3. United States Environmental Protection Agency, "Method SW8000D: Determinative Chromatographic Separations", Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012..

15.4. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.5. TestAmerica Edison SOP No. ED-ORP-002, *SW846 Method 3510C-Extraction of Semi-Volatile Organic Compounds in Water by Separatory Funnel,* current revision.

15.6. TestAmerica Edison SOP No. ED-ORP-043, *SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270,* current revision.

15.7. TestAmerica Edison SOP No. ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW3546, current revision.*

15.8. TestAmerica Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.9. TestAmerica Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.10. TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), current revision.

15.11. TestAmerica Edison SOP No. ED-GCS-001, *Preparation and Screening of Semivolatile Organic Extracts for GC/MS Analysis*, current revision.

15.12. TestAmerica Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.13. TestAmerica Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision.

15.14. TestAmerica Edison SOP No. ED-ORP-001, *Extraction of Semivolatile Organic Compounds in Water, EPA Method 625.1,* current revision.

15.15. TestAmerica Edison SOP No. ED-GEN-022, *Training,* current revision.

15.16. TestAmerica Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.17. TestAmerica Corporate Quality SOP No. CA-Q-S-006, *Detection and Quantitation Limits,* current revision.

16.0. Method Modifications:

Method 8270E requires the DFTPP tune standard to be analyzed once prior to an ICAL and not daily prior to sample analysis. Until such time as 8270D is removed from lab capabilities and in order to satisfy both 8270D and 8270E The laboratory will analyze the DFTPP tune daily, prior to QC and sample analysis. The laboratory will use the tighter criteria from Methods 8270C/8270D for tune evaluation, rather than the criteria suggested in Table 3 of Method 8270E.

17.0. Attachments

Attachment 1 Poor Performing Analytes

18.0. Revision History

- Revision 8, date 06/29/2020
    - Updated to Eurofins branding.
    - Updated throughout to include 8270E requirements.
    - Removed references to SW846 3550B/C prep methods (no longer in use for this method at Edison lab).
    - Update equipment listed in Section 6.0.Updated analytical column in Section 6.1.2.
    - Updated, deleted and renumbered tables as required.
    - Made extensive updates to Standards (sources and preparation) in Section 7.2.
    - Removed all references to Aromatic Amines. Deleted all tables specific to Aromatic Amine analysis. Renumbered remaining tables in document and updated text references.
    - Throughout document clarified tune requirements for 8270E.
    - Following added to Section 9.1.1: For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.
    - Calibration Point Read-back Criteria was added to Section 9.2.4.3. The calculation for percent error was added to Section 11.8.
    - Section 9.2.4.2.3: added following for 8270E: the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%.
    - Section 9.2.4.2.5.6: added ‘The recalculated concentration of the low calibration point should be within ±50% of the standard’s concentration.”
    - Section 12.1 revised to reflect the updated MDL procedure.
    - Added Section 12.3: annual Lower Limit of Quantitation Verification
    - Added Corporate SOP CA-Q-S-006, Detection and Quantitation Limits to references.
    - Section 16.0: added a Method Modification regarding tuning check requirements.
- Revision 7, date 06/08/2018
    - Section 2.3: revised to clarify that RVE/LVI is lab standard procedure.
    - Section 9.1.3: removed statement regarding allowance for up to five analytes to recover outside of lab acceptance limits in LCS/LCSD.
    - Section 9.2.4.3: Replace table ‘ICV Poor Performers (50-150% Recovery) with

expanded list of 'Poor Performing Analytes' in Attachment 1.
  - Added Section 9.2.4.4.5: CCV Poor Performers
  - Corrected number in section 9.2.4.5
  - Added Attachment 1 – Poor Performing Analytes

- Revision 6, date 01/12/2018:

  - Section 7.2.5 included to specify reagent and standard storage conditions.
  - Revised Section 9.1.3 to clarify requirements for specific LCS/LCSD evaluation criteria regarding the # of out of criteria analytes.
  - Revised Section 9.2.4.3 to add 2,4-Dimethylphenol as a poor performing analyte, increased the range for the poor performers to 50-150 and also expanded the guidelines for flagging the ICV outliers.

- Revision 5, dated 09/29/2017:
  - Revised Section 9.1.1 to clarify requirements for surrogate recovery in method blanks.

- Revision 4, dated 08/21/2017:
  - Updated throughout to add a procedure for the analysis of 1,4-dioxane by isotope dilution selected ion monitoring (SIM)
  - Added tables for isotope dilution SIM standards. Renumbered all tables as necessary.
  - Section 7.2.1: added a list of full scan calibration list options.
  - Table 3: Renamed 'Full Scan Stock Standards'.
  - Section 9.2.1: noted that DFTTP applies only to full scan analysis.
  - Section 9.2.3: updated CCV concentrations
  - Added reference to GC/MS Tuning Policy in Section 15.16.

- Revision 3, dated 01/07/2016:
  - Tables 1 and 2: added SIM as option for 1,4-Dioxane.
  - Section 2.3: removed SW3541 (Soxtherm) as option for soils prep (lab has discontinued use of this method). Also removed SW3541 SOP reference from Section 15.0.
  - Tables 19 and 20: added source and prep instructions for 1,4-Dioxane SIM standard. Updated source and prep instructions for 4,6-Dinitro-2-methylphenol.
  - Table 22: added prep instructions for 1,4-Dioxane and 4,6-Dinitro-2-methylphenol SIM ICV standard.
  - Corrected the information in the 'DFTPP Key Ions and Abundance Criteria' table in Section 9.2.1 to match the info found in SW846 8270C.
  - Section 10.1.4.2: updated "SIM Parameters" to included ion masses/dwell times for 1,4-Dioxane.

- Revision 2, dated 01/28/2015:
  - Extensively reformatted the SOP. Placed tables that had been in rear of document into the body of the text. Renumbered tables as applicable and fixed text references to tables.
  - Section 1.1, Table 1: Revised table to include all current analytes. Also footnoted those compounds which are currently analyzed by SIM.

- Section 2.3: added options for extraction of solids by SW846 3456 (Microwave Extraction) and by SW3580A (Waste Dilution) and added SOP references. Deleted reference to SOP ED-ORP-005 (SW3550B – Low Level); Updated Section 15 (References).
- Section 2.5: added text detailing the RVE/LVI options.
- Section 2.6: added table which includes all analytes routinely analyzed by SIM.
- Section 6: updated to include newer GC, MS and autosampler models currently in use.
- Section 6.1.3: added Zebron ZB column as an option.
- Section 7.2: extensively revised standards information to reflect switch to Restek standards.
- Table 3:Added Custom Aromatic Amine Surrogate Standard and revised Table 8 to include initial calibration prep instructions for the Aromatic Amine surrogates.
- Throughout document: removed references to Target and replaced with Chrom.
- Section 7.2.1: Added reference to section 10.2.1.2 for LVI.
- Added Section 7.2.1.3.1 and Table 17A both of which discuss use of Aromatic Amine surrogates.
- Section 7.2.1.2: Added reference to Tables 9,10 and 11 (ICV Preparation)
- Section 8.0: Added Sample container and minimum sample size (250 ml) for Reduced volume extraction.
- Sections 9.1.2, 9.1.3, 9.1.4 and 9.2.4: added statement that certain state regulatory programs have defined recovery limits which, where applicable, are used for spike and calibration evaluations.
- Section 9.1.2: Deleted sentence “A minimum of 16 spiked analytes are reported to in client reports (the full list is reported at least once during each 2 year period because we employ full spiking list.
- Section 9.1.4: Added note regarding use of Aromatic Amine Surrogates.
- Section 9.2.2.2: Added reference to ICV Preparation tables in Section 7.2.
- Section 9.2.3: added more specific info as to the concentration of the CCVs for all techniques.
- Section 9.2.4.2.1: Changed to reflect that each analyte should meet minimum RF’s, not the average across the calibration. Added LLCCV requirement.
- Section 10.3.1: added explanation of Chrom’s interaction with TALS. Removed references to Target.
- Section 9.2.4.2.5.5: Added: (or can be noted in the narrative)
- Section 9.2.4.2.5.6: Revised last sentence to read: “This evaluation can be checked using the Initial Calibration %Drift Report in Chrom.”
- Section 9.2.4.3: Removed 65-135% criteria and added “poor performing” analyte list and associated criteria of 60-140%.
- Section 9.2.4.4.3: Added LLCCV criterion for RFs
- Section 9.2.4.4.4: Added LLCCV criterion for %D
- Section 10.1.4: Updated GC/MS operating conditions for full scan, SIM and DFTPP.
- Section 10.1.4.1: added a table detailing operating conditions for LVI option.
- Table 2: Added 2-ethylaniline, 2,4-dimethylaniline, 3,4-dimethylaniline, 2,3-dimethylaniline, 2,4,5-trimethylaniline and 4-chloro-o-toluidine to Working Standards preparation information.
- Table 25: updated to include all current analytis/surrogates/internal standards and associated ions.
- Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision.

- Revision 1, dated 11/07/2011

    - Section 1.1, Table 1: Added Pentachloronitrobenzene and associated CAS# to the analyte list.
    - Section 7.2.1: Added Pentachloronitrobenzene standard information.
    - Table 2: Added Pentachloronitrobenzene to Working Standards preparation information.
    - Table 4: Added Pentachloronitrobenzene and associated minimum RF.
    - Table 8: Added Pentachloronitrobenzene and associated ions.

- Revision 0, dated 02/22/2011: NEW

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	Primary Ion	Secondary Ion(s)
1,1'-Biphenyl	154	153,76
1,2,4,5-Tetrachlorobenzene	216	214, 179
1,2,4-Trichlorobenzene	180	182, 145
1,2-Dichlorobenzene	146	148, 111
1,2-Diphenylhydrazine	77	105, 182
1,3-Dichlorobenzene	146	148, 111
1,3-Dimethylnaphthalene	156	141, 115
1,4-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene d4 **(ISTD)**	152	150, 115
1,4-Dioxane	88	58, 43
1-Methylnaphthalene	142	141, 115
1-Naphthylamine	143	115, 116
2,2'-oxybis[1-chloropropane]	45	77, 121
2,3,4,6-Tetrachlorophenol	232	131, 230
2,3,7,8-TCDD (screen)	320	322, 324
2,3-Dihydroindene		
2,3-Dimethylaniline	106	129
2,4,5-Trichlorophenol	196	198, 200
2,4,5-Trimethylaniline	102	55, 56
2,4,6-Tribromophenol **(Surrogate)**	330	132, 141
2,4,6-Trichlorophenol	196	198, 200
2,4-Dichlorophenol	162	164, 98
2,4-Xylidine	121	120, 106
2,4-Dimethylphenol	122	107, 121
2,4-Dinitrophenol	184	63, 154
2,4-Dinitrotoluene	165	63, 89
2,6-Dinitrotoluene	165	63, 89
2-Chloronaphthalene	162	127, 164
2-Chlorophenol	128	64, 130

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
2-Ethylaniline	106	122,104
2-Fluorobiphenyl **(Surrogate)**	172	171
2-Fluorophenol **(Surrogate)**	112	64
2-Methylnaphthalene	142	141
2-Methylphenol	108	107
2-Naphthylamine	143	115, 116
2-Nitroaniline	65	108, 138
2-Nitrophenol	139	109, 65
2-tert-butyl-4-Methylphenol	149	121, 91
2-Toluidine	107	106, 77
3,3'-Dichlorobenzidine	252	254, 126
3,4-Dimethylaniline	106	129, 127
3,5-Di-tert-butyl-4-Hydroxytol	205	220, 145
3-Nitroaniline	138	108, 65
4,6-Dinitro-2-methylphenol	198	51, 105
4-Bromophenyl phenyl ether	248	250, 141
4-chloro-2-methylaniline	106	144, 142
4-Chloro-3-methylphenol	107	144, 142
4-Chloroaniline	127	129
4-Chloroaniline-d4 **(Surrogate)**	131	133
4-Chlorophenyl phenyl ether	204	206, 141
4-Methylphenol	108	107
4-Nitroaniline	138	108, 65
4-Nitrophenol	139	109, 65
Acenaphthene	154	153, 152
Acenaphthene d10 **(ISTD)**	164	162, 160
Acenaphthylene	152	151, 153
Acetophenone	105	77, 51
Aniline	93	66
Aniline-d5 **(Surrogate**)	98	71,42
Anthracene	178	176, 179
Atrazine	200	173,215
Benzaldehyde	77	105,106
Benzidine	184	92, 185
Benzo(a)anthracene	228	229, 226
Benzo(a)pyrene	252	253, 125
Benzo(b)fluoranthene	252	253, 125
Benzo(g,h,i)perylene	276	138, 277
Benzo(k)fluoranthene	252	253, 125
Benzoic Acid	122	105, 77
Benzyl Alcohol	108	79, 77
Bis(2-chloroethoxy)methane	93	95, 123
Bis(2-chloroethyl)ether	93	63, 95
Bis(2-ethylhexyl)phthalate	149	167, 279
Bisphenol-A	213	228, 119
Butyl benzyl phthalate	149	91, 206

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
Caprolactam	113	55,56
Carbamazepine	193	236, 135
Carbazole	167	166, 139
Chrysene	228	226, 229
Chrysene d12 **(ISTD)**	240	120, 136
Coumarin	146	118, 63
Dibenz(a,h)anthracene	278	139, 279
Dibenzofuran	168	139
Diethylphthalate	149	177, 150
Dimethylphthalate	163	194, 164
Di-n-butylphthalate	149	150, 104
Di-n-octylphthalate	149	167, 43
Fluoranthene	202	101, 203
Fluorene	166	165, 167
Hexachlorobenzene	284	142, 249
Hexachlorobutadiene	225	223, 227
Hexachlorocyclopentadiene	237	235, 272
Hexachloroethane	117	201, 199
Indeno(1,2,3-cd)pyrene	276	138, 227
Isophorone	82	95,138
Kepone	272	237, 355
N,N-Dimethylaniline	120	122, 104
Naphthalene	128	129, 127
Naphthalene d8 **(ISTD)**	136	68
n-decane	43	57
Nitrobenzene	77	123, 65
Nitrobenzene-d5 **(Surrogate)**	82	128, 54
N-Nitrosodimethylamine	42	74, 44
N-Nitroso-di-n-propylamine	170	42,101,130
N-Nitrosodiphenylamine	169	168, 167
n-Octadecane	57	43, 85
o-Toluidine-d9 **(Surrogate)**	114	112, 42
Pentachloronitrobenzene	237	214,295
Pentachlorophenol	266	264, 268
Perylene d12 **(ISTD)**	264	260, 265
Phenanthrene	178	179, 176
Phenanthrene d10 **(ISTD)**	188	94, 80
Phenol	94	65, 66
Phenol-d5 **(Surrogate)**	99	42, 71
Phenyl ether	170	77, 115
Pyrene	202	200, 203
Pyridine	79	52, 51
Terphenyl-d14 **(Surrogate)**	244	122, 212

Attachment 1
Poor Performing Compounds

1,2,4,5-Tetrachlorobenzene
1,4-Dioxane
1-Naphthylamine
2,3,4,6-Tetrachlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Chloroaniline
2-Naphthylamine
3&4-Methylphenol
3'3-Dichlorobenzidine
4,6-Dinitro-2-methyl- phenol
4-Chloroaniline
4-Nitrophenol
Aniline
Atrazine
Benzaldehyde
Benzidine
Benzoic Acid
Benzyl Alcohol
Biphenyl
Caprolactam
Diphenylamine
Hexachlorocyclopentadiene
Hexachloroethane
n-Decane
n-Nitrosodimethylamine
o,o,o-Triethylphosphorothioate
o-Toluidine
Pentachloronitrobenzene
Pentachlorophenol
Phenol
Pyridine

These analytes are exempt from the ICV and CCV criteria as detailed in this SOP

Title: Maintaining Sample Chain of Custody

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1.0 PURPOSE

The purpose of this document is to describe the TestAmerica Edison procedures for establishing and maintaining sample chain of custody to ensure sample integrity via documentation of sample possession and transfer.

2.0 SCOPE

The SOP is to be followed by all TestAmerica Edison personnel involved in sample collection, sample transport & shipment, sample receipt, sample preparation & analysis, and sample disposal, as applicable & described herein. Chain of custody is maintained from the point of collection, through sample handling, shipment, analysis and disposal.

3.0 SAFETY

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

3.1. Specific Safety Concerns or Requirements

Personal protective equipment must be worn during all phases of sample handling. At minimum, safety glasses, protective gloves and appropriate bodily protection (ex., field uniform, coveralls, Tyvek, lab coat, etc..>) must be worn as described in the specific task or method SOP. Additional PPE is available for specific tasks and must be worn or utilized when performing these tasks. Anytime broken glassware is encountered or the task has a risk for contacting or creating broken glass, cut resistant gloves must be worn.

Proper gloves should be worn when handling chemicals: Nitrile gloves for organic solvents and latex for acids/caustics. Gloves may be worn in layers as appropriate to the task.

3.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Sodium Hydroxide	Corrosive	2 mg/M2-Ceiling	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on the severity of exposure.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

4.0 DEFINITIONS

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

Routine chain of custody: An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples.

Evidentiary chain of custody: includes the same general requirements as routine chain of custody, but is specifically designed to provide a documentation record that may be produced as evidence in legal proceedings. As such it has special requirements, which may differ from state to state and from project to project, including the use of specific types of sample collection labels and forms, custody seals and internal chain of custody records within the lab.

5.0 PROCEDURE

5.1 A sample is considered to be in a person's custody when:

- It is in a person's physical possession;
- It is in the person's view; after being in the physical possession
- The person has placed it in secure storage, and access to the sample is controlled.

5.2 As few people as possible should hand a sample until final custody is relinquished to the analytical laboratory.

5.3 **Initiation of custody:** Sample custody begins when a sample is collected. The following is a complete list of documentation that should be completed once custody is initiated. (**NOTE**: these tasks are completed by TestAmerica personnel when they are performing the sampling otherwise these steps are completed by client personnel following their own procedures and forms):

5.3.1 Field Notebook entries should be made as described in the applicable TestAmerica Edison Field Services SOP.

5.3.2 Field Sample Labels: To ensure proper identification all samples must be labeled in a clear, consistent manner. Waterproof labels are affixed to each sample container and are completed in permanent ink (see Attachment 1). Each label should include the following information:

5.3.2.1 Sample ID name or number

5.3.2.2 Sample collection date and time.

5.3.2.3 Sample type: grab or composite, as applicable.

5.3.2.4 Method of preservation

5.3.2.5 Samplers name or initials

5.3.2.6 Other info as required.

5.3.3 Custody seals: are typically used only when evidentiary chain of custody is required. Custody seals are simple tape seals that are signed, dated and placed over the caps of sample bottles, lids of sample cooler or both prior to shipping samples (see Attachment 2).

5.3.4 Chain of Custody/Analysis Request Form: All samples must be recorded on the chain of custody form. These forms may vary in format and complexity. Attachment 3 is an example *TestAmerica Edison Chain of Custody/Analysis Request Form* which is used by TestAmerica Field Sampling Personnel. Blank copies of this form are included with all client

bottle orders filled by the laboraoty. A chain of custody form submitted to TestAmerica should provide the following information at a minimum:

5.3.4.1 Client Contact Information (Company Name/Address/Phone Number)

5.3.4.2 Samplers Name

5.3.4.3 Site/Project Identification:

5.3.4.4 Site Location (City/State)

5.3.4.5 Regulatory Program (or regulatory reporting requirements)

5.3.4.6 Sample Identification

5.3.4.7 Sample Date (record for each sample point)

5.3.4.8 Sample Time (record for each sample point)

5.3.4.9 Sample Matrix (record for each sample point)

5.3.4.10 Number of containers for each sample

5.3.4.11 Preservation used (for each container)

5.3.4.12 Analysis requested (for each sample point)

5.3.4.13 Special instructions

5.3.4.14 'Relinquished by ' with date/time (for each custody transfer)

5.3.4.15 'Received by' with date/time (for each custody transfer)

5.3.5 Transfer of Custody: Transfer of custody occurs when sample possession is relinquished from one person to another or to another storage location. When relinquishing custody of samples, the person relinquishing signs the box at the bottom of the chain of custody labeled 'Relinquished by:' and records the date/time of custody transfer (the first entry should always be the sampler). The person accepting the sample(s) signs the corresponding box labeled 'Received By:' and records the date/time (or verifies the relinquished date/time if there is only one box for that info. Multiple fields for both 'Relinquished by:' and "Received By:' are typically provided in case multiple couriers are required.

5.3.5.1 An exception to the transfer of custody procedures detailed in 5.3.5 is made when releasing custody to a private courier (i.e. Federal Express) or when samples are dropped/ stored at a secure (locked) facility and picked up by another person at a later time/date. In these cases a notation should be made that the sample(s) were transferred to common courier or secure storage and the person taking custody should sign/date the chain of custody when they actually take custody.

5.3.5.2 The exception outlined in Section 5.3.5.1 is acceptable only for routine chain of custody but not for cases where evidentiary chain of custody is required. The additional steps typically required in cases of evidentiary chain of custody include the use of custody seals which are often used to demonstrate sample integrity when

samples are transported via common carrier or dropped at secure locations. Custody seals are simple tape seals that are signed, dated and placed over the caps of sample bottles, lids of sample cooler or both prior to shipping samples (see Attachment 2 for an example custody seal). At the laboratory, the custody seals are broken on the transport cooler by the sample custodian, who inspects samples for breakage, integrity and temperature. This also initiates the laboratory's internal chain of custody (if required) which is signed and dated by the sample custodian (see Attachment 4). Custody seals on sample bottles (if provided) are broken by the analyst at the time of sample prep or analysis and the date/time is recorded in the lab's internal custody record along with the identification of the analyst.

5.3.6 Completing Custody: Routine chain of custody typically closes upon final receipt by the laboratory performing the analyses. When the analytical report is generated, a copy of the chain of custody is included in the report (the original is kept on file in the laboratory). In cases where evidentiary chain of custody is required, additional documentation is included in the final data report including: copies of custody seals, copies of air bills or bills of lading, copies of shipping receipts and copies of internal chains of custody as required.

5.3.6.1 An internal chain of custody form (see Attachment 4) documents all transfers of samples, subsamples and sample extracts with the laboratory until the sample is consumed by analysis or disposed. The same transfer rules that apply for routine chain of custody apply for internal chain of custody (see Section 5.3.5).

6.0 RESPONSIBILITIES

6.1 Field Services Personnel: responsible for proper documentation of sample collection and custody procedures.

6.2 Couriers: responsible for ensuring that chain of custody is maintained as per the procedures detailed in this SOP.

6.3 Sample control personnel: responsible for following sample receipt procedures detailed in relevant SOPs as well as properly documenting chain of custody as detailed in this document.

6.4 Laboratory analysts: responsible for maintaining internal chain of custody documentation when required.

7.0 REFERENCES / CROSS-REFERENCES

7.1. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

7.2. *NJDEP Field Sampling Procedures Manual*, August 2005.

7.3. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

8.0 ATTACHMENTS

Attachment 1: Example: Sample Container Label

Attachment 2: Example: Custody Seal

Attachment 3: Example: Chain of Custody/Analytical Request Form

Attachment 4: Example: Internal Chain of Custody Form

9.0 Revision History

- Revision 7 dated 08 July 2014
  - Approval signatures updated to current employees.
  - Sections 1 & 2: Clarified SOP's purpose and scope.
  - Throughout document- revised for general grammar and spelling.
- Revision 6 dated 02 May 2012
  - Sec 7: Added applicable references.
- Revision 5 dated 16 February 2010
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 1.2 Added reference to Quality Assurance Manual for method modifications.
  - Section 3: Revised to include most up to date corporate health and safety references and information.
  - Section 4: revised to reference new location for definitions. Added definitions for routine chain of custody and evidentiary chain of custody.
  - Section 5.0: revised and updated to reflect current lab procedures.
  - Section 7.0: References: updated
  - Section 8.0: Added additional attachments.
  - Section 9.0: Added this Revision History section

Attachment 1.

Example: Sample Container Label

SAMPLE ID

SAMPLED BY	DATE
	TIME
LOCATION	PRESERVATIVE
ANALYSIS	CLIENT

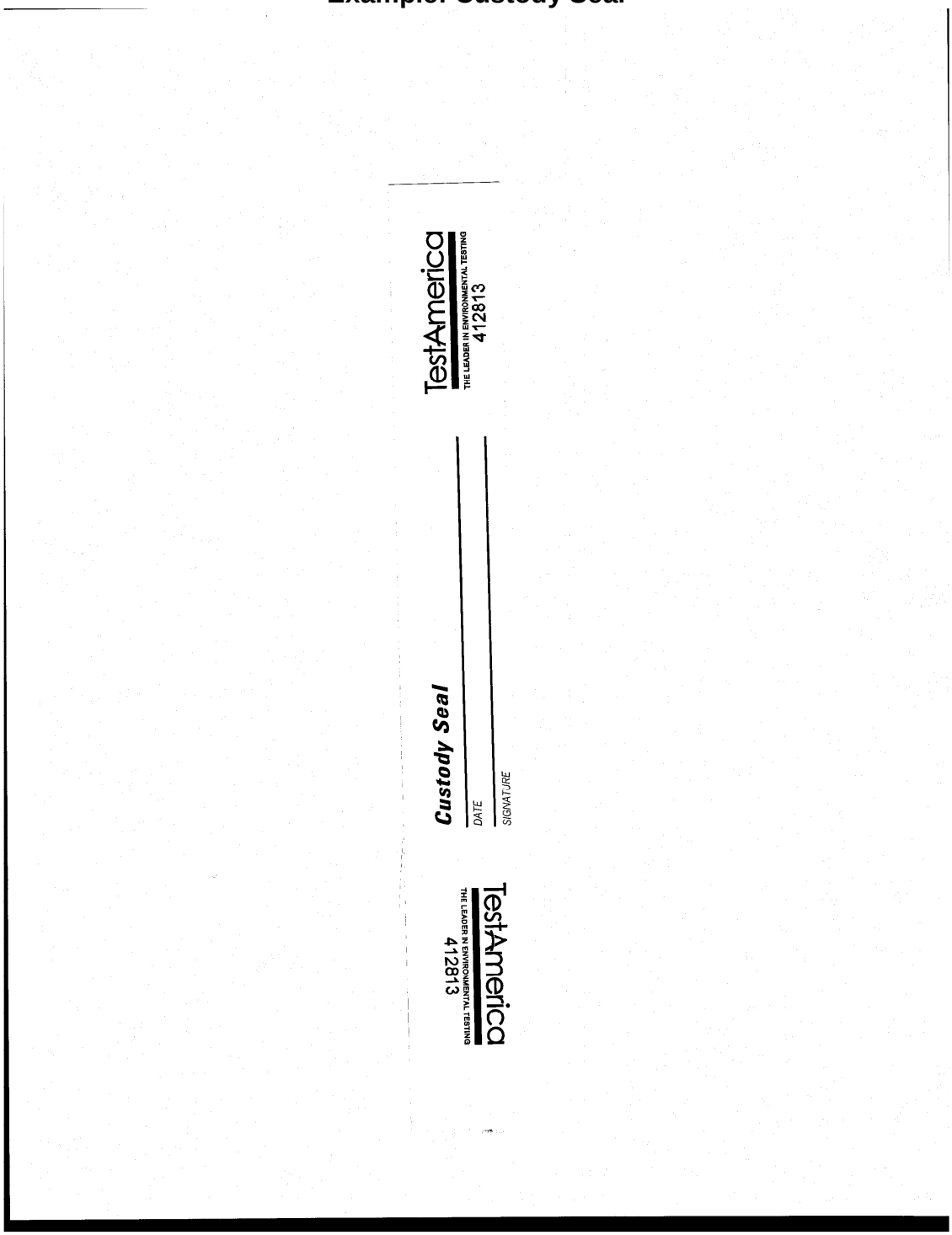
LOT#

ENVIRONMENTAL SAMPLING SUPPLY

(800) 233-8425 www.essvial.com

Attachment 2.

Example: Custody Seal



Attachment 3.

Example: Chain of Custody/Analytical Request Form

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

777 New Durham Road
Edison, New Jersey 08817
Phone: (732) 549-3900 Fax: (732) 549-3679

CHAIN OF CUSTODY / ANALYSIS REQUEST

Page ____ of ____

Name (for report and invoice)

Company

Address

City State

Phone Fax

Samplers Name (Printed)

P. O. #

Analysis Turnaround Time
Standard ☐
Rush Charges Authorized For:
2 Week ☐
1 Week ☐
Other ☐ _____

Site/Project Identification

State (Location of site): NJ: ☐ NY: ☐ Other:

Regulatory Program:

Sample Identification	Date	Time	Matrix	No. of Cont.	ANALYSIS REQUESTED (ENTER "X" BELOW TO INDICATE REQUEST)	LAB USE ONLY Project No: / Job No: / Sample Numbers

Attachment 4.

Example: Internal Chain of Custody Form

DEP-077
Rev. 3/04

Page _____ of _____

New Jersey Department of Environmental Protection

Internal Chain of Custody

Instructions: Use 1 form for each 20 samples of aliquot.

Laboratory Person Breaking Field Seal on Sample Shuttle & Accepting Responsibility for Sample	
Laboratory:	Location:
Name:	Title:
Field Sample Seal No.:	Date Broken: / / Military Time Seal Broken:
Case No.:	Analytical Parameter/Fraction:

Sample No.	Aliquot/Extract No.

Sample No.	Aliquot/Extract No.

Date	Time	Relinquished By	Received By	Purpose of Change of Custody
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	
		SIGNATURE	SIGNATURE	
		PRINTED NAME	PRINTED NAME	

Distribution: White – Original (Sent With Report) Yellow – Contractor Archive Pink – Sample Custodian – Interim Copy

Quality Assurance Manual Cover Page

Eurofins TestAmerica Edison
777 New Durham Road
Edison, NJ 08817
Phone No. 732-549-3900
Fax No. 732-549-3679

www.testamericainc.com

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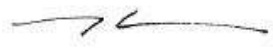
1.0 Title Page

Quality Assurance Manual
Approval Signatures



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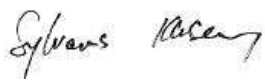

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3.0 INTRODUCTION, SCOPE AND APPLICABILITY

3.1 Introduction and Compliance References

Eurofins TestAmerica Edison's Quality Assurance (QA) Manual is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving the laboratory's QA Program.. Governing SOPs are in place within the organization to ensure the proper execution of this QA Manual (refer to Appendix 1). This manual and referenced documents are required reading for all personnel.

The laboratory is a team of people who work together to serve the health and environmental needs of society through science and technology. We offer comprehensive expertise in environmental laboratory applications and client relations and maintain a national perspective in terms of quality.

As such, this QA Manual has been prepared to assure compliance with The NELAC Institute (TNI) Standard, dated 2009 and 2016 and SO/IEC Guide 17025:2005 and 2017. Policies and procedures listed in Appendix 1 are compliant with the National Divisional Support Center (NDSC) Quality Management Plan (QMP) for Eurofins TestAmerica and the various accreditation and certification programs which are held by the laboratory to support environmental work (Appendix 2). The QMP provides a summary of Eurofins TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all Eurofins TestAmerica facilities shall conduct their operations.

Refer to Appendix 3 for a list of additional references for which this QA Manual is compliant; and Appendix 4 for the compliance crosswalk of this manual to the TNI & ISO/IEC Guide 17025 requirements.

3.2 Terms and Definitions

A QA Program is a system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the local management level through company goals, from guidance at the executive management level, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. Our program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization to better serve our clients.

Refer to Appendix 5 for a list of Terms and Acronyms.

3.3 Scope / Fields of Testing

The laboratory analyzes a broad range of environmental and industrial samples. Sample matrices vary among drinking water, effluent water, groundwater, hazardous waste, sludge and soils. The QA Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical processes, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all analytical requests are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of

test methods used by the laboratory can be found in our active LIMS method database. Our areas of expertise include:

Standard Services	Specialty Services
• Volatiles • Semivolatiles • Metals • Pesticides/PCBs/Herbicides • Petroleum Hydrocarbons • Waste Characterization • Non-Potable Water Testing • Drinking Water Testing • Soil and Surface Water Testing • Sediment Testing •	• 1,4-Dioxane • Free Cyanide • PCBs by EPA 680

NOTE: All current certificates and scopes of accreditation are available on the laboratory's website at https://www.testamericainc.com.

The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet these requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory President, Laboratory Vice-President, Director of Operations, Laboratory Director and/or Business Unit Manager and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory President, Laboratory Vice-President, Director of Operations, Laboratory Director and/or Business Unit Manager and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 Management of the Manual

3.4.1 Review Process

The template on which this manual is based is reviewed annually by Eurofins National Divisional Support Center (NDSC) which houses the Quality Assurance leadership team for Eurofins Environment Testing America. NDSC QA will assure that the template remains in compliance with Section 3.1. This manual itself is reviewed every two years**,** or as required by state program**)** by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the QMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our Document Control & Updating procedures (refer to SOP ED-GEN-002, Document Control).

4.0 MANAGEMENT REQUIREMENTS

4.1 Overview

The laboratory is a local operating unit of Eurofins Environment Testing America. The laboratory's operational and support staff have the day-to-day independent operational authority under the direction of the Laboratory President, Laboratory Vice-President, Director of Operations, Laboratory Director and/or Business Unit Manager and is supported by the NDSC QA team. The laboratory management staff includes directors, managers and group leaders. The organizational chart of the management staff are presented in Figure 4-1. Individual departmental staff lists are maintained in the laboratory's internal intranet.

4.2 Roles and Responsibilities

In order for the QA Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The responsibility for quality resides with every employee of the laboratory. All employees have access to the QA Manual, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks impartially and in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Vice President of Quality and Environmental Health and Safety (VP-QA/EHS)

The Vice President (VP) of QA/EHS reports directly to Eurofins Environment Testing America Chief Operating Officer (COO). With the aid of the NDSC Quality Team Members, Business Unit Managers, Laboratory Directors, the VP-QA/EHS has the responsibility for the establishment, general overview and maintenance of the Quality Assurance and EH&S Programs within Eurofins Environment Testing America. Additional responsibilities include:

- Review of QA/QC and EHS aspects of NDSC Official Documents, national projects and expansions or changes in services.
- Work with various organizations outside of the laboratory to further the development of quality standards and represent the laboratory at various trade meetings.
- Prepare monthly reports for quality and EH&S metrics across the environmental testing laboratories and a summary of any quality and EH&S related initiatives and issues.
- With the assistance of the Executive Management and the EHS Managers, maintenance and implementation of the Eurofins Environment Testing America Environmental, Health and Safety Program.

4.2.2 Quality Directors

There are four (4) Quality Directors within NDSC that report directly to the VP-QA/EHS. These Quality Directors have oversight of the general overview and maintenance of the QA Program within the Eurofins Environment Testing America laboratories. Supported tasks include:

- Monitors laboratory internal audit findings;
- Identifies common laboratory weaknesses and monitors corrective action closures.
- Develops NDSC quality guidance documents and management tools for ensuring and improving compliance;
- Monitors and communicates DoD/DoE requirements;

- Monitors and communicates regulatory and certification requirements;
- Training and OnBoarding
- Laboratory assessments, mentoring, and interventions
- Track/drive root cause investigations and corrective action plans
- Builds knowledge base for preventive actions

4.2.3 Quality Information Manager

The Quality Information works directly with the NDSC Quality Directors and EHS Managers; and reports directly to the VP-QA/EHS. The Quality Information Manager is responsible for the management of:

- NDSC Official Documents
- TALS/LIMS Certification Module Data
- Company's Intranet website
- Company's Regulatory Limits Database
- Subcontract laboratory and approved vendor information
- Internal and External client support for various company groups (e.g., Client Services, EH&S, Legal, IT, Sales) for both quality and operational functions
- Communicate regulatory information and lists

4.2.4 Environmental Health and Safety (EH&S) Managers

There are 3 EH&S Managers within NDSC that report directly to the VP-QA/EHS. These EH&S Managers have oversight of the general overview and maintenance of the EH&S Program within the Eurofins Environment Testing America laboratories. Supported tasks include:

- Consolidation and tracking all safety and health-related information and reports for the company, and managing compliance activities for Eurofins Environment Testing America locations.
- Coordination/preparation of the Environmental, Health and Safety Manual Template that is used by each laboratory to prepare its own laboratory-specific Safety Manual/ CHP.
- Preparation of information and training materials for laboratory EHS Coordinators.
- Assistance in the coordination of employee exposure and medical monitoring programs to insure compliance with applicable safety and health regulations.
- Serving as Department of Transportation (D.O.T.) focal point and providing technical assistance to location management.
- Serving as Hazardous Waste Management main contact and providing technical assistance to location management.

4.2.5 Ethics and Compliance Officers (ECOs)

The NDSC VP-QA/EHS and Corporate Counsel are designated Ethics and Compliance Officer (ECO). Each ECO acts as a back-up to the other ECO and both are involved when data investigations occur. Each ECO has a direct line of communication to the entire executive management personnel and lab management staff.

The ECOs monitor and audit procedures to determine compliance with policies and to make recommendations for policy enhancements to the President, COO, Laboratory Director or other appropriate individuals within the laboratory. The ECO will assist the laboratory QA Manager in

the coordination of internal auditing of ethical policy related activities and processes within the laboratory, in conjunction with the laboratory's regular internal auditing function.

The ECOs will also participate in investigations of alleged violations of policies and work with the appropriate internal departments to investigate misconduct, remedy the situation, and prevent recurrence of any such activity.

4.2.6 Laboratory Director

The Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their business unit President. The Laboratory Director is also responsible for any service centers connected with their laboratory that perform analytical tests, such as short holding time analyses for pH. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Provides one or more technical managers for the appropriate fields of testing. If the Technical Manager is absent for a period of time exceeding 15 consecutive calendar days, the Laboratory Director must designate another full time staff member meeting the qualifications of the Technical Manager to temporarily perform this function. If the absence exceeds 35 consecutive calendar days, the primary accrediting authority must be notified in writing.
- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented. Works with Eurofins Environment Testing Human Resources for hiring of new personnel.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures company human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory. Assesses laboratory capacity and workload.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QA Manual or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals. Supports ISO 17025 requirements.
- Ensures client specific reporting and quality control requirements are met.
- Contributes to the continuous improvement of the laboratory operations.
- Maintains an awareness of technical developments and regulatory requirements.
- Captains the management team, consisting of the QA Manager, the Technical Manager(s), and the Operations Manager as direct reports.

4.2.7 Quality Assurance (QA) Manager or Designee

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system at the laboratory where they work. The QA Manager is also responsible for any service centers connected with their laboratory that perform analytical tests, such as short holding time analyses for pH.

The QA Manager reports directly to the Laboratory Director and their NDSC Quality Director. This position is able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence. The NDSC QA Team may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA office to accomplish specific responsibilities, which include, but are not limited to:

- Serves as the focal point for QA/QC in the laboratory.
- Have functions independent from laboratory operations for which he/she has quality assurance oversight.
- Have documented training and/or experience in QA/QC procedures and the laboratory's Quality System.
- Have a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arrange for or conducting internal audits on quality systems and the technical operation
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QA Manual or laboratory SOPs shall be investigated following procedures outlined in Section 14 and if deemed necessary may be temporarily suspended during the investigation.
- Maintaining and updating the QA Manual.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Objectively monitor standards of performance in quality control and quality assurance without outside (e.g., managerial) influence.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Performing technical data audits and method audits to ensure consistency and compliance with regulatory requirements.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.

- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or NDSC QA Team.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Participate in the vendor and supplier approval process, including subcontractors.
- Captains the QA team to enable communication and to distribute duties and responsibilities.
- Communication to the relevant regulatory authorities when there are management or facility changes that impact the laboratory.
- Ensuring communication & monitoring standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.
- Evaluation of the thoroughness and effectiveness of training.
- Compliance with ISO 17025

4.2.8 Technical Manager or Designee

The Technical Manager(s) report(s) directly to the Operations Manager – Organic and Operations Manager – Inorganic. (Note: Technical Managers at the Edison lab serve a dual role as Department Supervisors.. See Section 4.2.11). He/she is accountable for all analyses and analysts under their experienced supervision and for compliance with the ISO 17025:2017 Standard. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and new instrumentation. Specific responsibilities include, but are not limited to:

- Exercises day-to-day supervision of laboratory operations for the appropriate field of accreditation and reporting of results. Coordinating, writing, and reviewing preparation of all test methods, i. e., SOPs, with regard to quality, integrity, regulatory and optimum and efficient production techniques, and subsequent analyst training and interpretation of the SOPs for implementation and unusual project samples. He/she insures that the SOPs are properly managed and adhered to at the bench. He/she develops standard costing of SOPs to include supplies, labor, overhead, and capacity (design vs. demonstrated versus first-run yield) utilization.
- Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory's capability and resources, the client's expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.
- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.

- Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.
- Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.
- Coordinating sample management from “cradle to grave,” insuring that no time is lost in locating samples.
- Scheduling all QA/QC-related requirements for compliance, e.g., MDLs, etc.
- Captains department personnel to communicate quality, technical, personnel, and instrumental issues for a consistent team approach.
- Coordinates audit responses with the QA Manager.
- Compliance with ISO 17025.

4.2.9 Operations Manager

The Operations Manager manages and directs the analytical production sections of the laboratory. He/She reports directly to the Laboratory Director. He/She assists the Technical Manager in determining the most efficient instrument utilization. More specifically, he/she:

- Evaluates the level of internal/external non-conformances for all departments.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments.
- Develops and improves the training of all analysts in cooperation with the Technical Manager and QA Manager and in compliance with regulatory requirements.
- Works with the Preventive Maintenance Coordinator to ensure that scheduled instrument maintenance is completed.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the departments.
- Fully supports the quality system and, if called upon in the absence of the QA Manager, serves as his substitute in the interim.

4.2.10 Project Manager (PM)

Members of the laboratory Client Services/Project Management Group are responsible for organizing and managing client projects. Clients are assigned a project manager who serves as their primary contact at the laboratory. It is the PM’s responsibility to act as the client advocate by communicating client requirements to laboratory personnel and ensuring that clients provide complete information needed by the laboratory to meet those requirements – including all verbal communcations.

- Scheduling sample submissions, sample container orders and sample pick-up via the laboratory courier service.
- Confirming certification status

- Coordinating and communicating turnaround time (TAT) requirements for high priority samples/projects.
- Answering common technical questions, facilitating problem resolution and coordinating technical details with the laboratory staff.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Accountable to clients for communicating sample status reports or results prior to receipt of the final report.
- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports.
- Inform clients of data package-related problems and resolve service issues.

4.2.11 Department Supervisors

Department Supervisors (aka Department Managers) report to the Operations Manager. Department Supervisors serve as Technical Managers for their department. Each one is responsible to:

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in compliance and if new, modified, and optimized measures are feasible and should be added to these documents.
- With regard to analysts, participates in the selection, training (as documented in Section 5.3), development of performance objectives and standards of performance, appraisal (measurement of objectives), scheduling, counseling, discipline, and motivation of analysts and documents these activities in accordance with systems developed by the QA and Personnel Departments. They evaluate staffing sufficiency and overtime needs. Training consists of familiarization with SOP, QC, Safety, and computer systems.
- Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.
- Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Operations Manager, and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance and *CPAR* issues, the timely and accurate completion of performance evaluation samples and MDLs, for his department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Operations Manager, and/or BU / Laboratory Director.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.

- Achieve optimum turnaround time on analyses and compliance with holding times.
- Conduct efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.
- Develop, implement, and enhance calibration programs.
- Provide written responses to external and internal audit issues.

4.2.12 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Manager, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.
- Suggest method improvements to their supervisor, the Technical Manager, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

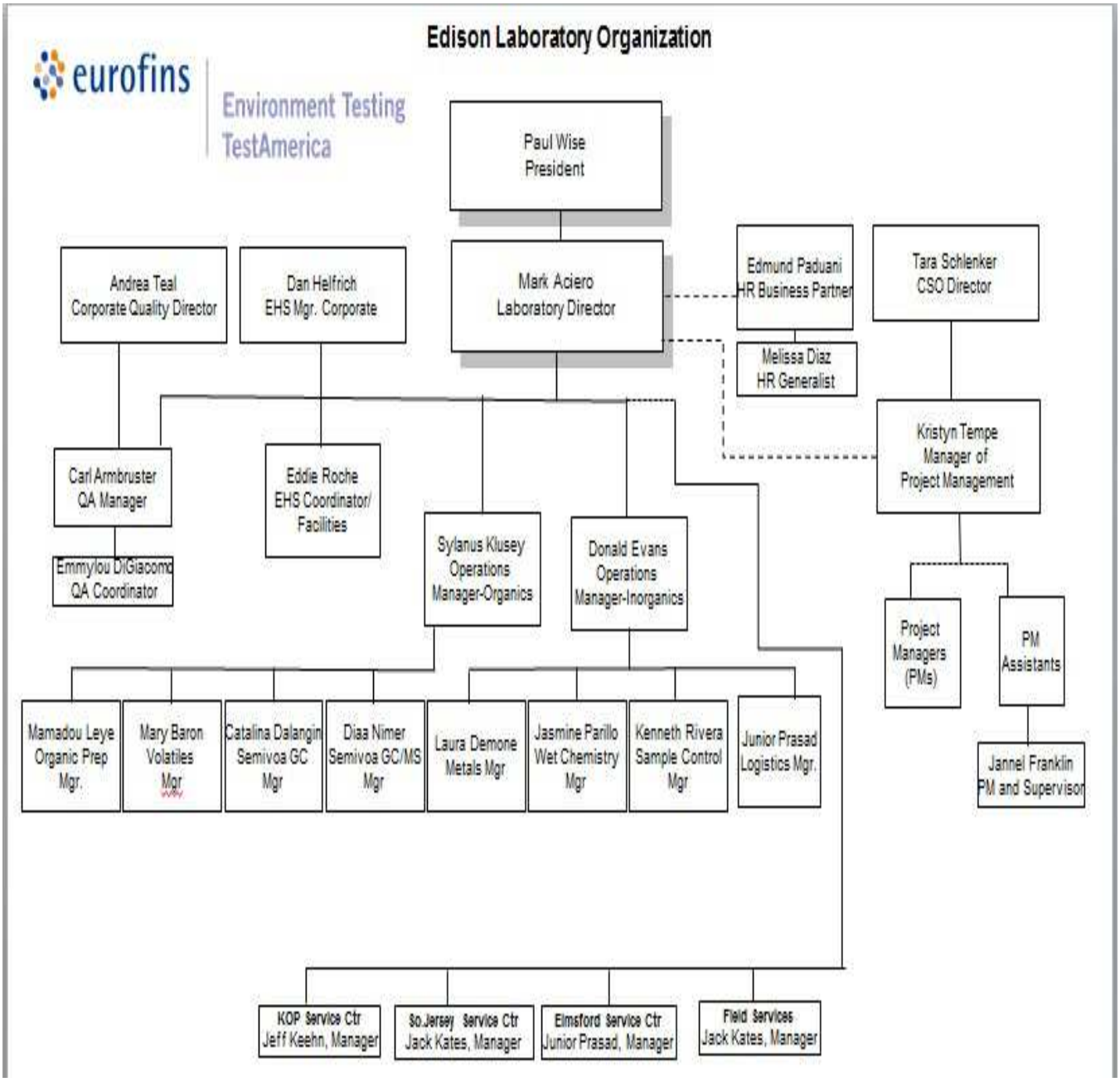
4.3 Business Continuity and Contingency Plans

Various policies and practices are in place to address continuity of business and contingency plans to ensure continued operations or minimal disruption in operations should unplanned events (natural disasters, unexpected management changes, etc.) occur. Deputies are identified for all key management personnel. Deputies would temporarily fill a role if the primary is absent for more than 15 consecutive calendar days. The deputies must meet the same qualifications as the primary person should they be required to take on the responsibilities. The QA Manager communicates to the relevant regulatory authorities when there are management or facility changes that impact the laboratory. Changes in the technical director must be communicated within a period of time and in the manner dictated by each regulatory authority.

The following table defines who assumes the responsibilities of key personnel in their absence:

Key Personnel	Deputy
Mark Acierno Laboratory Director	In the event of absence the Laboratory Director's responsibilities are shared by the Laboratory Operations Manager, the Quality Assurance Manager and the Client Services Manager, as appropriate
Carl Armbruster Quality Manager	Emmylou Digiacomo Quality Assurance Specialist Mark Acierno Laboratory Director
Sylvanus Klusey Organic Operations Manager	Donald Evans Inorganics Operations Manager
Donald Evans Inorganics Operations Manager	Sylvanus Klusey Organic Operations Manager
VOA, SVOA & Organic Prep Technical Managers	Sylvanus Klusey Organic Technical Manager
Wet Chemistry, Metals Technical Managers	Donald Evans Inorganics Operations Manager
Dan Helfrich EH&S Manager	Edward Roche EH&S Coordinator
Tara Schenkler Client Services Manager	Kristyn Tempe Manager of Project Managers
John Kates South Jersey/King of Prussia Service Center Manager	Alonzo Hall, Sample Control Tech. South Jersey Service Center Jeffery Keehn, Sample Control Tech. King of Prussia Service Center
John Kates Fields Services Manager	Stephen Schulze Thomas Lesinski Field Specialists – Edison
Junior Prasad Logistics Manager/Elmsford Service Center Manager	Donald Evans Inorganics Operations Manager

Figure 4-1. Laboratory Organization Charts



5.0 PERSONNEL

5.1 Overview

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

5.2 Education and Experience Requirements for Technical Personnel

The laboratory makes every effort to hire analytical staffs that possess a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for laboratory employees are outlined in job descriptions maintained by Eurofins Environment Testing America Human Resources.

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)

Specialty	Education	Experience
GFAA, CVAA, FLAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience
Technical Managers – **General**	Bachelor's Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee
Technical Managers – **Wet Chem** only (no advanced instrumentation)	Associates degree in an applied science or engineering or 2 years of college with 16 semester hours in chemistry	And 2 years relevant experience

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Technical Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

5.3 Training

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics – Comprehensive	60 days of hire	All
Data Integrity	60 days of hire	Technical and PMs

Required Training	Time Frame	Employee Type
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics.
- Documentation of proficiency (refer to Section 19).
- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status and records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics violations). This information is maintained in the employee's secured personnel file.

Evidence of successful training could include such items as:

- Adequate documentation of training within operational areas, including one-on-one technical training for individual technologies, and particularly for people cross-trained.
- Analysts knowledge to refer to QA Manual for quality issues.
- Analysts following SOPs, i.e., practice matches SOPs.
- Analysts regularly communicate to supervisors and QA if SOPs need revision, rather than waiting for auditors to find problems.

Further details of the laboratory's training program are described in the Laboratory Training SOP ED-GEN-022..

5.4 Data Integrity and Ethics Training Program

The laboratory's Ethics and Data Integrity Program is discussed in Section 6.2. Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.

- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by the NDSC.

6.0 ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS

6.1 Overview

The laboratory is a 42,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis, and administrative functions.

6.2 Environment

Laboratory accommodation, test areas, energy sources, and lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

When the laboratory performs laboratory activities at sites or facilities outside its permanent control, it shall ensure that the requirements related to facilities and environmental conditions of this document are met.

Specific requirements for facility and environmental conditions, as well as periodic monitoring of conditions, are given in the Environmental Health & Safety Manual plus each laboratory's Facility Addendum.

6.3 Work Areas

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory. Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

6.4 Responding to Emergencies

Employees must be aware of procedures to respond to all emergencies that might occur in the workplace. Employees must be familiar with the location and proper operation of all emergency equipment, evacuation routes and designated assembly areas for all areas where they work. Refer to the NDSC EH&S Manual Document No. CW-E-M-001. Sec. 7 and the laboratory's local EH&S addendum for complete details. These documents provide direction for situations where normal operations of the laboratory are not possible (e.g., electrical failures, heating/air

conditioning failures, fire/building evacuation, computer failures, hazardous material spills, injury to employees, pandemic flu, disruption of phone service, etc.)

In the event that the building or information technology (IT) systems would be severely challenged, a designated disaster recovery team, which includes Facility Management, Maintenance, Safety, Laboratory/Executive Management, Public Relations, IT, QA and other applicable personnel depending on the scope of the disaster, would assemble at a designated area to assess the situation and formulate a plan.

6.5 Building Security

The laboratory is considered a secure facility. All outside doors (except the main lobby entrance) are locked during normal business hours to prevent unauthorized entry. (An attendant monitors this entrance at all times.) Building keys and alarm codes are distributed to employees as necessary.

All visitors to the laboratory must sign in and out in a visitor's logbook that is located in the lobby. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. Both visitors and vendors must review and sign specific EH&S forms; and are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

Signs are posted in the laboratory designating employee only areas - "Authorized employees beyond this point".

7.0 QUALITY SYSTEM

7.1 Quality Policy Statement

The Quality Policy statement gives employees clear requirements for the production of analytical data. As an organization, all personnel are committed to high quality professional practice, testing and data, and service to our clients.

We strive to provide the highest quality data achievable by:

- Reading and understanding all of the quality documents applicable to each position and implementing the process in our work.
- Following all recordkeeping requirements; describing clearly and accurately all activities performed; recording "real time" as the task is carried out; understanding that it is never acceptable to "back date" entries and should additional information be required at a later date, the actual date and by whom the notation is made must be documented.
- Ensuring data integrity through the completeness, consistency, impartiality and accuracy of the data generated. Data is attributable, legible, contemporaneously recorded, original or a true copy, and accurate (ALCOA). This applies to manual paper documentation and electronic records.
- Providing accountability and traceability for each sample analyzed through proper sample handling, labeling, preparation, instrument calibration/qualification/validation, analysis, and reporting; establishing an audit trail (the who, what, when, and why) that identifies date, time, analyst, instrument used, instrument conditions, quality control samples (where appropriate and/or required by the method), and associated standard material.

- ❖ Emphasizing a total quality management process which provides impartiality, accuracy, and strict compliance with agency regulations and client requirements, giving the highest degree of confidence; understanding that meeting the requirements of the next employee in the work flow process is just as important as meeting the needs of the external client.
- ❖ Providing thorough documentation and explanation to qualify reported data that may not meet all requirements and specifications, but is still of use to the client; understanding this occurs only after discussion with the client on the data limitations and acceptability of this approach.
- ❖ Responding immediately to indications of questionable data, out-of-specification occurrences, equipment malfunctions, and other types of laboratory problems, with investigation and applicable corrective action; documenting these activities completely, including the reasons for the decisions made.
- ❖ Providing a work environment that ensures accessibility to all levels of management and encourages questions and expression of concerns on quality issues to management. Eurofins recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff
- ❖ Continually improve systems and manage risk to support quality improvement efforts in laboratory, administrative and managerial activities

7.2 Ethics and Data Integrity

Eurofins Environment Testing America is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The laboratory operates our Ethics and Data Integrity program under the guidance of Eurofin's Key Guidance Document (KGD). The elements of the our program include:

- An Ethics Policy (NDSC Document No. CW-L-P-004) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (NDSC Document No. CW-L-S-002).
- Procedures and guidance for recalling data if necessary (NDSC Document No. CW-Q-S-005).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 17).
- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.
- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our Industry.
- Provide procedures and guidance to ensure the impartiality and confidentiality of all data and customer information.

- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

7.3 Quality System Documentation

The laboratory's Quality System is communicated through a variety of documents.

- Quality Assurance (QA) Manual – Each laboratory has a lab-specific QA manual.
- NDSC Official Documents – Each laboratory may use the Guidance (instructional use) documents at their discretion. Template documents are process documents that the laboratory's need to implement locally by using the document as is or as an outline to define their internal practices that meet the minimum requirements of the template. Required documents need to be implemented as is and listed in the laboratory's document control list.
- Key Guidance Documents (KGDs) - Documents compiled at the Group Service Centre (GSC) level by Functional Leaders (document owners) aimed at providing specific Eurofins groups of employees with guidelines necessary for the good conduct of their respective work.
- Laboratory SOPs and Policies – General and Technical
- Work Instructions – A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).

7.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Quality Management Plan (QMP)
- NDSC Guidance Documents
- KGDs
- Laboratory Quality Assurance Manual (QA Manual)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, flow charts, etc.)

NOTE: The laboratory has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the QMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's QA Manual shall take precedence over the QMP in those cases.

7.4 QA/QC Objectives for the Measurement of Data

Quality Assurance (QA) is responsible for developing planned activities whose purpose is to provide assurance to all levels of management that a quality program is in place within the laboratory, and that it is functioning in an effective manner that is consistent with the requirements of NELAP, ISO 17025, and any other regulatory agencies (i.e., states) in which the laboratory maintains accreditation.

Quality Control (QC) is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. The client is responsible for developing the QAPP; however, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS). Each laboratory SOP defines the required QC indicators.

7.4.1 Precision

The objective is to meet the performance for precision demonstrated for the methods on similar samples and to meet DQOs of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

7.4.2 Accuracy

The objective is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet DQOs of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

7.4.3 Representativeness

The objective is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. Refer to laboratory SOPs for subsampling and homogenization techniques appropriate to the analytical method.

7.4.4 Comparability

The objective is to provide analytical data for which the accuracy, precision, representativeness, and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

Comparability is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision, and reporting limits with those of other laboratories.

7.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope, or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

7.4.6 Selectivity

Selectivity is defined as the capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), and specific electrodes (separation and identification).

7.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (above the Method Detection Limit) or quantified (above the Reporting Limit).

7.5 Criteria for Quality Indicators

The laboratory maintains tables, housed in LIMS, that summarize the precision and accuracy acceptability limits for performed analyses. This summary includes an effective date, is updated each time new limits are generated, and are managed by the laboratory's QA department. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits is contained in lab SOP ED-GEN-026, Evaluation of Analytical Accuracy and Precision Through The Use of Control Charts.

7.6 Statistical Quality Control

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs.. The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts use the current limits entered into LIMS. The QA department maintains an archive of all limits used within the laboratory. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in lab SOP ED-GEN-026, Evaluation of Analytical Accuracy and Precision Through The Use of Control Charts and Section 26. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

7.6.1 QC Charts

The QA Manager may evaluate QC control charts as needed to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file.

7.7 Quality System Metrics

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 18). These metrics are used to drive continuous improvement in the laboratory's Quality System.

8.0 DOCUMENT CONTROL

8.1 Overview

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance (QA) Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- NDSC Documents[1]
- KGDs[1]

[1]Includes locally implemented documents that are document controlled within the laboratory's document control system. The NDSC and/or KGD documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving NDSC Official

Documents is found in Document No. CW-Q-S-001, NDSC Document Control and Archiving. KGD documents are controlled according to this document. The laboratory's internal document control procedure is defined in SOP No. ED-GEN-002, Document Control.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data, and final reports.

8.2 Document Approval and Issue

The pertinent elements of a document control system includes a unique document title and number, pagination, the total number of pages of the item or an 'end of document' page, the effective date, revision number, and the laboratory's name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a responsible manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retains that document as the official document on file. That document is then provided to all applicable operational units. Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years and revised as appropriate. Changes to documents occur when a procedural change warrants.

8.3 Procedures for Document Control Policy

For changes to the QA Manual, SOPS and Work Instructions refer to SOP No. ED-GEN-002, Document Control. Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. Electronic copies are stored on the Public server in the QA folder for the applicable revision.

8.4 Obsolete Documents

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. ED-GEN-002, Document Control.

9.0 SERVICE TO THE CLIENT

9.1 Overview

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily fit into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals, and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another Eurofins facility on the same LIMS or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 10 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or Eurofins Edison are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

9.2 Review Sequence and Key Personnel

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet

the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the Client Relationship Manager or Proposal Team, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in NDSC Document No. CA-L-P-002**,** Contract Compliance Policy..

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below).:

- Contract Administrator
- Laboratory Project Manager
- Laboratory Directors and/or Technical Managers
- Account Executives
- Quality Managers
- Laboratory Environmental Health and Safety Managers/Directors

The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The Sales Director, Contract Administrator, Account Executive or Proposal Coordinator then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

9.3 Balancing Laboratory Capacity and Workload

Evaluating laboratory capacity to perform specific projects is the responsibility of the Vice-President, Laboratory Directors and Managers, and the Client Services director and manager. Many analysts are cross-trained to perform a variety of tests, and there is redundant equipment available in case of malfunctions. This minimizes the need to evaluate small and medium size projects against capacity available to complete them. Large and complex projects are reviewed against capacity estimates before bids are submitted to ensure that the client's analysis schedule is met. Regularly scheduled meetings are held between laboratory management, PMs, Client Services and QA personnel to review progress with current projects, as well as special requirements of new work scheduled for the laboratory. Laboratory capacity and backlog is tracked on a continuous basis using information from the Laboratory Sample Information System (LIMS) including turnaround time, and work in-house.

9.4 Documentation

The Contracts Department maintains copies of all signed contracts**.** The Manager of Project Management maintains a copy locally.

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. This documentation is maintained by the laboratory PM on the lab's network server.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Account Executive. A copy of the contract and formal quote will be filed with the laboratory PM and the Laboratory Director.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client and a copy of all related email correspondence.

9.4.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, a PM is assigned to each client. It is the PM's responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements, They coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new project information to maximize production and client satisfaction, while maintaining quality. Project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

Any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document (e.g., letter, e-mail, variance, contract addendum), which has been signed by both parties.

Such changes are also communicated to the laboratory. The laboratory staff is introduced to the modified requirements via the PM or the individual laboratory Technical Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

9.5 Special Services

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all

client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 17 and 25).

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assisting client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

When the client requests a statement of conformity to a specification or standard based on the analysis performed by the laboratory (e.g., pass/fail, in-tolerance/out-of-tolerance), the decision rule shall be clearly defined. Unless inherent in the requested specification or standard, the decision rule selected shall be communicated to the client. Associated reporting requirements are addressed in Section 25.2.18.

9.6 Client Communication

PMs are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Technical Managers are available to discuss any technical questions or concerns that the client may have.

9.7 Reporting

The laboratory works with our clients to produce any special communication reports required by the contract.

9.8 Client Feedback and Surveys

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service. Eurofins Sales and Marketing teams periodically develop lab and client specific surveys to assess client satisfaction. Client satisfaction surveys are sent to the client via email with the final report deliverables for the client's job(s).

When a complaint is received, we determine, to the best of our ability, the extent of the issue and what data is in question. The person receiving the complaint documents this information and promptly forwards it to the appropriate management personnel where the work in question was performed. If a data reporting error is discovered, the final report and/or data must be regenerated with the correct value(s).

The PM is responsible for entering client concerns into an NCM in TALS LIMS. In some cases, an ICAT is initiated to address and document the situation. While an individual issue may not warrant a formal investigation, QA monitors these issues for potential trends and will issue an ICAT if a trend is evident.

10.0 SUBCONTRACTING OF TESTS

10.1 Overview

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the Eurofins TestAmerica laboratories. The phrase “work sharing” refers to internal transfers of samples between the Eurofins TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients because project scope, changes in laboratory capabilities, capacity, or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to the NDSC Documents Subcontracting Procedures (CW-L-S-004) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in TNI/ISO 17025 and/or the client’s Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client’s analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-TNI accredited work where required

PMs or other responsible Client Service members, for the Export Lab (i.e., the Eurofins Environment Testing laboratory that transfers samples to another laboratory) are responsible for obtaining client approval prior to subcontracting any samples. The laboratory will advise the client of a subcontract arrangement in writing and when possible approval from the client shall be obtained and retained in the project folder. Standard Eurofins TestAmerica Terms & Conditions include the flexibility to subcontract samples within the Eurofins TestAmerica laboratories. Therefore, additional advance notification to clients for intra-laboratory subcontracting is not necessary unless specifically required by a client contract.

Note: In addition to the client, some regulating agencies (e.g., USDA) or contracts require notification prior to placing such work**.**

10.2 Qualifying and Monitoring Subcontractors

Whenever a PM, or Account Executive (AE) or Client Relationship Manager becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- Subcontractors specified by the client - In these circumstances, the client assumes responsibility for the quality of the data generated from the use of a subcontractor.
- Subcontractors reviewed by Eurofins TestAmerica - Firms which have been reviewed by the company and are known to meet standards for accreditations (e.g., State, TNI and DoD/DOE); technical specifications; legal and financial information.

A listing of vendors is available on the Eurofins TestAmerica intranet site.

All Eurofins TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations and can adhere to the project/program requirements. Client approval

is not necessary unless specifically required by the contract. In these cases, the client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs as detailed in NDSC Document No. CA-C-S-001, Work Sharing Process.

10.2.1 When the potential subcontract laboratory has not been previously approved, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Client Relations Manager (CRM). The CRM requests that the PM begin the process of approving the subcontract laboratory. Refer to the NDSC Document No. CW-L-S-004, Subcontracting Procedures.

Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability and forwarded to the NDSC Quality Information Manager (QIM) for review. After the NDSC QIM reviews the documents for completeness, the information is forwarded to the Finance Department for formal signature and contracting with the laboratory. The approved vendor will be added to the approved subcontractor list on the intranet site, and the finance group is concurrently notified.

The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. Eurofins TestAmerica does not certify laboratories. The subcontractors on our approved list can only be recommended to the extent that we would use them.

10.3 Oversight and Reporting

The status and performance of qualified subcontractors will be monitored by NDSC and includes an annual review process (ref.: NDSC Document No.SOP CW-L-S-004). Any problems identified will be brought to the attention of NDSC.

- Complaints shall be investigated. Documentation of the complaint, investigation, and corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report.
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. Client Service personnel will notify all Eurofins TestAmerica laboratories, NDSC and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all Client Service, Personnel, Laboratory Directors, QA Managers, and Sales Personnel.

Prior to initially sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. The information is documented within the project records.

The laboratory's certifications can be viewed on the company's website at https://www.testamericainc.com/.

10.3.1 All subcontracted samples must be accompanied by a Eurofins TestAmerica Chain of Custody (COC). A copy of the original COC sent by the client must be available in LIMS for all

samples workshared within Eurofins TestAmerica. Client COCs are only forwarded to external subcontractors when samples are shipped directly from the project site to the subcontractor lab. Under routine circumstances, client COCs are not provided to external subcontractors.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-TNI accredited work must be identified in the subcontractor's report as appropriate. If TNI accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratory's EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a Eurofins TestAmerica work sharing laboratory may be transferred electronically and the results reported by the Eurofins TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

10.4 Contingency Planning

The full qualification of a subcontractor may be waived to meet emergency needs. This decision and justification must be documented in the project files, and the 'Purchase Order Terms And Conditions For Subcontracted Laboratory Services' must be sent with the samples and COC.

In the event this provision is utilized, the laboratory (e.g., PM) will be required to verify and document the applicable accreditations of the subcontractor. All other quality and accreditation requirements will still be applicable, but the subcontractor need not have signed a subcontract agreement with Eurofins TestAmerica at this time.

The use of any emergency subcontractor will require the PM to complete a New Vendor Add Form in order to process payment to the vendor and add them to LIMS. This form requires the user to define the subcontractor's category/s of testing and the reason for testing.

10.5 Use of NELAP and A2LA Logo

It is not laboratory policy to use these logos on any company letterhead, including analytical reports.

11.0 PURCHASING SERVICES AND SUPPLIES

11.1 Overview

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from

specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with NDSC Document No. CW-F-S-007, Eurofins TestAmerica's Fixed Asset Acquisition, Retention and Safeguarding.

Contracts will be signed in accordance with NDSC Document No. CW-F-P-002, Company-Wide Authorization Matrix Policy. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in the NDSC Document No. CW-F-P-004, Guidance on Procurement and Contracts Policy. RFP's allow the laboratory to determine if a vendor is capable of meeting requirements such as supplying all of the laboratory facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

11.2 Glassware

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

11.3 Reagents, Standards & Supplies

Purchasing guidelines for equipment, consumables, and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with NDSC Document No. CA-Q-S-001, Solvent & Acid Lot Testing & Approval. Approval information for the solvents and acids tested under Document No. CA-Q-S-001 is stored on the laboratory's SharePoint site, under Solvent Approvals. A master list of all tested materials, as well as the certificates of analysis for the materials, is stored in the same location. ***[***

11.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. The analyst completes the Material Request Sheet when requesting reagents, standards, or supplies. The analyst may check the item out of the on-site consignment system that contains items approved for laboratory use.

The analyst must provide the master item number (from the master item list that has been approved by the Technical Manager), item description, package size, catalogue page number, and the quantity needed. If an item being ordered is not the exact item requested, approval must be obtained from the Technical Manager prior to placing the order. The purchasing manager places the order.

11.3.2 Receiving

It is the responsibility of the analyst or department manager to receive the shipment. It is the responsibility of the analyst who ordered the materials to document the date materials were received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the

quality level specified. This is documented through the addition of the received date and initials to the information present on the daily order log.

The analyst or department manager verifies the lot numbers of received solvents and acids against the pre-approval lists. If a received material is listed as unapproved, or is not listed, it is sequestered and returned to the vendor. Alternatively, the laboratory may test the material for the intended use, and if it is acceptable, document the approval on the approval list. Records of any testing performed locally are maintained on the shared "public" folder on the computer network.

Materials may not be released for use in the laboratory until they have been inspected, verified as suitable for use, and the inspection/verification has been documented.

Safety Data Sheets (SDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

11.3.3 Specifications

Methods used in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, analytical reagent grade will be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals and solvents unless noted otherwise by the manufacturer or by the reference source method. Chemicals/solvents should not be used past the manufacturer's or SOP expiration date unless verified as outlined below.

- An expiration date **cannot** be extended if the dry chemical/solvent is discolored or appears otherwise physically degraded. In this case, the dry chemical/solvent must be discarded.
- Expiration dates can be extended if the dry chemical/solvent is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).
- If the dry chemical/solvent is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical/solvent is compared to an unexpired independent source in performing the method and the performance of the dry chemical/solvent is found to be satisfactory. The comparison must show that the dry chemical/solvent meets CCV limits. The comparison studies are maintained on-file and available for review in the QA Manager's office.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. To prevent a tank from going to dryness, or introducing potential impurities, the pressure should be closely watched as it decreases to approximately 15% of the original reading, at which point it should be replaced. For example, a standard sized laboratory gas cylinder containing 3,000 psig of gas should be replaced when it drops to approximately 500 psig. The quality of the gases must

meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of samples, standards or reagents must have a specific conductivity of less than 1-µmho/cm (or specific resistivity of greater than 1.0 megohm-cm) at 25°C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Technical Managers must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified clean by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased bottleware used for sampling must be certified clean and the certificates must be maintained. If uncertified sampling bottleware is purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in files or binders in each laboratory section. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the Technical Manager or QA Manager.

11.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the NDSC Environmental Health & Safety Manual, Document No. CW-E-M-001, the local laboratory EH&S manual addendum and method SOPs or manufacturer instructions.

11.4 Purchase of Equipment / Instruments / Software

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Manager and/or the Laboratory Director. If they agree with the request, the procedures outlined in NDSC Document No. CA-T-P-001 Qualified Products List are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 20). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

11.5 Services

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 22. The need for service is determined by analysts and/or Technical Managers. The service providers that perform the services are approved by the Technical Manager.

Analytical balances are serviced and calibrated annually in accordance with SOP No.ED-GEN-010, Calibration of Analytical Balances. The calibration and maintenance services are performed on-site, and the balances are returned to use immediately following successful calibration. Calibration certificates are filed for reference. If the calibration was unsuccessful, the balance is immediately removed from service and segregated pending either further maintenance or disposal.

Calibration services for support equipment such as thermometers, weight sets, autopipettors, etc., are obtained from vendors with current and valid ISO 17025 accreditation for calibration of the specific piece of equipment. Prior to utilizing the vendor's services, the vendor's accreditation status is verified. Once the equipment has been calibrated, the calibration certificates are reviewed by the QA department, and documentation of the review is filed with the calibration certificates. The equipment is then returned to service within the laboratory

11.6 Suppliers

The laboratory selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts).

This process is defined in the NDSC Document No. CW-F-P-004, Procurement & Contracts Policy. The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on the laboratory's business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Purchasing Group by completing a Vendor Performance Report.

The Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

Suppliers are subject to re-evaluation, as deemed appropriate, through the use of Vendor Performance Reports used to summarize and review to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the purchasing system.

11.6.1 New Vendor Procedure

Laboratory employees who wish to request the addition of a new vendor must complete a Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with laboratory employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technical Services Director are consulted with vendor and product selection that have an impact on quality.

12.0 COMPLAINTS

12.1 Overview

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures client knowledge that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 14 (Corrective Actions) and is documented following SOP No. ED-GEN-003, Control of Non-Conformances and Corrective Action. A copy of this procedure will be made available to any interested party on request.

12.2 External Complaints

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according SOP No. ED-GEN-003, Control of Non-Conformances and Corrective Action.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and documenting complaints
- Acknowledging receipt of complaint, whenever possible
- Complaint investigation and service recovery
- Process improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

12.3 Internal Complaints

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 14. In addition, Executive Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 14.

12.4 Management Review

The number and nature of client complaints is reported by the QA Manager to the Laboratory Director and Quality Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Systems Review (Section 18).

13.0 CONTROL OF NON-CONFORMING WORK

13.1 Overview

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 14).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the supervisor for resolution. The supervisor may elect to discuss it with the Technical Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 14. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section

21. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Technical Manager and QA Manager,, documented and included in the project folder. Deviations **must** also be noted on the final report with a statement that the compound is not reported in compliance with TNI (or the analytical method) requirements and the reason. Data being reported to a non-TNI state would need to note the change made to how the method is normally run.

13.2 Responsibilities and Authorities

Under certain circumstances, the Laboratory Director, a Technical Manager, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory's corrective action procedures. This information may also be documented in logbooks and/or data review checklists as appropriate**.** Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, and the Technical Managers. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an ECO (e.g., the VP-QA/EHS) and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, VP of Operations and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

13.3 Evaluation of Significance and Actions Taken

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

The NDSC Document entitled Data Recalls (CW-Q-S-005) is the procedure to be followed when it is discovered that erroneous or biased data may have been reported to clients or regulatory agencies.

The NDSC Document entitled Internal Investigations (CW-L-S-002) is the procedure to be followed for investigation and correction of situations involved alleged incidents of misconduct or violation of the company's ethics policy.

Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in NDSC Document No.CW-Q-S-005.

13.4 Prevention of Nonconforming Work

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system. Periodically as defined by the laboratory's preventive action schedule, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

13.5 Method Suspension / Restriction (Stop Work Procedures)

In some cases, it may be necessary to suspend/restrict the use of a method or target analyte which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 13.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line. The QA Manager will also initiate a corrective action report as described in Section 14 if one has not already been started. A copy of any meeting notes and agreed upon steps should be e-mailed by the laboratory to their Business Unit President; VP-QA & EHS. This e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc.). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (e.g., Laboratory Director, Technical Manager, QA Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete.

14.0 CORRECTIVE ACTION

14.1 Overview

A major component of the laboratory's QA Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action

procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. The laboratory employs two systems to manage non-conformances. Issues suspected of being systematic in nature and for which root cause analysis and a formal Corrective Action Report (CAR) are documented in the Incident Corrective Action Tracking (ICAT) database. Routine batch non-conformances, events that are understood to be isolated in nature, are documented in the LIMS non-conformance memo (NCM) system.

14.2 General

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc.

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify systematic problems before they become serious.
- Identify and track client complaints and provide resolution.

14.2.1 Non-Conformance Memo (NCM)

NCMs are used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits
- Isolated reporting / calculation errors
- Client complaints
- Discrepancies in materials / goods received vs. manufacturer packing slips (Forms of documentation other than NCMs in LIMS are also acceptable)

14.2.2 Corrective Actions Documented In the ICAT Database

- Internal and external audit findings
- Failed or unacceptable PT results
- Identified poor process or method performance trends
- Systematic reporting / calculation errors
- Data recall investigations
- Questionable trends that are found in the review of NCMs.
- Client complaints
- Excessive revised reports

The ICAT database is used to document background information, track the results of corrective action investigations and root cause analysis, and to provide reports of corrective action plans.

14.3 Closed Loop Corrective Action Process

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

14.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An entry into the ICAT system must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Technical Manager, Laboratory Director, or QA Manager (or QA designee) is consulted.

14.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The ICAT record is used for this documentation.

14.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness. NDSC Document No. CA-Q-S-009, Root Cause Analysis, provides guidance on this procedure.

Systematically analyze and document the root causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the root cause data from these incidents to identify root causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with problem and ask why this event occurred. Brainstorm the root causes of failures; for example, by asking why events occurred or conditions existed; and then why the cause occurred consecutive times until you get to the root cause. For each of these sub events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed and continue to plague the laboratory or operation.

14.3.4 Monitoring of the Corrective Actions

- The Technical Manager and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Technical Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- The QA Manager reviews monthly NCM and ICAT records for trends. Highlights are included in the QA monthly report (refer to Section 18). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the NDSC Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

14.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 17.1.4, Special Audits.)

14.4 Technical Corrective Actions

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 13). The documentation of these procedures is through the use of an NCM or record in the ICAT system.

Table 14-1 includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintain Work Instructions on these items that are available upon request.

Table 14-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, QA Manual Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the PM is notified by an NCM and appropriate corrective action (e.g., reanalysis) is taken and documented**.**

14.5 Basic Corrections

When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g. no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original uncorrected file must be maintained intact and a second corrected file is created. This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated. When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Table 14-1. Example – General Corrective Action Procedures

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Technical Manager(s))*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Technical Manager(s))*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in TALS Method Limit Group	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set. - For matrix spike or duplicate results outside criteria the data for that sample shall be reported with qualifiers.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in TALS Method Limit Group	- Batch must be re-prepared and re-analyzed. This includes any allowable marginal exceedance. When not using marginal exceedances, the following exceptions apply: 1) when the acceptance criteria for the positive control are exceeded high (i.e., high bias) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes; 2) when the acceptance criteria for the positive control are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level with data qualifying codes. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- Individual sample must be repeated. Place comment in LIMS. - Surrogate results outside criteria shall be reported with qualifiers.
Method Blank (MB) *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results. - Qualify the result(s) if the concentration of a targeted analyte in the MB is at or above the reporting limit AND is > 1/10 of the amount measured in the sample.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Proficiency Testing (PT) Samples *(QA Manager, Technical Manager(s))*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Technical Manager(s), Laboratory Director)*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Technical Managers, QA Manager, NDSC-QA, Executive Management)	- NDSC Document No. CW-Q-S-005, Data Recall **or** local SOP No.	- Corrective action is determined by type of error. Follow the procedures in NDSC Document No. CW-L-S-002 **or** in lab SOP No. ED-GEN-003, Non-Conformances and Corrective Action.
Client Complaints *(Project Managers, Lab Director/Manager, Sales and Marketing)*	-	- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 16 for an example) (QA Manager, Lab Director/Manager, *Technical Manager(s)*)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.
Health and Safety Violation (Safety Officer, Lab Director/Manager, *Technical Manager(s)*)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:
1. Except as noted below for certain compounds, the method blank should be below the reporting limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur. For benzene and ethylene dibromide (EDB) and other analytes for which regulatory limits are extremely close to the detection limit, the method blank must be below the method detection limit

15.0 PREVENTIVE ACTION / IMPROVEMENT

15.1 Overview

The laboratory's preventive action programs improve or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive and continuous process of improvement activities that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its QA Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, the laboratory continually strives to improve customer service and client satisfaction through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered through any of the following:

- review of the monthly QA Metrics Report,
- trending NCMs,
- review of control charts and QC results,
- trending proficiency testing (PT) results,
- performance of management system reviews,
- trending client complaints,
- review of processing operations, or
- staff observations.

The monthly Management Systems Metrics Report shows performance indicators in all areas of the laboratory and quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. The metrics report is reviewed monthly by the laboratory management, NDSC QA Team, Local and Executive Management.. These metrics are used in evaluating the management and quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

Items identified as continuous improvement opportunities to the management system may be issued as goals from the annual management systems review, recommendations from internal audits, white papers, Lessons Learned, Technical Services audit report, Technical Best Practices, or as Executive or management initiatives.

The laboratory's corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action and non-conformances provides a valuable mechanism for identifying preventive action opportunities.

15.1.1 The following elements are part of a preventive action/process improvement system:

- Identification of an opportunity for preventive action or process improvement.
- Process for the preventive action or improvement.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action or improvement.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action or improvement.
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action or Process Improvement. Documentation of Preventive Action/process Improvement is incorporated into the monthly QA reports, corrective action process and management review.

15.1.2 Any preventive actions/process improvement undertaken or attempted shall be taken into account during the annual Management Systems Review (Section 16). A highly detailed report is not required; however, a summary of successes and failures within the preventive action program is sufficient to provide management with a measurement for evaluation.

16.0 CONTROL OF RECORDS

The laboratory maintains a records management system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued. Exceptions for programs with longer retention requirements are discussed in Section 14.1.2.

16.1 Overview

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. More detailed information on retention of specific records is provided in NDSC Document Nos. CW-L-P-001, Records Retention Policy and CW-L-WI-001, Records Retention/Storage Schedule and local SOP No. ED-GEN-024, Records Storage and Retention.. Quality records are maintained by the QA department in a database which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by department supervisors.

Table 16-1. Record Index

	Record Types [1]:	**Retention Time:**
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - MDLs/IDLs/DOCs - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Policy Memorandums - Manuals - Published Methods	Indefinitely
QA Records	- Certifications - Method and Software Validation / Verification Data	Indefinitely
QA Records	- Internal & External Audits/Responses - Corrective/Preventive Actions - Management Reviews - Data Investigation	5 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)
Project Records	- Sample Receipt & COC Documents - Contracts and Amendments - Correspondence - QAPP - SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*
Administrative Records	Financial and Business Operations	Refer to NDSC Doc. No. CW-L-WI-001
	EH&S Manual, Permits	Indefinitely
	Disposal Records	Indefinitely
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	Refer to HR Manual
	Administrative Policies	Indefinitely
	Technical Training Records	7 years
	Legal Records	Indefinitely
	HR Records	Refer to NDSC Doc. No. CW-L-WI-001
	IT Records	Refer to NDSC Doc. No. CW-L-WI-001
	NDSC Governance Records	Refer to NDSC Doc. No. CW-L-WI-001
	Sales & Marketing	5 years
	Real Estate	Indefinitely

[1] Record Types encompass hardcopy and electronic records.

[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 16-2.

16.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility that provides a suitable environment to prevent damage or deterioration and to prevent loss. All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees and shall be documented with an access log**.** Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether on-site or off-site storage is used, logs are maintained in each storage box to note removal and return of records. Retention of records are maintained on-site at the laboratory for the full length of the required storage time. Records are maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as NDSC and/or KGD Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 16-2 have lengthier retention requirements and are subject to the requirements in Section 16.1.3.

16.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 16-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 16-2. Example: Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (lab reports and raw data) 10 years - Radiochemistry (project records)
Drinking Water Lead and Copper Rule	12 years (project records)
Commonwealth of MA – All environmental data 310 CMR 42.14	10 years
OSHA	30 years

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

16.2.1 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section 19.15.1 for more information.

16.2.2 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data. The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the COC is stored with the invoice and the work order sheet generated by LIMS. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with this package.
- All information relating to the laboratory facilities' equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.
- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set). Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day's run log or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is recorded in logbooks or entered into LIMS for each method as required.
- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.
- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "analyzed by".
- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.
- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned. The procedure for this verification can be found in SOP No. ED-GEN-021, Data Review.
- Also refer to Section 19.15.1 'Computer and Electronic Data Related Requirements'**.**

16.3 Technical and Analytical Records

16.3.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.

16.3.2 Observations, data and calculations are recorded real-time and are identifiable to the

specific task.

16.3.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- Laboratory sample ID code;
- Date of analysis; time of analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook or on a benchsheet.
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in instrument maintenance logs where available.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**
- sample preparation including cleanup, separation protocols, incubation periods, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents**;**
- test results**;**
- standard and reagent origin, receipt, preparation, and use**;**
- calibration criteria, frequency and acceptance criteria**;**
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions**;**
- quality control protocols and assessment**;**
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements. These are indicated both in LIMS and on specific analytical report formats**.**

16.3.4 All logbooks used during receipt, preparation, storage, analysis, and reporting of samples or monitoring of support equipment shall undergo a periodic, documented supervisory or peer review.

16.4 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records)**;**
- a written description or reference to the specific test method used which includes a

description of the specific computational steps used to translate parametric observations into a reportable analytical value**;**

- copies of final reports**;**
- archived SOPs**;**
- correspondence relating to laboratory activities for a specific project**;**
- all corrective action reports, audits and audit responses**;**
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

16.4.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

16.5 Administrative Records

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 16-1.

16.6 Records Management, Storage and Disposal

All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

The laboratory has a record management system (a.k.a., document control) for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are maintained in LIMS – no logbooks are used to record that data**.** Records are considered archived when noted as such in the records management system (a.k.a., document control.)

16.6.1 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of NDSC. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

16.6.2 Records Disposal

Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required.

17.0 AUDITS

17.1 Internal Audits

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab's quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and**,** when requested**,** to Executive Management.

Audits are conducted and documented as described in the NDSC Document No. on performing Internal Auditing, SOP No. CW-Q-S-003. The types and frequency of routine internal audits are described in Table 17-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 17-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems Audits	QA Department, QA approved designee, or NDSC QA	All areas of the laboratory annually

Description	Performed by	Frequency
Method Audits QA Technical Audits	Joint responsibility: a) QA Manager or designee b) Technical Manager or Designee (Refer to NDSC CW-Q-S-003)	QA Technical Audits Frequency: 50% of methods annually
SOP Method Compliance	Joint responsibility: a) QA Manager or designee b) Technical Manager or Designee (Refer to NDSC CW-Q-S-003)	SOP Compliance Review Frequency: • Every 2 years • Every 1 year (Drinking Water Methods)
Special	QA Department or Designee	Surveillance or spot checks performed as needed, e.g., to confirm corrective actions from other audits.
Performance Testing	Analysts with QA oversight	Two successful per year for each TNI-field of testing or as dictated by regulatory requirements

17.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, Eurofins Data Integrity and Ethics Policies (see Sec. 7.2), TNI quality systems, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed for effectiveness & sustainability. The audit is divided into sections for each operating or support area of the lab, and each section is comprehensive for a given area. The area audits may be performed on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

17.1.2 QA Technical Audits

QA technical audits assess data authenticity and analyst integrity. These audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, electronic audit miner programs (e.g., Chrom AuditMiner) are used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

17.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Technical Manager or qualified designee at least every two years. It is also recommended that the work of each newly hired analyst is assessed within 3

months of working independently, (e.g., completion of method IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

17.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

17.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Drinking Water, Non-potable Water and Soil.

It is Eurofins policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written investigations for unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

17.2 External Audits

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is Eurofins policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response. Audit responses are due in the time allotted by the client or agency performing the audit.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

17.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may

not be obscured from the information. Additional information regarding CBI can be found in within the 2009 and 2016 TNI standards.

17.3 Audit Findings

Audit findings are documented using the corrective action process and database (see Section 14). The laboratory's corrective action responses may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must be set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Technical Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24 hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

18.0 MANAGEMENT REVIEWS

18.1 Quality Assurance Report

The QA Department is responsible for preparing a comprehensive monthly metrics report to Management to keep them apprised of current quality issues. This report fosters communication, review, and refinement of the QA system to evaluate the suitability of policies and procedures to meet both regulatory and laboratory quality objectives.

The NDSC QA team compiles information from all of the Environment Testing laboratories monthly metrics reports for the Executive Management team. This report includes notable information and concerns regarding the laboratories QA program and a listing of new regulations that may potentially impact the laboratories.

18.2 Annual Management Review

The Laboratory Management team (Laboratory Director, Technical Managers, QA Manager) conducts a review annually of its quality systems to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining goals, objectives and action items that feed into the laboratory planning system. NDSC personnel is be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to LIMS. The laboratory will summarize any critical findings that cannot be solved by the lab and report them to Corporate IT.

This management systems review NDSC Document No. CW-Q-S-004, Work Instruction No.

CW-Q-WI-003 and local SOP No. ED-GEN-004, Quality Management Review uses information generated during the preceding year to assess the “big picture” by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.
- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.
- For labs analyzing radioactive samples, also include the following:
    - Radiation health and safety
    - Radioactive hazardous waste management
    - Radioactive materials management
- Evaluation of overall risk, including risks to impartiality, confidentiality, reporting statements of conformity, and nonconforming work.

A report is generated by the QA Manager and management. The report is distributed to the QA Director and President of the Business Unit, Business Unit Manager. The report includes, but is not limited to the date of the review and the names and titles of participants.

- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

18.3 Potential Integrity Related Managerial Reviews

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other

appropriate actions have been completed and issues clarified. The NDSC Document No. CW-L-S-002, Internal Investigations shall be followed. All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

The Eurofins Environment Testing America Presidents, Business Unit Managers, Laboratory Directors and NDSC Team are informed any current data integrity or data recall investigations via the monthly metrics report.

19.0 TEST METHODS AND METHOD VALIDATION

19.1 Overview

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 Standard Operating Procedures (SOPs)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to NDSC Document No. CW-Q-S-002, Writing a Standard Operating Procedure..
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water and DoD/DOE SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 Laboratory Methods Manual

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 Selection of Methods

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the PM~~.~~. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data. Refer to Appendix 6 for a list of the currently accepted U.S. EPA analytical method references used by the laboratory.

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.1.1 Client Supplied Methods

Most of the client-supplied method requirements presented to us involve achieving specific quality control criteria, limits of quantitation (LOQ), and/or method detection limits (MDL) using standard EPA methods. These requirements are communicated to the appropriate technical groups prior to the project start up. Each technical group evaluates the scope of work and the requirements to ensure the criteria can be met using the standard EPA method. The data is monitored to ensure the criteria are met throughout the project. The PM notifies the client if there is a more appropriate method available or if the client's criteria cannot be achieved on a certain sample matrix (i.e., due to matrix or dilutions).

Occasionally, we are asked to transfer a non-standardized method from a client into our lab or to develop a new method, when one is not available. In the case of a method transfer, we set up the client's method and perform some initial evaluation. After the initial evaluation, we may make recommendations on how to improve method performance. If the method appears to be adequate, we determine linearity, specificity, precision, accuracy, MDL, and LOQ by performing calibrations, analyzing method blanks, and carrying out method detection limit and IDOC studies.

In the case of method development, we work with the client and/or data user to determine the level of validation required ensuring that the method meets its intended purpose. In addition to the elements above, we also determine standard and sample stability and robustness depending on the scope of the project. Typically, a standard operating procedure is written and submitted to the client with the results of the validation. These steps are completed prior to analysis of field samples. Data related to the setup of the method are archived.

19.4.1.2 Procedural Deviations

Analysts are required to follow a documented method for all tests performed; and any deviations from analytical methods must be documented, approved, and justified in an appropriate and consistent manner. We classify method deviations as either being a planned deviation or an unplanned deviation. In general, the following information is captured to document both types of situations:

- Description of the situation
- Reason or justification for the deviation
- Impact the deviation had on the testing
- Signature/date of analyst performing the test
- Signature/date of QA and Laboratory management approving the deviation
- Signature/date of client approval, if necessary

Deviations to written procedures are documented in raw data records, ICAT or through the ICAR (Investigation and Corrective Action Report) system. Both types of documentation require management and QA review and approval.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

A demonstration of capability (DOC, Lab SOP ED-GEN-022, Training) is performed whenever there is a change in instrument type (e.g., new instrumentation), matrix, method or personnel (e.g., analyst has not performed the test within the last 12 months).

Note: The laboratory shall have a DOC for all analytes included in the methods that the laboratory performs, and proficiency DOCs for each analyst shall include all analytes that the laboratory routinely performs. Addition of non-routine analytes does not require new DOCs for all analysts if those analysts are already qualified for routine analytes tested using identical chemistry and instrument conditions.

The initial demonstration of capability must be thoroughly documented and approved by the Technical Manager and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratory's archiving procedures.

The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (e.g., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

Note: IDOC procedures are further detailed in Lab SOP ED-GEN-022, Training.

The spiking standard used must be prepared independently from those used in instrument calibration.

The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.1 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.2 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.3 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.4 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.5 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 19.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.

Methods on line prior to the effective date of this Section shall be updated to the procedures outlined above as new analysts perform their demonstration of capability. A copy of the new record will replace that which was used for documentation in the past. At a minimum, the precision and accuracy of four mid-level laboratory control samples must have been compared to the laboratory's quality control acceptance limits.

19.5 Laboratory Developed Methods and Non-Standard Methods

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 Validation of Methods

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

When changes are made to any validated methods, the influence of such changes shall be documented and, if appropriate, a new validation shall be performed.

19.6.1.1 **Determination of Method Selectivity** – Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 **Determination of Method Sensitivity** – Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set

of samples. Detection limit studies are conducted as described in Section 19.7. Where other protocols for estimations and/or demonstrations of sensitivity are required by regulation or client agreement, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Limit of Quantitation (LOQ) – An important characteristic of expression of sensitivity is the distinction between the LOD and the LOQ. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The LOQ is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias, equivalent to the laboratory's routine reporting limit (RL). For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the LOQ. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the LOQ, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences – A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range – Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision – Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method – The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance – Continued demonstration of method performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 Method Detection Limit (MDL) / Limits of Detection (LOD)

The MDL is the minimum measured quantity of a substance that can be reported with 99% confidence that the concentration is distinguishable from method blank results, consistent with 40CFR Part 136 Appendix B, August, 2017. The MDL is equivalent to the TNI LOD or DL, and is also equivalent to the DoD/DOE Quality Systems Manual (QSM) DL. The working or final MDL is the higher of the MDL value determined from spikes (MDLs) and the MDL value determined from blanks (MDLb). An initial MDL study shall be performed during the method validation process and when the method is altered in a way that can reasonably be expected to change its sensitivity. On-going data are collected during each quarter in which samples are being analyzed. At least once every 13 months the MDLs and MDLb are re-calculated and re-evaluated using data

collected during the preceding period. Details of the laboratory's procedure for conducting MDL studies are given in NDSC Document No.CA-Q-S-006.

19.8 Verification of Detection Limits

If it is found during the re-evaluation of detection limit results that more than 5% of the spiked samples do not return positive numeric results that meet all method qualitative identification criteria, then then spiking level shall be increased and the initial MDL study pre-performed at the new spiking concentration. For DoD/DOE labs, additional guidance provided in NDSC Document No. No. CA-Q-S-006 - Attachment 2.

19.9 Instrument Detection Limits (IDL)

The IDL is sometimes used to assess the reasonableness of the MDL or in some cases required by the analytical method or program requirements. IDLs are most commonly used in metals analyses but may be useful in demonstration of instrument performance in other areas.

IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

19.10 Limit of Quantitation

The LOQ shall be at a concentration equivalent to the lowest calibration standard concentration, with the exception of methods using a single-point calibration, and shall be greater than the MDL. The LOQ is verified by preparing and analyzing spikes at concentrations 1-2X the selected LOQ, employing the complete analytical process.

When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 times the reporting limit or by a DL check samples at or below the LOQ. The LOQ is verified annually thereafter. The annual requirement is waived for methods that have an annually verified MDL. The laboratory will comply with any regulatory requirements.

19.11 Retention Time Windows

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specified in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept on-file and available for review. Complete details are available in the laboratory SOPs.

19.12 Evaluation of Selectivity

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.13 Estimation of Uncertainty of Measurement

19.13.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty" defined as the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.13.2 Uncertainty is not error. Error is a single value (i.e., the difference between the true result and the measured result). On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.13.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.13.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent uncertainties at approximately the 99% confidence level with a coverage factor of k = 3. As an example, for a reported result of 1.0 mg/L with an LCS recovery range of 50 to 150%, the estimated uncertainty in the result would be 1.0 +/- 0.5 mg/L.

19.13.5 In the case where a well-recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.14 Sample Reanalysis Guidelines

Because there is a certain level of uncertainty with any analytical measurement, a sample re-preparation (where appropriate) and subsequent analysis (hereafter referred to as 'reanalysis') may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. **Client specific Contractual Terms & Conditions for reanalysis protocols may supersede the following items.**

Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit,

the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.
- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.
- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Area Supervisor or Laboratory Director if unsure.

19.15 Control of Data

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.15.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below.

The laboratory is currently using the Eurofins LIMS system, which has been highly customized to meet the needs of the laboratory.

19.15.1.1 Maintain the Database Integrity – Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, documentation of system failures and corrective actions taken, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use. Cells containing calculations must be lock-protected and controlled.
- Instrument hardware and software adjustments are safeguarded through maintenance logs, audit trails and controlled access.

19.15.1.2 Ensure Information Availability – Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.15.1.3 Maintain Confidentiality – Ensure data confidentiality through physical access controls such as password protection or website access approval when electronically transmitting data.

19.15.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., select Wet Chemistry methods, , the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged using NDSC Document No. CA-Q-S-002, Acceptable Manual Integration Practices,.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.15.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.15.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1**%.** Units are defined in each lab SOP.

19.15.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

19.15.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a formatter for significant figure criterion for each analyte.

19.15.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS, electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with the data file. The data file is stored in a monthly folder on the instrument computer; periodically, this file is transferred to the server and, eventually, to a tape file.

19.15.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 14.

- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Technical Manager/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.15.4 Review / Verification Procedures

Review procedures are outlined in Lab SOP ED-GEN-021, Data Review to ensure that reported data are free from calculation and transcription errors, that QC parameters have been reviewed and evaluated before data is reported. The laboratory also utilizes NDSC Document No. CA-Q-S-002, Acceptable Manual Integration Practices to ensure the authenticity of the data . The general review concepts are discussed below, more specific information can be found in the SOPs.

19.15.4.1 Log-In Review - The data review process starts at the sample receipt stage. Sample control personnel review chain-of-custody forms and project instructions from the project management group. This is the basis of the sample information and analytical instructions entered into the LIMS. The log-in instructions are reviewed by the personnel entering the information, and a second level review is conducted by the project management staff.

19.15.4.2 First Level Data Review - The next level of data review occurs with the analysts. As data are generated, analysts review their work to ensure that the results meet project and SOP requirements. First level reviews include inspection of all raw data (e.g., instrument output for continuous analyzers, chromatograms, spectra, and manual integrations), evaluation of calibration/calibration verification data in the day's analytical run, evaluation of QC data, and reliability of sample results. The analyst transfers data into LIMS, data qualifiers are added as needed. All first level reviews are documented.

19.15.4.3 Second Level Data Review – All analytical data are subject to review by a second qualified analyst or supervisor. Second level reviews include inspection of all raw data (e.g., instrument output, chromatograms, and spectra) including 100% of data associated with any changes made by the primary analyst, such as manual integrations or reassignment of peaks to different analytes, or elimination of false negative analytes. The second review also includes evaluation of initial calibration/calibration verification data in the day's analytical run, evaluation of QC data, reliability of sample results, qualifiers and NCM narratives. Manual calculations are checked in second level review. All second level reviews are documented.

Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors

- Results outside of calibration range

19.15.4.4 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Director/Manager, Technical Manager, or Supervisor for further investigation. Corrective action is initiated whenever necessary.

19.15.4.5 The results are then entered or directly transferred into the computer database and a .pdf is printed for the client.

19.15.4.6 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that the COC is followed, cover letters / narratives are present, flags are appropriate, and project specific requirements are met. The Project Manager may also evaluate the validity of results for different test methods given expected chemical relationships.

19.15.4.7 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. The accounting personnel also check the report for any clerical or invoicing errors. When complete, the report is sent out to the client.

19.15.4.8 A brief overview of sample flow and information through the laboratory, as well as data review and validation, is presented in Figure 19-1.

19.15.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using NDSC Document No. CA-Q-S-002, Acceptable Manual Integration Practices..

19.15.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.15.5.2 Analysts shall not increase or decrease peak areas for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principles and policy and is grounds for immediate termination.

19.15.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.15.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on expanded scale "before" and "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented NDSC approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1. Example – Work Flow

Action	Personnel Involved
Bottle orders generated upon request - Bottles packed and shipped to the client under CoC	- Client Service Personnel / PM - Bottle Preparation Personnel
Samples received at laboratory - Unpacked and reconciled against client paperwork or CoC - Samples acceptance documented against completed (CoC)[1]	Sample Login Personnel
Samples are entered into LIMS - Job # assigned - Methods/Analytes linked from project - Sample labels generated - LIMS backlogs updated immediately	Sample Login Personnel
Sample Storage - Short TATs and hold-time samples are delivered directly to the laboratory for analysis - Samples stored in assigned locations (refrigerated walk-in coolers, freezers, VOA refrigerators; etc.)	Sample Login Personnel
Sample Receipt Acknowledgement sent to client (when requested)	Sample Login Personnel
Sample Acquisition/Testing - Analysts collect samples from assigned storage. - Legal CoC samples are signed in-and-out of storage - Remaining sample returned to storage.	Analysts / Login Personnel
Preparation and analysis is performed according to selected analytical method and applicable Project notes - Raw data recorded/reviewed[2] - Data imported to LIMS	Analysts
LIMS performs calculations: - Data reviewed by primary/secondary analyst - Data approved as final	Data Process (LIMS / Analyst)
Generation/review/release of reports (automated through LIMS) - Electronic copy saved in LIMS	Project Management Assistants / Reporting Group
Electronic Data Deliverables (EDDs) generated (as applicable)	EDD Group
Hard copy and electronic batch raw data is archived according to data archiving procedures.	Analysts / IT

[1]Refer to Sec. 23.3.
[2]Analyses requiring the analyst's interpretation may involve manual data reduction before entry into LIMS.

20.0 EQUIPMENT and CALIBRATIONS

20.1 Overview

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of available laboratory instrumentation is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturer's instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 Preventive Maintenance

The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

Scheduled routine maintenance is defined in each method SOP. It is the responsibility of each Technical Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures are also outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

- Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.
- Each entry in the instrument log includes the analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.
- When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the

maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

If an instrument requires repair (subjected to overloading or mishandling), gives suspect results, or otherwise has shown to be defective or outside of specified limits it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back-up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

At a minimum, if an instrument is sent out for service or transferred to another facility, it must be recalibrated and the laboratory MDL verified (using an MDLV) prior to return to lab operations.

20.3 Support Equipment

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, field sampling devices, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains “calibration only” ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file as detailed in lab SOP ED-GEN-010, Calibration of Analytical Balances.

20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters used in the laboratory are capable or measuring conductivity with an error not exceeding 1% or one umhos/cm, whichever is greater. The meters are also calibrated before each use with a known standard.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH, Conductivity, and Turbidity SOPs for further information.

20.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer.

- If the temperature measuring device is used over a range of 10℃ or less, then a single point verification within the range of use is acceptable;
- If the temperature measuring device is used over a range of greater than 10℃, then the verification must bracket the range of use.

IR thermometers, digital probes and thermocouples are calibrated quarterly. IR Thermometers should be calibrated over the full range of use, including ambient, iced (4^{o}C) and frozen (0^{o}C to -5^{o}C), per the Drinking Water Manual.

The digital NIST thermometer is recalibrated every five years (unless the thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree (0.5 degree or less increments are required for drinking water microbiological laboratories), and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the lab SOP ED-GEN-014, Thermometer Calibration. .

20.3.4 Refrigerators/Freezer Units, Water baths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, water baths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens, water baths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware and glass microliter syringes) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis.

For those dispensers that are not used for measurements, a label shall be applied to the device stating that it is not calibrated. Any device not regularly verified cannot be used for any quantitative measurements. Lab SOP ED-GEN-011, Calibration and Use of Lab Pipettes, contains detailed information on this topic.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an "Accuracy and Precision Statement of Conformance" from Hamilton attesting established accuracy.

20.3.6 Autoclaves

Section reserved. Autoclaves are not currently in use at Eurofins TestAmerica Edison.

20.3.7 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated monthly by setting the sample volume to 100ml and recording the volume received. The results are filed in a logbook/binder. The Auto Sampler is programmed to run three (3) cycles and each of the three cycles is measured into a graduated cylinder to verify 100ml are received.

If the RSD (Relative Standard Deviation) between the 3 cycles is greater than 10%, the procedure is repeated and if the result is still greater than 10%, then the Auto Sampler is taken out of service until it is repaired and calibration verification criteria can be met. The results of this check are kept in a logbook/binder.

20.4 Instrument Calibrations

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, and type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 14).

Note: Instruments are calibrated initially and as needed after that and at least annually (the annual requirement does not apply to Isotope dilution).

20.4.1 Calibration Standards

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. If a reference method does not specify the number of calibration standards, a minimum of 3 calibration points will be used.

Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to at least the same number of significant figures used to report the data) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exceptions to these rules. ICP and ICPMS methods which define the working range with periodic linear dynamic range studies, rather than through the range of concentrations of daily calibration standards.

All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst at a different time or a different preparation would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.1.1 Calibration Verification

The calibration relationship established during the initial calibration must be verified initially and at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and in the 2009 and 2016 TNI Standard. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification (ICV) is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications (CCV) may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to here is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met, i.e., RPD, per 2009 and 2016 TNI Std. EL-V1M4 Sec. 1.7.2.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used then bracketing calibration verification standards may not be required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

Generally, the calibrations must be verified by an ICV analyzed immediately following initial calibration and before sample analysis. The ICV may be used as the first bracketing CCV, if criteria for both are met.

A continuing instrument calibration verification (CCV) is generally analyzed at the beginning of each 12-hour analytical shift during which samples are analyzed. The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12-hours of the beginning of the shift. For methods that have quantitation by external calibration models, a CCV is analyzed at the end of each analytical sequence. Some methods have more frequent CCV requirements. See specific SOPs. Most inorganic methods require the CCV to be analyzed after ever 10 samples or injections, including matrix or batch QC samples.

Note: If an internal standard calibration is being used (e.g., GCMS) then bracketing standards are not required, only daily verifications are needed, except as specified by program or method requirements.

If the results of a CCV are outside the established acceptance criteria and analysis of a second consecutive (and immediate) CCV fails to produce results within acceptance criteria, corrective action shall be performed. Once corrective actions have been completed and documented, the laboratory shall demonstrate acceptable instrument / method performance by analyzing two consecutive CCVs, or a new initial instrument calibration shall be performed.

Sample analyses and reporting of data may not occur or continue until the analytical system is calibrated or calibration verified. However, data associated with an unacceptable calibration verification may be fully useable **reported based upon discussion and approval of the client** under the following special conditions:

a). when the acceptance criteria for the CCV are exceeded high (i.e., high bias) and the associated samples within the batch are non-detects, then those non-detects may be reported case narrative comment explaining the high bias. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted; or

b). when the acceptance criteria for the CCV are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted.

Samples reported by the 2 conditions identified above will be appropriately flagged.

20.4.1.2 Verification of Linear and Non-Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs.) Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.
- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 Tentatively Identified Compounds (TICs) – GC/MS Analysis

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Additional details are provided in NDSC Document No. CA-Q-QM-001, Tentatively Identified Compounds (TICS) – GCMS.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

20.6 GC/MS Tuning

Prior to any GC/MS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spectrometer, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally do not need

any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1

Eurofins TestAmerica Edison– Instrumentation by Type

(see EDS-WI-002, TestAmerica Edison Equipment List for full current listing)

GC	GC/MS	ICP	ICP-MS	Hg Analyzer	Auto Analyzer	IC	TOC	Spectrophotometer
x	x	X	x	x	x	x	x	x

21.0 MEASUREMENT TRACEABILITY

21.1 Overview

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware and glass microliter syringes, quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware and glass microliter syringes should be routinely inspected for chips, acid etching or deformity (e.g., bent needle). If the Class A glassware or syringe is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-Traceable Weights and Thermometers

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), or another accreditation organization that is a signatory to a MRA (Mutual Recognition Arrangement) of one or more of the following cooperations – ILAC (International Laboratory Accreditation Cooperation) or APLAC (Asia–Pacific Laboratory Accreditation Cooperation). A calibration certificate and scope of accreditation is kept on file at the laboratory.

21.3 Reference Standards / Materials

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared reference standards, to the extent available, are purchased from vendors that are accredited to ISO Guide 34 and ISO/IEC Guide 17025. All reference standards from commercial vendors shall be accompanied with a certificate that includes at least the following information:

- Manufacturer
- Analytes or parameters calibrated
- Identification or lot number
- Calibration method
- Concentration with associated uncertainties
- Purity

If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the true value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Environmental Health & Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory's Environmental Health and Safety Manual.

Standards and reference materials shall not be used after their expiration dates unless their reliability is verified by the laboratory and their use is approved by the Quality Assurance Manager. The laboratory must have documented contingency procedures for re-verifying expired standards.

21.4 Documentation and Labeling of Standards, Reagents, and Reference Materials

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company-wide purchase. [Refer to NDSC Document No. CA-Q-S-001, Solvent and Acid Lot Testing and Approval]

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained in the TALS Reagent Module.. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to method specific SOPs.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material. Blended gas standard cylinders use a nominal concentration if the certified value is within +/-15%, otherwise the certified values is used for the canister concentration.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's LIMS, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the LIMS.

- Standard ID
- Description of Standard
- Department
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date
- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment box (text field)

Records are maintained electronically for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date (include prep date for reagents)
- Standard ID (***from LIMS)***
- Special Health/Safety warnings if applicable

Records must also be maintained of the date of receipt for commercially purchased items or date of preparation for laboratory prepared items. Special Health/Safety warnings must also be available to the analyst. This information is maintained ***in*** TAL Reagent Module.

21.4.3 In addition, the following information may be helpful:

- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Recommended Storage Conditions
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include an expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and preparation/analytical batch records.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

22.0 SAMPLING

22.1 Overview

The laboratory provides sampling services. Sampling procedures are described in the following SOPs:

- ED-FLD-008 (Low Flow Well Purging & Sampling)
- ED-FLD-009 (Volume Average Purging & Sampling)
- ED-FLD-014 (Wastewater Sampling)

22.2 Sampling Containers

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Certificates of cleanliness for bottles and preservatives are provided by the supplier and are maintained at the laboratory. Alternatively, the certificates may be maintained by the supplier and available to the laboratory on-line.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 Definition of Holding Time

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in days (e.g., 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed in hours (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero. Holding times for analysis include any necessary reanalysis. However, there are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is.

22.4 Sampling Containers, Preservation Requirements, Holding Times

The preservation and holding time criteria specified in the laboratory SOPs are derived from the source documents for the methods. If method required holding times or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or “ASAP” is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 Sample Aliquots / Subsampling

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory’s responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots and subsampling are located in lab SOP ED-GEN-007, Subsampling.

23.0 HANDLING OF SAMPLES

It is the responsibility of the client to send us representative and/or homogeneous and properly preserved samples of the system from which they are drawn. The laboratory assumes that all multiple sample containers with the same designator/description and bottle type contain a homogeneous, representative sample.

The laboratory provides the appropriate sample containers, required preservative, chain-of-custody (COC) forms, shipping containers, labels, and custody seals. The laboratory also provides trip blanks and analyte-free water for field blanks. Preparation of methanol containers for field preservation of volatile soil samples is available.

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 Chain of Custody (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible.. This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)

- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

When the sampling personnel deliver the samples directly to the laboratory personnel, the samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory personnel. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a laboratory courier. When sampling personnel deliver the samples through a common carrier (Fed-Ex, UPS), the CoC relinquished date/time is completed by the field personnel and samples are released to the carrier. Samples are only considered to be received by the laboratory when personnel at the fixed laboratory facility have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is stored in log-in by date; it lists all receipts each date.

23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC, login will complete the custody seal retain the shipping record with the COC, and initiate an internal COC for laboratory use by analysts and a sample disposal record.

23.2 Sample Receipt

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are detailed in the laboratory's SOP No. ED-SPM-001, Procedure For Sample Receipt, Login, Identification, And Storage and summarized in the following sections.

23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented in a TALS Sample Receiving NCM and brought to the immediate attention of the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

Sample Receiving personnel check and document preservation of non-volatile liquid samples after the samples have been entered into the LIMS and before they are released to the laboratory for testing or placed into storage. Any checks of volatile samples and samples for oil and grease are performed and documented at the time of analysis.

23.3 Sample Acceptance Policy

The laboratory has a written sample acceptance policy (Figure 23-1) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined.

23.3.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.2 Any deviations from these checks that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or
- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Once sample acceptance is verified, the samples are logged into LIMS according to SOP No. ED-SPM-001, Procedure For Sample Receipt, Login, Identification, And Storage.

23.4 Sample Storage

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators, freezers or protected locations suitable for the sample matrix. Samples for metals analysis are stored unrefrigerated. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container allocated to their analysis from the designated refrigerator and place them on carts, analyze the sample, and return the remaining sample or empty container to the refrigerator or shelf (for metals samples) from which it originally came. All unused portions of samples, including empty sample containers, are returned to the secure sample control area. All samples are kept in the refrigerators for 30 days after delivery of the final report to the client, which meets or exceeds most sample holding

times. After 30 days the samples are disposed of or, upon client request moved to a sample archive area where they are stored for an additional time period agreed upon with the client or dictated by the applicable analytical program..

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of Eurofins TestAmerica Edison.

23.5 Hazardous Samples and Foreign Soils

To minimize exposure to personnel and to avoid potential accidents, hazardous and foreign soil samples are stored in an isolated area designated for hazardous waste only.

Procedures for the handling and storage of hazardous samples are addressed in the Eurofins TestAmerica Corporate Safety Manual (TestAmercia Document No. CW-E-M-001) and in Eurofins TestAmerica Edison SOP No. ED-SPM-001 (Sample Receipt, Login, Identification, and Storage).

Procedures for the acceptance and handling of USDA regulated domestic and foreign soils are detailed in Eurofins TestAmerica SOP No. ED-SPM-006 (Procedure for Acceptance and Handling of Regulated Domestic and Foreign Soils).

23.6 Sample Shipping

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses (see Note). The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a Eurofins TestAmerica Edison courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The laboratory's Environmental, Health and Safety Manual contains additional shipping requirements.

Note: If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will not analyze the trip blanks that were supplied. However, in the interest of good client service, the laboratory will advise the client at the time of sample receipt that it was noted that they did not request analysis of the trip blank; and that the laboratory is providing the notification to verify that they are not inadvertently omitting a key part of regulatory compliance testing.

23.7 Sample Disposal

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis,

the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures (SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures). All procedures in the laboratory's Environmental Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than two months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample must participate in the decision about the sample's disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal, nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client), names of individuals who conducted the arrangements and physically completed the task. The laboratory will remove or deface sample labels prior to disposal unless this is accomplished through the disposal method (e.g., samples are incinerated). A Waste Disposal Record should be completed.

Figure 23-1. Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

Per State and/or Federal Regulation, the client is responsible to ensure that samples are shipped in accordance with DOT/IATA requirements, and that radioactive materials may only be delivered to licensed facilities. Any samples containing (or suspected to contain) Source, Byproduct, or Special Nuclear Material as defined by 10 CFR should be delivered directly to facilities licensed to handle such radioactive material. Natural material or ores containing naturally occurring radionuclides may be delivered to any Eurofins TestAmerica facility or courier as long as the activity concentration of the material does not exceed 270 pCi/g alpha or 2700 pCi/g beta (49 CFR Part 173).

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
    - *Client name, address, phone number and fax number (if available)*
    - *Project name and/or number*
    - *The sample identification*
    - *Date, time and location of sampling*
    - *The collectors name*
    - *The matrix description*
    - *The container description*
    - *The total number of each type of container*
    - *Preservatives used*
    - *Analysis requested*
    - *Requested turnaround time (TAT)*
    - *Any special instructions*
    - *Purchase Order number or billing information (e.g. quote number) if available*
    - *The date and time that each person received or relinquished the sample(s), including their*

signed name.

- *The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.*
- Information must be legible

2) Samples must be properly labeled.
   - Use durable labels (labels provided by Eurofins TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - Information must be legible

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested.

4) Samples must be preserved according to the requirements of the requested analytical method

5) Most analytical methods require chilling samples to 4^{o} C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6^{o} C and above freezing (0^{o}C). For methods with other temperature criteria (e.g. some bacteriological methods require $\leq$ 10 ^{o}C), the samples must arrive within $\pm$ 2^{o} C of the required temperature or within the method specified range.

   5i.) Samples that are delivered to the laboratory on the same day they are collected may not meet the requirements of Section 5. In these cases, the samples shall be considered acceptable if the samples were received on ice.

   5ii.) If sample analysis is begun within fifteen (15) minutes of collection, thermal preservation is not required.

   5iii.) Thermal preservation is not required in the field if the laboratory receives and refrigerates the sample within fifteen (15) minutes of collection.

   - Chemical preservation (pH) will be verified prior to analysis and documented, either in sample control or at the analyst's level. The project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.
   - For Volatile Organic analyses in drinking water (Methods 502.2 or 524.2). Residual chlorine must be neutralized prior to preservation. If there is prior knowledge that the samples are not chlorinated, state it on the COC and use the VOA vials pre-preserved with HCl. The following are other options for a sampler and laboratory where the presence of chlorine is not known:
     - 1. Test for residual chlorine in the field prior to sampling.
       - If no chlorine is present, the samples are to be preserved using HCl as usual.
       - If chlorine is present, add either ascorbic acid or sodium thiosulfate prior to adding HCl.
     - 2. Use VOA vials pre-preserved with sodium thiosulfate or ascorbic acid and add HCl after filling the VOA vial with the sample.
   - **FOR WATER SAMPLES TESTED FOR CYANIDE (by Standard Methods or EPA 335)**

- In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.
  - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.
- It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.
- The laboratory must test the sample for oxidizing agents (e.g. Chlorine) prior to analysis and treat according to the methods prior to distillation. (ascorbic acid or sodium arsenite are the preferred choice).

Sample Holding Times

- Eurofins TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (2 working days) remaining on the holding time for us to ensure analysis.
- Analyses that are designated as “field” analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, Eurofins TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for “field” analyses received after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis. The actual times of all “field” sample analyses are noted on the “Short Hold Time Detail Report” in the final report. Samples analyzed in the laboratory will be qualified on the final report with an ‘H’ to indicate holding time exceedance.

6) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. Eurofins TestAmerica will supply a blank with the bottle order.

7) The project manager will be notified if any sample is received in damaged condition. Eurofins TestAmerica will request that a sample be resubmitted for analysis.

8) Recommendations for packing samples for shipment.
   - Pack samples in Ice rather than “Blue” ice packs.
   - Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
   - Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
   - Fill extra cooler space with bubble wrap.

24.0 ASSURING THE QUALITY OF TEST RESULTS

24.1 Overview

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. Quality control samples are to be treated in the exact same manner as the associated field samples being tested. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 Controls

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 Negative Controls

Table 24-1. Example – Negative Controls

Control Type	Details
Method Blank (MB)	are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
	Reanalyze or qualify associated sample results when the concentration of a targeted analyte in the blank is at or above the reporting limit as established by the method or by regulation, AND is greater than 1/10 of the amount measured in the sample.
Calibration Blanks	are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.

Table 24-1. Example – Negative Controls

Control Type	Details
Instrument Blanks	are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses (or as specified in the client's project plan). Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (TNI)
Holding Blanks	also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 Positive Controls

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, Toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

- For methods that have 1-10 target analytes, spike all components.
- For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.
- For methods with more than 20 target analytes, spike at least 16 components.
- Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.
- Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 Sample Matrix Controls

Table 24-3. Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects. If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.

[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 Acceptance Criteria (Control Limits)

As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits

with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

Laboratory generated % Recovery acceptance (control) limits are generally established by taking $\pm$ 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

- Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).
- In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.
- The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.
- The maximum acceptable recovery limit will be 150%.
- The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.
- If either the high or low end of the control limit changes by $\leq$ 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.1 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits.

The QA Department generates and reviews Quality Control Limit Summaries using the TALS Control Chart module. These tables summarize the updated, proposed precision and accuracy acceptability limits for each applicable analysis performed at Eurofins TestAmerica Edison. Once the QA Department is satisfied that the proposed limits are satisfactory the tables are forwarded to the applicable Department (Technical) Manager for final review. Once the proposed limits have been reviewed they entered into the appropriate TALS Method Limit Group database and approved for use (effectively replacing the existing limits in the database). The Quality Assurance Department maintains an archive of all limits used within the laboratory. Reference Eurofins TestAmerica Edison SOP No. ED-GEN-026 (Evaluation of Analytical Accuracy and Precision Through The Use of Control Charts).

24.6.2 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be

reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

- The analyte results are below the reporting limit and the LCS is above the upper control limit.
- If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.3 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.4 If a surrogate standard falls outside the acceptance limits, and if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 Additional Procedures to Assure Quality Control

The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 17).

A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

- Use of formulae to reduce data is discussed in the method SOPs and in Section 20.
- Selection of appropriate reagents and standards is included in Section 11 and 21.
- A discussion on selectivity of the test is included in Section 7.
- Constant and consistent test conditions are discussed in Section 6.
- The laboratories sample acceptance policy is included in Section 23.

25.0 REPORTING RESULTS

25.1 Overview

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory

requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 9.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client. Review of reported data is included in Section 19.

25.2 Test Reports

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g., Analytical Report)

25.2.2 The cover page shall include the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g., Eurofins TestAmerica Job ID #) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

Note: Page numbers of report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc.).

25.2.11 Reporting limit

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 25.2.4 – Item 3 regarding additional addenda).

25.2.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

25.2.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory, except when information is provided by the client. When data is provided by the client there shall be a clear identification of it, and a disclaimer shall be put in the report when the client supplied data can affect the validity of the test.

25.2.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

25.2.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Authorized signatories are qualified Project Managers appointed by the Manager of Project Managers.

25.2.21 When TNI accreditation is required, the lab shall certify that the test results meet all requirements of TNI or provide reasons and/or justification if they do not.

25.2.22 The laboratory includes a cover letter.

25.2.23 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.24 When soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.2.25 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.2.26 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report, or how your lab identifies it). A complete report must be sent once all of the work has been completed.

25.2.27 Any non Eurofins TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All Eurofins TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

25.2.28 A Certification Summary Report, where required, will document that, unless otherwise noted, all analytes tested and reported by the laboratory were covered by the noted certifications.

Note: Refer to the NDSC Document No. CA-I-P-002, Electronic Reporting and Signature Policy. for details on internally applying electronic signatures of approval.

25.2.29 Where the laboratory is responsible for the sampling stage, in addition to the requirements listed above, reports containing the results of sampling shall include the following, where necessary for the interpretation of test results:

- the date of sampling;
- unambiguous identification of the material sampled;
- the location of sampling plan and procedures, and deviations, addition to or exclusions from the sample procedures;

- a reference to the sampling plan and procedure, and deviations, additions to or exclusions from the sample procedures;
- details of any environmental conditions during sampling that affect the interpretation of test results;
- information required to evaluate measurement uncertainty for subsequent testing

25.3 Reporting Level or Report Type

The laboratory offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level 1 is a report with all of the elements outlined in Section 25.2 above, excluding 25.2.15 (QC data).
- Level II is a Level I report plus summary information, including results for the method blank reported to the laboratory MDL, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- Level III contains all the information supplied in Level II, but presented on the CLP-like summary forms, and relevant calibration information. A Level II report is not included, unless specifically requested. No raw data is provided.
- Level IV is the same as Level III with the addition of all raw supporting data.

In addition to the various levels of QC packaging, the laboratory also provides reports in EDD (see below). Initial reports may be provided to clients by facsimile. Procedures used to ensure client confidentiality are outlined in Section 25.6.

25.4 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of Eurofins TestAmerica services in addition to the test report as described in Section 25.2. When NELAP accreditation is required and both a test report and EDD are provided to the client, the official version of the test report will be the combined information of the report and the EDD. Eurofins TestAmerica Edison offers a variety of EDD formats including NJ Hazsite Deliverables, Excel, Dbase, GISKEY, and Text Files

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.5 Supplemental Information for Test

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have

affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

Numeric results with values outside of the calibration range, either high or low are qualified as estimated.

Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet TNI sample acceptance requirements such as improper container, holding time, or temperature.

Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

When, as requested by the client and agreed to by Eurofins TestAmerica Edison, the report includes a statement of conformity to specification or standard (see Special Services, Section 7.4), the report shall clearly identify:

- to which results the statement applies,
- which specifications, standard or parts thereof are met or not, and
- the decision rule that was applied (unless the decision rule is inherent in the requested specification or standard, taking into account the level of risk (such as false accept and false reject and statistical assumptions) associated with the decision rule.

Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.6 Environmental Testing Obtained From Subcontractors

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the NDSC Document No. CW-L-S-004, Subcontracting.

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of EurofinsTestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.7 Client Confidentiality

The laboratory will ensure the highest standards of quality and integrity of the data and services provided to our clients

The laboratory is responsible for maintaining in confidence all client information obtained or created. In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

The laboratory will not intentionally divulge to any person (other than the client or any other person designated by the client in writing) any information regarding the services provided by the laboratory or any information disclosed to the laboratory by the client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Information about the client obtained from sources other than the client (e.g., complainant, regulators) shall be confidential between client and the laboratory. The source of this information shall be confidential to the laboratory and shall not be shared with the client, unless agreed by the source.

Note: This shall not apply to the extent that the information is required to be disclosed by the laboratory under the compulsion of legal process. The laboratory will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.7.1 Report deliverable formats are discussed with each new client. If a client requests that reports be e-mailed, the reports are to meet all requirements of this document.

25.8 Format of Reports

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.9 Amendments to Test Reports

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the sample number followed by "Rev (n)" where 'n' is the revision number. The revised report will have the words "Revision (n)" on the report cover page beneath the report date. Additionally, a section entitled "Revised Report" will appear on the Case Narrative page. A brief explanation of the reasons for the re-issue will be included in this section.

When the report is re-issued, a notation of "report re-issue" is placed on the cover/signature page of the report *or at the top of the narrative page* with a brief explanation of reason for the re-issue and a reference back to the last final report generated. *For Example*: *Report was revised on 3/8/20 to include toluene in sample NQA1504 per client's request. This final report replaces the final report generated on 1/27/20 at 10:47am.*

25.10 Policies on Client Requests for Amendments

25.10.1 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

25.10.2 Multiple Reports

The laboratory does not issue multiple reports for the same work order where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1. List of Governing Documents applicable to the QA Manual

NDSC Doc. No.	Title
CA-C-S-001	Work Sharing Process
CA-I-P-002	Electronic Reporting and Signature Policy
CA-L-P-002	Contract Compliance Policy
CA-Q-M-002	Quality Management Plan
CA-Q-QM-001	Guidance on Tentatively Identified Compounds (TICs) – GC/MS Analysis
CA-Q-S-001	Acid and Solvent-Lot Testing and Approval Program
CA-Q-S-002	Manual Integrations
CA-Q-S-006	Detection and Quantitation Limits
CA-Q-S-009	Root Cause Analysis
CA-T-P-001	Qualified Products List
CW-E-M-001	Environmental Health & Safety Manual
CW-F-P-002	Company-Wide Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CW-F-S-007	Fixed Asset Acquisition, Retention and Safeguarding
CW-I-M-001	IT Change Control Procedure Manual
CW-L-P-001	Records Retention Policy
CW-L-P-004	Ethics Policy
CW-L-S-002	Internal Investigation

CW-L-S-004	Subcontracting
CW-Q-S-001	Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CW-Q-S-003	Internal Auditing
CW-Q-S-004	Management Systems Review
CW-Q-S-005	Data Recall Process
CW-Q-S-001	Document Control and Archiving
Local Laboratory Document No.	**Title**
ED-GEN-002	Document Control
ED-GEN-022	Training
ED-GEN-010	Calibration of Analytical Balances
ED-GEN-003	Control of Non-Conformances and Corrective Action
ED-GEN-024	Records Storage and Retention
ED-GEN-021	Data Review
ED-GEN-026	Evaluation of Analytical Accuracy and Precision Through The Use of Control Charts
ED-GEN-004	Quality Management Review
ED-GEN-014	Calibration of Laboratory Thermometers and Measurement of Temperatures in the Laboratory
ED-GEN-011	Calibration, Use, and Care of Laboratory Pipettes
ED-GEN-007	Subsampling
ED-FLD-008	Low Flow Monitoring Well Purging and Sampling
ED-FLD-009	Volume-Average Purging and Sampling
ED-FLD-014	Wastewater Sampling
ED-SPM-001	Procedure For Sample Receipt, Login, Identification, And Storage
ED-SPM-006	Procedure for Acceptance and Handling of Regulated Domestic and Foreign Soil
ED-SPM-008	Laboratory Waste Disposal Procedures

Appendix 2. List of Laboratory Certifications, Accreditations, Validations

The laboratory maintains accreditations, certifications, and approvals with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/ certification/licensing with the following organizations:

eurofins | Environment Testing TestAmerica

Certification List

Laboratory	Program	Authority	Identification	Expiration Date
Edison	NELAP	New Jersey	12028	06/30/2021
Edison	NELAP	New York	11452	04/01/2021
Edison	NELAP	Pennsylvania	68-00522	02/28/2021
Edison	State	Connecticut	PH-0200	09/30/2020
Edison	State	DE Haz. Subst. Cleanup Act (HSCA)	<cert No.>	12/31/2021
Edison	State	Massachusetts	M-NJ312	06/30/2021
Edison	State	Rhode Island	LAO00132	12/31/2020
Edison	US Federal Programs	USDA	P330-18-00135	05/03/2021

Appendix 3. References used to prepare the QA Manual

The QAM has been prepared to be consistent with the requirements of the following documents:

- ANSI/ASQC, E4-1994, "Specifications and Guidelines for Quality Management Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995, or most recent version)
- "EPA Requirements for Quality Management Programs" (QA/R-2) (EPA/240/B-01/002, May 31, 2006).
- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008; Final Update V, August 2015.*
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005) (DW labs only)*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- APHA, *Standard Methods for* the Examination of Water and Wastewater, 18th Edition, 19th, 20th, 21st, 22nd and on-line Editions.
- *U.S. Department of Energy* Order 414.1B, *Quality Assurance*, Approved April 29, 2004.
- *U.S. Department of Energy* Order 414.1C, *Quality Assurance*, June 17, 2005.
- *U.S. Department of Energy Order 414.1D, Quality Assurance, April, 25, 2011.*
- Nuclear Regulatory Commission (NRC) Quality Assurance Requirements.
- Marine Protection, Research, and Sanctuaries Act (MPRSA).
- Toxic Substances Control Act (TSCA).

Appendix 4. QA Manual Crosswalk with TNI and ISO/IEC 17025 Standards

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
-	QUALITY ASSURANCE MANUAL COVER **PAGE**	V1M2 Sec. 4.2.8.3		
1.0	Title Page			
2.0	Table of Contents	V1M2 Secs. 4.2.8.3-4.2.8.4		8.1.2, 8.2.1
3.0	Introduction, Scope and Applicability	V1M2 Sec. 4.2.8.4		
3.1	Introduction and Compliance References	V1M2 Secs. 1.1; 1.2; 2.0; 3.2; 4.1.2; 4.2.4	4.1.2; 4.2.4	5.3; 5.4; 8.2.4; 8.3.1
3.2	Terms and Definitions	V1M2 Secs. 3.0; 4.2.4	4.2.4	
3.3	Scope /Field of Testing	V1M2 Secs. 1.2; 4.2.4	4.1.2; 4.2.4	5.3; 5.4; 8.2.1; 8.2.4
3.4	Management of The Manual	V1M2 Secs. 4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	5.3
4.0	Management and Responsibilities	V1M2 Sec. 4		8.2.4; 8.2.5
4.1	Overview	V1M2 Secs. 4.1.1, 4.1.3; 4.1.5	4.1.1; 4.1.3; 4.1.5; 4.2.6	5.1; 5.2; 5.5; 5.6 ; 6.2.1; 6.2.4
4.2	Roles and Responsibilities	V1M2 Secs. 4.1.4; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	4.1.3; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	4.1.1 to 4.1.3; 4.1.5; 5.5; 5.6; 6.2.1; 6.2.4; 6.2.6 8.2.2;
4.3	Business Continuity and Contingency Plan *(Prev. Deputies)*	V1M2 Secs. 4.1.5; 4.1.7.2; 4.2.7	4.1.5; 4.2.7	
5.0	PERSONNEL	V1M2 Secs. 5.2; 5.2.1	5.2.1	6.1; 6.2.3
5.1	Overview	V1M2 Secs. 5.2.2; 5.2.3; 5.2.5	5.2.2; 5.2.3; 5.2.5	6.2.2
5.2	Education and Experience Requirements for Technical Staff	V1M2 Secs. 5.2.1; 5.2.3; 5.2.4	5.2.1; 5.2.3; 5.2.4	6.2.2 to 6.2.4
5.3	Training	V1M2 Sec. 5.2.5	5.2.5	4.2.1; 6.2.2; 6.2.4; 6.2.5
5.4	Data Integrity and Ethics Training Program	V1M2 Sec. 4.2.8.1; 5.2.7		4.1.1
6.0	ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS	V1M2 Sec. 5.3		6.1; 6.3.1
6.1	Overview	V1M2 Secs. 5.3.1; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.3; 5.3.4; 5.3.5	6.3.1
6.2	Environment	V1M2 Secs. 5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	6.3.1 to 6.3.5
6.3	Work Area	V1M2 Secs. 5.3.3; 5.3.4; 5.3.5	5.3.3; 5.3.4; 5.3.5	6.3.1
6.4	Responding to Emergencies			
6.5	Building Security	V1M2 Sec. 5.3.4	5.3.4	6.3.4
7.0	QUALITY SYSTEM			6.1; 8.2.4
7.1	Quality Policy	V1M2 Secs. 4.1.5; 4.2.2; 4.2.3; 4.2.8.3	4.1.5; 4.2.2; 4.2.3	8.2.3; 8.6.1
7.2	Ethics and Data Integrity	V1M2 Secs. 4.1.5; 4.16; 4.2.2; 4.2.8.1; 5.2.7	4.1.5; 4.2.2	4.1.1 to 4.1.3; 4.2.1; 6.2.1; 8.2.2; 8.2.3

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
7.3	Quality System Documentation	V1M2 Secs. 4.1.5; 4.2.2; 4.2.5	4.2.2; 4.2.5	8.2.4
7.4	QA/QC Objectives for the Measurement of Data	V1M2 Sec. 4.2.2	4.1.5; 4.2.2	6.2.4
7.5	Criteria for Quality Indicators			
7.6	Statistical Quality Control			
7.7	Quality System Metrics			
8.0	Document Control	V1M2 Secs. 4.2.7; 4.3.1; 4.3.2.2 ; 4.3.3.3; 4.3.3.4	4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	8.2.4; 8.3.1
8.1	Overview			8.2.5; 8.3.1; 8.3.2
8.2	Document Approval and Issue	V1M2 Secs. 4.3.2; 4.3.2.1-4.3.2.3; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.2.3; 4.3.3.1	8.2.5; 8.3.2
8.3	Procedures for Document Control Policy	V1M2 Secs. 4.3.2.1–4.3.2.2; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.3.1	8.2.5; 8.3.2
8.4	Obsolete Documents	V1M2 Secs. 4.3.2.1–4.3.2.2	4.3.2.1; 4.3.2.2	8.2.5; 8.3.2
9.0	SERVICE TO THE CLIENT	V1M2 Secs. 4.4.1 - 4.4.4	4.4.1; 4.4.2; 4.4.3; 4.4.4	7.1.1; 7.1.1.4; 7.1.1.5; 7.1.1.8; 7.1.2.1
9.1	Overview	V1M2 Secs. 4.4.5; 4.5.5; 5.7.1	4.4.5; 5.7.1	
9.2	Review Sequence and Key Personnel	V1M2 Sec. 4.4.5	4.4.5	7.1.1.6
9.3	Balancing Laboratory Work Load and Capacity			
9.4	Documentation	V1M2 Sec. 5.7.1	5.7.1	
9.5	Special Services	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	7.1.1.3; 7.1.1.7
9.6	Client Communication	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	7.1.1.7
9.7	Reporting	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	7.1.1.7
9.8	Client Feedback and Surveys	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	7.1.1.7; 8.6.2
10.0	SUBCONTRACTING OF TESTS	V1M2 Secs. 4.4.3; 4.5.4	4.4.3; 4.5.4	
10.1	Overview	V1M2 Secs. 4.5.1 - 4.5.3; 4.5.5; 5.3.1	4.5.1; 4.5.2; 4.5.3; 5.3.1	6.6.1; 7.1.2.1; 7.1.2.2
10.2	Qualifying and Monitoring Subcontractors	V1M2 Secs. 4.5.1; 4.5.2; 4.5.3; 4.5.5	4.5.1; 4.5.2; 4.5.3	6.6.1; 7.1.2.1; 7.1.2.2
10.3	Oversight and Reporting	V1M2 Sec. 4.5.5		
10.4	Contingency Planning			
10.5	Use of NELAP and A2LA Logo			
11.0	PURCHASING SERVICES AND SUPPLIES	V1M2 Sec. 4.6.1	4.6.1	
11.1	Overview	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4	4.6.2; 4.6.3; 4.6.4	6.6.1; 6.6.2
11.2	Glassware	V1M2 Sec. 5.5.13.1		
11.3	Reagents, Standards & Supplies	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4 2016 V1M4 1.7.2.5	4.6.2; 4.6.3; 4.6.4	6.6.1 to 6.6.3
11.4	Purchase of Equipment / Instruments / Software			
11.5	Services			
11.6	Suppliers			
12.0	COMPLAINTS	V1M2 Sec. 4.8	4.8	8.6.1; 8.6.2
12.1	Overview			7.9.1 to 7.9.3 8.6.1; 8.6.2;

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
12.2	External Complaints			7.9.2 to 7.9.7 8.6.1; 8.6.2;
12.3	Internal Complaints			8.6.1; 8.6.2
12.4	Management Review			8.6.1; 8.6.2
13.0	CONTROL OF NON-CONFORMING WORK	V1M2 Secs. 4.9.1; 5.10.5	4.9.1; 5.10.5	7.10.1
13.1	Overview	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	7.10.1
13.2	Responsibilities and Authorities	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5; 5.2.7	4.9.1; 4.11.3; 4.11.5	7.10.1
13.3	Evaluation of Significance and Action Taken	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	4.1.5; 7.10.1; 7.10.2; 8.5.3
13.4	Prevention of Non-Conforming Work	V1M2 Secs. 4.9.4; 4.11.2	4.9.2; 4.11.2	7.10.2; 7.10.3; 8.5.3
13.5	Method Suspension / Restriction (Stop Work Procedures)	V1M2 Secs. 4.9.1; 4.9.2; 4.11.5	4.9.1; 4.9.2; 4.11.5	7.10.1; 7.10.2
14.0	CORRECTIVE ACTION	V1M2 Sec. 4.11		4.1.4; 4.1.5
14.1	Overview	V1M2 Secs. 4.9.2; 4.11.1; 4.11.2	4.9.2; 4.11.1; 4.11.2; 8.7.1; 8.7.3	7.10.2 8.7.1; 8.7.3;
14.2	General	V1M2 Sec. 4.11.2; 4.11.3	4.11.2; 4.11.3	7.7.2; 8.5.3; 8.7.1;
14.3	Closed Loop Correction Action Process	V1M2 Sec. 4.11.2; 4.11.3; 4.11.4; 4.11.6; 4.11.7; 4.12.2	4.11.2; 4.11.3; 4.11.4; 4.12.2	8.5.3; 8.6.1; 8.7.2
14.4	Technical Corrective Actions	V1M2 Sec. 4.11.6		8.7.1
14.5	Basic Corrections	V1M2 Secs. 4.11.1; 4.13.2.3	4.11.1; 4.13.2.3	7.5.2; 8.7.1
15.0	PREVENTIVE ACTION / IMPROVEMENT	V1M2 Secs. 4.10; 4.12.1; 4.12.2	4.10; 4.12.1; 4.12.2	4.1.4
15.1	Overview	V1M2 Secs. 4.15.1; 4.15.2	4.15.1; 4.15.2	8.6.2
15.2	Management of Change			
16.0	CONTROL OF RECORDS	V1M2 Secs. 4.2.7; 4.13.1.1; 4.13.3	4.2.7; 4.13.1.1	8.4.2
16.1	Overview	V1M2 Secs. 4.13.1.1 - 4.13.1.4; 4.13.2.1-4.13.2.3; 4.13.3	4.13.1.1 - 4.13.1.4; 4.13.2.1-4.13.2.3	8.4.1; 8.4.2
16.2	Programs with Longer Retention Requirements			
16.3	Technical and Analytical Records	V1M2 Sec. 4.13.2.2 - 4.13.2.3	4.13.2.2; 4.13.2.3	7.5.1; 8.4.2
16.4	Laboratory Support Activities			7.5.2; 8.4.2
16.5	Administrative Records			8.4.2
16.6	Records Management, Storage and Disposal	V1M2 Sec. 4.13.3		4.2.1; 8.4.2
17.0	AUDITS			
17.1	Internal Audits	V1M2 Sec. 4.2.8.1; 4.14; 4.14.1; 4.14.2 ; 4.14.3; 4.14.5; 5.9.1; 5.9.2	4.14.1; 4.14.2; 4.14.3; 5.9.1; 5.9.2	8.6.1; 8.8.1; 8.8.2
17.2	External Audits	V1M2 Secs.4.14.2; 4.14.3	4.14.2; 4.14.3; 4.14.4	4.2.1; 8.6.1
17.3	Audit Findings	V1M2 Secs. 4.14.2; 4.14.3; 4.14.5		8.6.1

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
18.0	MANAGEMENT REVIEWS	V1M2 Sec. 4.1.6; 4.15; 4.15.1; 4.15.2	4.1.6; 4.15.1; 4.15.2	4.1.4; 8.5.1; 8.6.1; 8.9.1; 8.9.2
18.1	Quality Assurance Report			8.5.1
18.2	Annual Management Review	V1M2 Sec. 4.2.2; 4.15.3	4.2.2	4.1.1, 4.1.4; 4.2.1; 7.1.1.3; 8.2.2; 8.5.1 to 8.5.3; 8.6.1; 8.9.3
18.3	Potential Integrity Related Managerial Reviews			4.1.5; 8.5.1; 8.6.1
19.0	TEST METHODS AND METHOD VALIDATION	V1M2 Sec. 5.4.1	5.4.1	7.2.1.1; 8.2.5
19.1	Overview	V1M2 Sec. 5.4.1	5.4.1; 5.4.5.1	6.2.3; 7.2.1.1 to 7.2.1.3
19.2	Standard Operating Procedures (SOPs)	V1M2 Secs. 4.2.8.5; 4.3.3.1; 5.4.2	4.3.3.1; 5.4.2	7.2.1.4
19.3	Laboratory Methods Manual	V1M2 Sec. 4.2.8.5 (2019 5.4.4.2)		6.2.3
19.4	Selection of Methods	V1M2 Secs. 4.13.3; 5.4.1; 5.4.2; 5.4.3. (2019 5.4.4) V1M4 Secs. 1.4; 1.5.1; 1.6.1; 1.6.2; 1.6.2.1; 1.6.2.2	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5.1; 5.4.5.2; 5.4.5.3	7.1.1.2; 7.2; 7.2.1.2; 7.2.1.3; 7.1.2.4 to 7.2.1.7; 7.2.2.1 to 7.2.1.7; 7.2.2.1
19.5	Laboratory Developed Methods and and Non-Standard Methods	V1M2 Sec. 5.4.2. (2019 5.4.4.1, 5.4.4.2) V1M4 Sec. 1.5.1	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	7.1.1.2; 7.2.1.4 to 7.2.1.7 7.2.2.1; 7.2.2.3; 8.2.5
19.6	Validation of Methods	V1M2 Sec. 5.4.2. (2019 5.4.5.4) V1M4 Secs. 1.5.1; 1.5.2; 1.5.2.1; 1.5.2.2; 1.5.3	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	7.1.1.2; 7.1.2.4; 7.2.1.6; 7.2.2.1 to 7.2.2.4
19.7	Method Detection Limits (MDLs) / Limit of Detection (LOD)	V1M2 Sec. 5.9.3. V1M4 Secs. 1.5.2; 1.5.2.1; 1.5.2.2	5.4.5.3	7.2.2.3
19.8	Verification of Detection Limits	V1M2 Sec. 5.9.3		
19.9	Instrument Detection Limits (IDLs)	V1M2 Sec. 5.9.3. V1M4 Sec. 1.5.2.1		
19.10	Limit of Quantitation	V1M2 Sec. 5.9.3		
19.11	Retention Windows	V1M2 Sec. 5.9.3. V1M4 Sec. 1.5.4; (2009 1.7.3.6) (2016 1.7.2.6)		
19.12	Evaluation of Selectivity	V1M2 Sec. 5.9.3. V1M4 Sec. 1.5.4; (2009 1.7.3.6) (2016 1.7.2.6)		
19.13	Estimation of Uncertainty of Measurement	V1M2 Sec. 5.1.1; 5.1.2; 5.4.6	5.1.1; 5.1.2; 5.4.6.1; 5.4.6.2; 5.4.6.3	7.6.1; 7.6.2; 7.6.3
19.14	Sample Reanalysis Guidelines	V1M2 Sec 5.9.1	5.9.1	
19.15	Control of Data	V1M2 Secs. 5.4.7.1; 5.4.7.2; 5.9.1	5.4.7.1; 5.4.7.2; 5.9.1	7.11.1 to 7.11.6
20.0	EQUIPMENT AND CALIBRATIONS	V1M2 Secs. 5.5.4; 5.5.5; 5.5.6	5.5.4; 5.5.5; 5.5.6; 5.6.1	6.1; 6.4.3; 6.4.6; 6.4.9

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
20.1	Overview	V1M2 Secs. 5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10	5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10; 5.6.1	6.4.1; 6.4.4 to 6.4.6; 6.4.9; 6.4.11
20.2	Preventive Maintenance	V1M2 Secs. 5.5.1; 5.5.3; 5.5.7; 5.5.9	5.5.1; 5.5.3; 5.5.7; 5.5.9; 5.6.1	6.4.1 to 6.4.3; 6.4.6; 6.4.10
20.3	Support Equipment	V1M2 Secs. 5.5.10; 5.5.11; 5.5.13.1	5.5.10; 5.5.11; 5.6.2.1.2; 5.6.2.2.1; 5.6.2.2.2	6.4.11; 6.4.12; 6.5.1; 6.5.2; 6.5.3
20.4	Instrument Calibrations	V1M2 Secs. 5.5.8; 5.5.10; 5.6.3.1. V1M4 Sec. 1.7.1.1; (2009 1.7.2) (2016 1.7.1.2)	5.5.8; 5.5.9; 5.5.10; 5.6.1; 5.6.2; 5.6.3.1	6.4.2; 6.4.3; 6.4.6 to 6.4.8; 6.4.11; 6.4.13; 6.4.14; 6.5.1; 6.5.2
20.5	Tentatively Identified Compounds (TICs) – GC/MS Analysis			
20.6	GC/MS Tuning			
21.0	MEASUREMENT OF TRACEABILITY			
21.1	Overview	V1M2 Sec. 5.6.3.1	5.6.2.1.2; 5.6.2.2.2; 5.6.3.1	6.4.14; 6.5.1; 6.5.2; 6.5.3
21.2	NIST-Traceable Weights and Thermometers	V1M2 Secs. 5.5.13.1; 5.6.3.1; 5.6.3.2	5.6.3.1; 5.6.3.2	6.4.14
21.3	Reference Standards / Materials	V1M2 Secs. 5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.6.4.1; 5.6.4.2; 5.9.1; 5.9.3	5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.9.1	6.4.14
21.4	Documentation and Labeling of Standards, Reagents, and Reference Materials	V1M2 Secs. 5.6.4.2; 5.9.3		
22.0	SAMPLING			
22.1	Overview	V1M2 Secs. 5.7.1; 5.7.3	5.7.1; 5.7.3	7.3.1; 7.3.2; 7.3.3
22.2	Sampling Containers			
22.3	Definition of Holding Time			
22.4	Sampling Containers, Preservation Requirements, Holding Times			
22.5	Sample Aliquots / Subsampling	V1M2 Sec. 5.7.1	5.7.1	7.3.1; 7.3.2
23.0	HANDLING OF SAMPLES	V1M2 Sec. 5.8.1	5.8.1	7.4.1
23.1	Chain of Custody (CoC)	V1M2 Secs. 5.7.2; 5.7.4; 5.8.4; 5.8.7.5; 5.8.8; 5.9.1	5.7.2; 5.8.4; 5.9.1	7.1.1.6; 7.4.1
23.2	Sample Receipt	V1M2 Secs. 5.8.1; 5.8.2; 5.8.3; 5.8.5; 5.8.7.3; 5.8.7.4; 5.8.7.5	5.8.2; 5.8.3	7.4.3
23.3	Sample Acceptance Policy	V1M2 Secs. 5.8.6; 5.8.7.2		
23.4	Sample Storage	V1M2 Secs. 5.7.4; 5.8.4	5.8.4	7.4.1; 7.4.4
23.5	Hazardous Samples and Foreign Soilds			
23.6	Sample Shipping	V1M2 Sec. 5.8.2	5.8.2	7.4.2
23.7	Sample Disposal			
24.0	ASSURING THE QUALITY OF TEST RESULTS			
24.1	Overview	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	7.7.2 to 7.7.3
24.2	Controls	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	7.7.1; 7.7.3

Sec. No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
24.3	Negative Controls	V1M2 Secs. 5.9.2; 5.9.3 V1M4 Secs. (2019 1.7.3; 1.7.3.1; 1.7.4.1) (2016 1.7.2, 1.7.2.1, 1.7.3.1)	5.9.2	7.7.1; 7.7.3
24.4	Positive Controls	V1M2 Secs 5.9.2; 5.9.3. V1M4 Secs.(2009 1.7.3; 1.7.3.2; 1.7.3.2.1; 1.7.3.2.2; 1.7.3.2.3) (2016 1.7.2, 1.7.2.2, 1.7.3.2)	5.9.2	7.7.1; 7.7.3
24.5	Sample Matrix Controls	V1M2 Secs. 5.9.2; 5.9.3. V1M4 Secs. (2009 1.7.3 ; 1.7.3.3; 1.7.3.3.1; 1.7.3.3.2; 1.7.3.3.3) (2016 1.7.2, 1.7.2.3, 1.7.3.3)	5.9.2	7.7.1; 7.7.3
24.6	Acceptance Criteria (Control Limits)	V1M2 Sec. 5.9.3. V1M4 Secs. 1.7.4.2; 1.7.4.3		7.7.1; 7.7.3
24.7	Additional Procedures to Assure Quality Control	V1M2 Sec. 5.9.3. V1M4 Sec. (2009 1.7.3.4), (2016 1.7.2.4)		7.7.1; 7.7.3
25.0	REPORTING RESULTS			
25.1	Overview	V1M2 Secs. 5.10.1; 5.10.2; 5.10.8	5.10.1; 5.10.2; 5.10.8	7.8.1 to 7.8.2
25.2	Test Reports	V1M2 Secs. 5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8; 5.10.10; 5.10.11	5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8	7.8.2.1; 7.8.2.2; 7.8.3; 7.8.5
25.3	Reporting Level or Report Type	V1M2 Secs. 5.10.1; 5.10.7; 5.10.8	5.10.1; 5.10.7; 5.10.8	
25.4	Electronic Data Deliverables (EDDs)			
25.5	Supplemental Information for Test	V1M2 Secs. 5.10.1; 5.10.3.1; 5.10.5	5.10.1; 5.10.3.1; 5.10.5	7.1.1.3; 7.8.6.1; 7.8.6.2; 7.8.7.1 to 7.8.7.3
25.6	Environmental Testing Obtained from Subcontractors	V1M2 Secs. 4.5.5; 5.10.1; 5.10.6	5.10.1; 5.10.6	
25.7	Client Confidentiality	V1M2 Secs. 4.1.5; 5.10.7	4.1.5; 5.10.7	4.2.1 to 4.2.4
25.8	Format of Reports	V1M2 Sec. 5.10.8	5.10.8	
25.9	Amendments to Reports	V1M2 Sec. 5.10.9	5.10.1; 5.10.9	7.8.8.1 to 7.8.8.3
25.10	Policies on Client Requests for Amendments	V1M2 Secs. 5.9.1; 5.10.9	5.9.1; 5.10.1; 5.10.5; 5.10.9	

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Table No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	ISO/IEC 17025:2017(E) Reference
14-1	General Corrective Action Procedures	V1M2 Sec. 4.11.6. V1M4 Sec. (2009 1.7.4.1) (2016 1.7.1.2, 1.7.2.1, 1.7.2.3, 1.7.3.1)	4.11.2	
16-1	Record Index		4.13.1.1	
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24-1	Negative Controls			
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Figure No.	Title	2009 and 2016 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	ISO/IEC 17025:2017(E) Reference
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19-1	Work Flow			
23-2	Sample Acceptance Policy	V1M2 Sec. 5.8.6; 5.8.7.1 V1M4 Sec. (2009 1.7.5) (2016 1.7.4)		

Appendix 5. Terms/Glossary and Acronyms (EL-V1M2 Sec. 3.1)

Terms/Glossary:

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

Anomaly: A condition or event, other than a deficiency, that may affect the quality of the data, whether in the laboratory's control or not.

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation). (TNI)

Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI)

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples. (TNI)

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). (TNI)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Calibration: A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).

2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Curve: The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

Calibration Standard: A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM): A reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI)

Chain of Custody (COC) Form: Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses. (TNI)

Compromised Samples: Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified.

Confidential Business Information (CBI): Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. TNI and its representatives agree to safeguard identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to Second Column Confirmation; Alternate wavelength; Derivatization; Mass spectral interpretation; Alternative detectors or Additional Cleanup procedures. (TNI)

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Correction: Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis**.** No significant action is taken to change behavior, process or procedure.

Corrective Action: The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Integrity: The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements. (TNI)

Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria).

Data Reduction: The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collation into a more useable form. (TNI)

Deficiency: An unauthorized deviation from acceptable procedures or practices, or a defect in an item (ASQC), whether in the laboratory's control or not.

Demonstration of Capability: A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Equipment Blank: Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

External Standard Calibration: Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Field Blank: Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Holding Times: The maximum time that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (TNI)

Internal Standard Calibration: Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Instrument Detection Limit (IDL): The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is ± 100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Least Squares Regression (1st Order Curve): The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit(s) of Detection (LOD) [a.k.a., Method Detection Limit (MDL)]: The MDL is the minimum measured quantity of a substance that can be reported with 99% confidence that the concentration is distinguishable from method blank results, consistent with 40CFR Part 136 Appendix B, August, 2017.

Limit(s) of Quantitation (LOQ) [a.k.a., Reporting Limit]: The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.

(QS) Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts.

Drinking Water: Any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-Aqueous Liquid: Any organic liquid with <15% settleable solids.

Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

Air & Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (TNI)

Matrix Spike (spiked sample or fortified sample): A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A replicate matrix spike prepared and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit: See Limit of Detection (LOD)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

Non-conformance: An indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Observation: A record of phenomena that (1) may assist in evaluation of the sample data; (2) may be of importance to the project manager and/or the client, and yet not at the time of the observation have any known effect on quality.

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI)

Preservation: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within specified acceptance criteria. (TNI)

Quality Assurance: An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item or service is of the type of quality needed and expected by the client. (TNI)

Quality Assurance [Project] Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against “out of control” conditions and ensuring that the results are of acceptable quality. (TNI)

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control. (TNI)

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (TNI)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC activities. (TNI)

Raw Data: The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

Record Retention: The systematic collection, indexing and storing of documented information under secure conditions.

Reference Material: Material or substance one or more properties of which are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

Reference Standard: Standard used for the calibration of working measurement standards in a given organization or a given location. (TNI)

Sampling: Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.

Second Order Polynomial Curve (Quadratic): The 2^{nd} order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2^{nd} order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity: The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system. (TNI)

Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

Spike: A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)

Standard Operating Procedures (SOPs): A written document which details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks. (TNI)

Storage Blank: A blank matrix stored with field samples of a similar matrix (volatiles only) that measures storage contribution to any source of contamination.

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit): A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Technical Manager: A member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations for the appropriate fields of accreditation and reporting of results

Technology: A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.

Traceability: The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

Trip Blank: A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

Uncertainty: A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

CAR – Corrective Action Report

CCV – Continuing Calibration Verification

CF – Calibration Factor

CFR – Code of Federal Regulations

COC – Chain of Custody

DOC – Demonstration of Capability

DQO – Data Quality Objectives

DUP - Duplicate

EHS – Environment, Health and Safety

EPA – Environmental Protection Agency

GC - Gas Chromatography

GC/MS - Gas Chromatography/Mass Spectrometry

HPLC - High Performance Liquid Chromatography

ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy

ICP/MS – ICP/Mass Spectrometry

ICV – Initial Calibration Verification

IDL – Instrument Detection Limit

IH – Industrial Hygiene

IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
LOD – Limit of Detection
LOQ – Limit of Quantitation
MDL – Method Detection Limit
MDLCK – MDL Check Standard
MDLV – MDL Verification Check Standard
MRL – Method Reporting Limit Check Standard
MS – Matrix Spike
MSD – Matrix Spike Duplicate
SDS - Safety Data Sheet
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
TNI – The NELAC Institute
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP – Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 6. Analytical Method References

Reference methods include:

- *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; 40CFR Part 136 as amended by Method Update Rule; August 28, 2017.*
- *Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.*
- *Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.*
- *Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991. Supplement I: EPA-600/R-94/111, May 1994.*
- *Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992. Supplement III EPA/600/R-95/131 - August 1995 (EPA 500 Series) (EPA 500 Series methods)*
- *Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th/ on-line edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008; Final Update V, August 2015.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005)*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*

Appendix F

Field Sampling Plan (Prepared by Tetra Tech)

FIELD SAMPLING PLAN
RINGWOOD MINES LANDFILL/SUPERFUND SITE
OPERABLE UNIT TWO

Site Background

The Site consists of approximately 500 acres in a historic iron mining district that includes forested areas, areas of overgrown vegetation, abandoned iron mine pits and shafts, and a closed municipal landfill. Portions of the Site are currently used as State of New Jersey parklands (Ringwood State Park), utility corridors for the Public Service Electric & Gas and the Rockland Electric Company, Borough of Ringwood facilities, including a Recycling Center and a Public Works yard and open space. In addition, 48 residential properties are dispersed throughout the Site. The following is summarized from the Remedial Investigation Reports prepared by Arcadis.

The land which comprises the Site has been utilized for the mining of iron ore almost continuously from the mid-1700s to the early 1900s. There are a number of former mine workings at the Site, which include former open pits that are now filled, closed shafts and tunnels, and prospect diggings. The former mining operations resulted in the disposal of mine tailings and mine waste rock in the Cannon Mine Pit (CMP) and Peters Mine Pit (PMP) areas. Part of the former O'Connor Disposal Area (OCDA) was used as a "slime" tailings disposal area prior to being used for the placement of waste materials.

This FSP specifically address proposed remediation activities within the PMP area. The PMP Area is located in the north central portion of the Site. This area encompasses approximately three acres and is located such that the majority of the area is within Ringwood State Park and the balance is located on Borough of Ringwood property. An approximately one-half acre pond, an expression of the groundwater table, is located within the approximate center of the PMP Area where a former soil cap has subsided thus enabling the pond to form. The PMP Area is otherwise forested and overgrown with vegetation.

Groundwater at the Site occurs in the overburden and bedrock, more specifically, overburden/shallow bedrock (upper aquifer) and the deep bedrock (lower aquifer). The upper aquifer exists on the order of tens to hundreds of feet below the site and the lower aquifer exists on the order of hundreds to perhaps thousands of feet below the site. The transition from the upper to lower aquifer is gradual and the connectivity between the two is limited due to poor vertical permeability.

The direction of groundwater flow in the lower and upper aquifers of the PMP is generally to the southeast. Groundwater in the upper aquifer discharges to streams creating baseflow in the perennial streams. Surface water within the streams ultimately discharges into the Wanaque Reservoir, located approximately one mile from the confluence of Park Brook, North Brook, Mine Brook and the Ringwood River.

The remedy for the PMP Area as defined by USEPA in the Record of Decision is briefly summarized as follows:

- Excavation of soil and fill to the water table, unless drums and paint waste are found to extend below the water table and can be removed, in which case, excavation will also include such materials;
- Segregation of excavated materials for re-use or off-site disposal based on the nature of the materials and the results of laboratory analyses, as applicable;

- Placement of compacted fill to achieve grades above the water table and provide overall grading of the area as necessary for Engineering Cap construction;
- Installation of an Engineered Geotextile/Soil Cap as an Engineering Control and restoration with indigenous vegetation consistent with Ringwood State Park; and
- Institutional Controls and long-term monitoring, maintenance, and reporting.

Sampling Plans

Individual sampling plans have been prepared for Stockpile and Drum Sampling (Attachment A) and Monitoring Well and Effluent Sampling (Attachment B). Reference is also made to the Quality Assurance Project Plan, provided as Appendix E to the RAWP, and the Standard Operating Procedures (SOPs) therein.

ATTACHMENT A

INDIVIDUAL SAMPLING PLAN

STOCKPILE AND DRUM SAMPLING

Sampling Background

The remedial action specifies in-situ soils from the Peters Mine Pit (PMP) Area may be reused after excavation if they are determined to be non-hazardous per RCRA standards. In addition, drums and/or paint waste, if encountered, will also be removed from the excavations and characterized for disposal.

Sampling Objectives

The purpose of the stockpile sampling is to determine if excavated material from the PMP Area can be re-used on-site as fill or if off-site disposal will be required. Drums and/or paint waste, if encountered, will be removed from the excavation, segregated, and characterized for appropriate off-site disposal.

Sample Frequency

To determine potential for reuse, soil samples will be collected from stockpiled material from the PMP Area excavation work. One sample per every 680 cubic yards is required based on the NJDEP Fill Material Guidance for SRP Sites in the Recommended Sampling Frequency Guide for Alternative Fill guidelines. To meet this requirement excavated material will be stockpiled in approximate 500 cubic yard lots. This increased sample frequency will provide adequate samples for characterization.

A composite sample will be collected from each 500 cubic yard lot as noted above. As material is placed into the stockpile from the excavation, 1 representative sample aliquot, biased towards potential areas of contamination (olfactory or observed staining), will be collected for every 100 cubic yards of material. The 5 sample aliquots will then be combined into the composite sample for that stockpile. A survey stake or other means of identification will be used to identify each stockpile.

Recovered drums will have 1 grab sample per drum collected. Drums will be labeled with a corresponding drum identification number, i.e., the first drum removed will be “1”, the second drum removed will be “2”, and so on.

Sample Designation

The following sample identification will be used to name the stockpile and drum samples: SP-Y-2021XXXX and Drum-Y-2021XXXX, respectively. The “Y” represents the sequential stockpile or drum number assigned as described above, and the “XXXX” represent the month and day of sampling (*e.g.*, 20210315 represents March 15, 2021).

Sampling Equipment

The stockpile sample material will be placed into a pre-cleaned stainless steel bowl or similar via a clean stainless steel scoop or trowel. Once all 5 sample aliquots have been collected, the materials will be mixed together to form the composite sample for that stockpile. The composite sample will then be placed into laboratory supplied bottles.

The stainless steel bowl and scoop/trowel shall be decontaminated between each stockpile sample collection. The bowl and trowel will be rinsed with potable water with all remnants of the soil sample

removed either by the potable water or wiping the material away. Once, cleaned the bowl and trowel will be rinsed with deionized water and dried with a clean towel/rag or similar. All rinse water will be collected and added into the stockpile which will either be re-used as backfill or disposed of after testing.

All drums must be removed from the excavation and staged on secondary containment prior to opening. Upon removal of a drum from the excavation, the drum will be inspected for corrosion, leaks, deterioration, bulging, or symbols and labels that may help identify the drum condition and contents prior to opening. If the drum appears to be in extremely poor condition, an over pack drum may need to be utilized to prevent a release. Refer to the Drum Handling and Removal Plan (Appendix G of the Remedial Action Work Plan [RAWP]).

Due to the unknown material within historically buried drums, extra caution must be taken when opening a drum. Proper personal protective equipment (PPE), such as gloves, face masks and monitoring devices to identify potentially harmful fumes, must be used when opening drums; refer to the Site-Specific Health and Safety Plan (HASP; Appendix B of the RAWP). Drums can be opened with the following methods: Manual opening with non-sparking bung wrenches, drum deheading, or remote drum puncturing or bung removal. Open drums in well ventilated and designated areas only. Place drums with similar contents in their own respective groups. Once the contents have been verified to be safe to handle, collect a sample into laboratory supplied bottle ware for analysis using the appropriate PPE. Drums shall remain in secondary containment, isolated from the rest of the work area, while analysis is pending.

Clean nitrile gloves must be worn during sample collection and placement of the sampled material into the laboratory bottles.

Sample Documentation

Field notes will be taken to record collected samples which includes the sample name identification, time the sample was collected, the individual who collected the sample, and any other details of importance related to the sampling event. Photographs may be utilized to log significant differences in soil quality and characteristics if observed.

Sample Handling and Analysis

Bottles will be labeled with their corresponding identification and other required label information, stored in the laboratory provided cooler, and sent to the laboratory or picked up by a laboratory courier. All samples will be transferred for laboratory analysis under chain of custody.

All samples will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, ignitability, corrosivity, and reactivity. A 3 to 4-day turnaround time for laboratory analysis will be requested. This will allow materials to be quickly characterized, allowing the contractor to reuse the material on-site or send off-site for proper disposal in a timely manner.

ATTACHMENT B

INDIVIDUAL SAMPLING PLAN

MONITORING WELL AND EFFLUENT SAMPLING

Sampling Background

In order to properly remove drums, paint waste or other identified potential sources of contamination, if encountered within the excavation below the groundwater table, groundwater extraction and treatment may be required. Groundwater, if removed, will be processed through an on-site treatment system and discharged to infiltration pits. In the event these discharge pits are located outside the excavation area water quality will be monitored in the effluent discharge water. Additionally, groundwater elevations and groundwater quality will also be monitored. The monitoring and sampling will be conducted as required by the applicable discharge permits.

Sampling Objectives

Groundwater extraction from the remedial excavations may be required for the removal of drums and/or paint wastes below the groundwater table. The extracted groundwater will be treated and discharged to infiltration pits within the remediation area (as possible). Monitoring of the effluent water quality will occur if these pits are located outside the excavation area to ensure compliance with project permits. If an exceedance of the permit requirements is noted, groundwater samples will be collected from monitoring wells OB-30A and OB-30B using low-flow methods.

As required by the discharge permits, if the water is discharged to infiltration pits or a stormwater basin outside of the excavation area, then effluent water quality monitoring will be required to ensure compliance with the permit requirements. Additionally, hydraulic monitoring will be performed at wells OB-30A and OB-21. In the event effluent water quality standards are exceeded and/or a rise in water level greater than 0.25 feet in OB-30A is realized, then groundwater samples will be collected from OB-30A and OB-30B using low flow methods.

Sample Location and Frequency

Water quality data will be collected from the effluent discharge every 10 days of treatment system operation when discharging outside the excavation area. The samples will be collected directly into lab-supplied jars from sample ports on the water treatment system.

If required due to exceedances of water quality in the effluent discharge, as defined in the permit, groundwater samples will be collected from OB-30A and OB-30B using low flow methods on a monthly basis until exceedances in the wells are no longer detected above background or natural conditions.

In addition to effluent monitoring described above, if discharge is to occur outside of the excavation area, transducers will be deployed in wells OB-21 (upgradient well) and OB-30A (downgradient well) prior to commencing discharges to monitor groundwater elevations, as required by the discharge permits. Starting 60 days after the beginning of the discharge, data from the transducers will be reviewed every two weeks to determine if a rise in groundwater elevations have occurred. A groundwater sample shall be collected from OB-30A and OB-30B for laboratory analysis if an increase in groundwater elevation linked to the basin discharge is greater than 0.25 ft in well OB-30A. Monitoring will continue for 6 months after discharge has ceased.

Sample Designation

The following sample identification will be used to name the samples: the effluent sample will be identified as EFF-2021XXXX, while the monitoring well samples will be identified as OB-30A-

2021XXXX and OB-30B-2021XXXX. "XXXX" represent the month and day of sampling (20210315 represents March 15, 2021.

Sampling Equipment

Effluent Sampling

1. Collect groundwater sample in appropriately prepared laboratory containers (containing appropriate preservatives, if required) directly from treatment plant effluent sample port.

2. Record effluent sampling data on the field data sheets.

3. Label each sample container with the appropriate sample identification data and place in coolers for transport to the analytical laboratory.

4. Initiate standard chain-of-custody procedures.

Monitoring Well Sampling

Equipment includes the following:

- Water level meter (Solinst 101 or equivalent)
- Field water quality instrument (U-52 Certified Horiba or equivalent)
- Bladder pump
- Control unit and Nitrogen tank
- Dual ¼'' bonded sample tubing
- Graduated bucket

Before collecting a representative groundwater sample, monitoring wells will be purged in accordance with the Low Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504), April 1996. Groundwater wells will be purged at a rate of 100 to 500 ml per minute until three consecutive indicator readings are within the following ranges of each other:

± 0.1 for pH

± 3% for conductivity and temperature

± 10 mv for redox potential (ORP)

± 10% for DO and turbidity

Pumping rates will be adjusted depending upon the recovery rate of each well. If the parameters have not stabilized within 4 hours the attempt to reach stabilization will be noted and the sample will be collected. If the well will not sustain the minimum pumping rate, stop pumping when the water level reaches the top of the screen, or the well is evacuated if the static water level is within the screened interval; allow the well to recover until sufficient volume is available, and collect the sample as described below.

1. Immediately after the field parameters reach stabilization, or within two (2) hours of monitoring well purging, if the well has recharged enough to sample, samples will be collected into appropriate containers using the pump and dedicated tubing used to purge the monitoring well.

2. Collect groundwater sample in appropriately prepared laboratory containers (containing appropriate preservatives, if required) directly from pump discharge tube.

3. Record well sampling data on the field data sheets.

4. Close and lock protective casing.

5. Label each sample container with the appropriate sample identification data and place in coolers for transport to the analytical laboratory.

6. Initiate standard chain-of-custody procedures.

Sample Documentation

Field notes will be taken to record collected samples which includes the sample name identification, time the sample was collected, the individual who collected the sample, and any other details of importance related to the sampling event. Photographs may be taken.

Sample Handling and Analysis

Bottles will be labeled with their corresponding identification and other required label information, stored in the laboratory provided cooler on ice, and sent to the laboratory or picked up by a laboratory courier. All samples will be transferred for laboratory analysis under chain of custody.

All samples will be analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), 1,4-Dioxane, Lead, and Arsenic as defined by the project permits. A standard turnaround time for laboratory analysis will be requested.

Appendix G

Paint Waste, Drum, and Drum Carcass excavation and Removal Plan

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Paint Waste, Drum, and Drum Carcass Excavation and Removal Plan

Ringwood Mines/Landfill Superfund Site

Ringwood, Passaic County, NJ

Prepared for:

FORD MOTOR COMPANY

December 2020

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Acronyms/Abbreviations	Definition
AC	Area of Concern
Borough	Borough of Ringwood
HASP	Health and Safety Plan
JSAP	Job Safety Analysis Program
OU2	Operable Unit Two
Paint/Drum Plan	Paint Waste, Drum, and Drum Carcass Excavation and Removal Plan
PPE	Personal Protective Equipment
RA	Remedial Action
RAWP	Remedial Action Work Plan
RECON	Remedial Construction Services, L.P.
Site	Ringwood Mines/Landfill Superfund Site

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1.0 Introduction

Remedial Construction Services, L.P. (RECON) has prepared this Paint Waste, Drum and Drum Carcass Excavation and Removal Plan (Paint/Drum Plan) for the Ringwood Mines/Landfill Superfund Site (Site) Operable Unit Two (OU2) Remedial Action (RA) construction at the three OU2 land Areas of Concern (ACs), specifically, the Cannon Mine Pit Area, Peters Mine Pit Area, and O'Connor Disposal Area located in the Borough of Ringwood (Borough), Passaic County, New Jersey. Background information on each of the three land ACs is presented in the OU2 Remedial Action Work Plan (RAWP; December 2020) to which this Paint/Drum Plan is appended. The location of the Site and each of the three land ACs is shown in **Figure 1**.

The following sections describe the approach for handling and removal of any paint waste, drums, or drum remnants and/or carcasses if encountered during excavation and fill/waste consolidation activities. All work outlined in this Paint/Drum Plan will be implemented in accordance with applicable provisions of the Site-Specific Health and Safety Plan (HASP) provided as Appendix B of the OU2 RAWP dated December 2020.

2.0 RECON PROJECT TEAM RESPONSIBILITIES

RECON has assigned an experienced and knowledgeable team to manage and perform this RA project. RECON's project organization is designed to ensure that the key personnel on the RECON project management team have the required resources to be successful. The focal leadership point for the project will be RECON's Project Manager, Larry Endicott. Mr. Endicott will be supported by RECON's on-site project management team (Project Team) which will consist of the below; and will coordinate and communicate with the Construction Manager and Owner's Representative.

Construction Manager	Douglas Jumper
Superintendent	Scott Sutton
Superintendent	Carl Walker
Site Safety Officer	Rodney Cockerel
Quality Control Manager/Project Engineer	Brad Houston

RECON's Project Team will be responsible for:

- Communicating the Paint/Drum Plan to all project personnel and subcontractors.
- Conducting daily safety and informational meetings with onsite personnel in accordance with the HASP (Appendix B of the RAWP), including status of paint waste and/or drums, if any, encountered within the ACs.
- Communicating with the client representatives and the Borough if paint waste and/or drums are encountered.
- Maintenance of this Paint/Drum Plan and management of any changes.
- Investigating any paint waste and/or drums if they are encountered.

- Reporting of near miss incidents pursuant to Section 3.7 of the project HASP included in Appendix B of the OU2 RAWP to the Site Safety Officer and the on-site Client Representative.

3.0 General Approach and Assumptions

The Final Remedial Design Report (October 2017) indicates that there exists the potential to encounter paint waste and what is anticipated to be a limited number of drums, drum remnants and/or drum carcasses during the performance of the RA construction activities to be performed at the three land ACs. Paint waste and any drums and/or drum remnants and carcasses will be managed in accordance with Technical Specification 02 86 00 (Paint Waste and Drum Handling). Based on previous investigations at the Site, paint waste historically encountered and subsequently excavated and disposed of offsite was described as a solid mass that resembles asphalt and often exhibits a weathered gray color, although the color can be variable.

The general approach for handling paint waste and/or drums and drum remnants/carcasses that may be encountered will be to stop work in the immediate area, notify RECON's Site Manager (Doug Jumper) who will in turn notify the *de maximis, inc.* Construction Manager (Tom Perkins), and relocate excavation operations to a different part of the land AC being excavated. A separate paint waste/drum handling crew will be used to first verify ambient air immediately surrounding the drum/paint waste using the multi-gas handheld meter to confirm the ambient oxygen and any volatile organic compound concentrations are within acceptable levels for Modified Level D personnel protective equipment (PPE) and there is not a potentially explosive or hazardous condition. If hazardous conditions are observed, work will be suspended in that area until a plan is developed to address the hazards appropriately. In accordance with Section 8.2 of the Site-Specific HASP (RAWP; Appendix B), in the event of any adverse air quality reading, the appropriate PPE adjustments will be made before proceeding beyond the initial air quality evaluation. However, if a PPE upgrade is needed to address the hazard encountered, RECON will cordon off the area and temporarily suspend work in that area until the hazards are evaluated, and a safety plan is developed.

On a parallel track with the initial air quality evaluation, paint waste and drum staging areas will be prepared. The staging areas will be lined with polyethylene sheeting and surrounded by a soil berm as shown on Sheet D-3 of the Design Drawings.

Once air quality conditions have been verified and any PPE adjustments made, the paint waste/drum crew will use a small excavator to carefully expose the paint waste and/or drum(s) by excavating material adjacent to the paint waste or drums. Paint waste encountered in the subsurface, comingled with soil or encountered with a drum or drum remnants/carcasses, will be segregated from the surrounding soil and relocated to a designated staging area pending sampling, analysis, and subsequent off-site disposal. Photographs will be taken to document the size, physical condition, and appearance of the paint waste.

If a drum(s) is encountered, a drum identification and inventory will be performed, and photographs will be taken prior to removal. Excavation will proceed to unearth the drum or drum remnant/carcass with precaution taken to avoid digging directly into the drum(s) to avoid potentially damaging it. The soil around each drum will be hand-excavated with non-sparking tools to further expose the drum. Once a

buried, or partially buried, drum is exposed, it will be inspected visually to determine the condition and, to the extent possible, the contents, prior to handling. The inspection will include evaluation for any signs of bulging, corrosion, rust, punctures, crystallization, or leaking contents, including for the presence of any paint waste. During previous work at the Site, paint waste was typically observed as a solid mass that resembles asphalt and often exhibits a weathered gray color, although the color can be variable. The drum will also be inspected for any visible markings or labels to aid in the identification of the contents, if any. Photographs will again be taken of any drum, drum carcass, and/or drum remnant after removal and placement in the drum staging area.

If the drum(s) are found to be empty carcasses or remnants, they will be removed with the excavator and relocated to the temporary drum staging area. If intact drums that are suspected of being partially or completely full are encountered, RECON will immediately notify the Construction Manager prior to performing any further drum-related work. RECON will then establish a separate exclusion zone in the area immediately around the drum(s). A task-specific Job Safety Analysis Plan (JSAP) will be devised in accordance with the Site-Specific HASP to further investigate the container condition prior to removal. The task-specific JSAP will identify hazards associated with the conditions encountered, evaluate and prioritize risk for each hazard, identify potential exposures, identify mitigation controls, verify risks are reduced to an acceptable level, and document risk assessment results prior to starting that task. RECON will maintain 85-gallon steel drum overpacks on the Site for potential repackaging of drums determined to be intact.

Any equipment utilized for the removal of drums and/or paint waste will be properly decontaminated in accordance with Attachment I of the Site-Specific HASP using dry material removal and pressure washing techniques with the collection of decontamination water within a decontamination pad.

4.0 Paint Waste and Drum/Drum Carcass Disposal

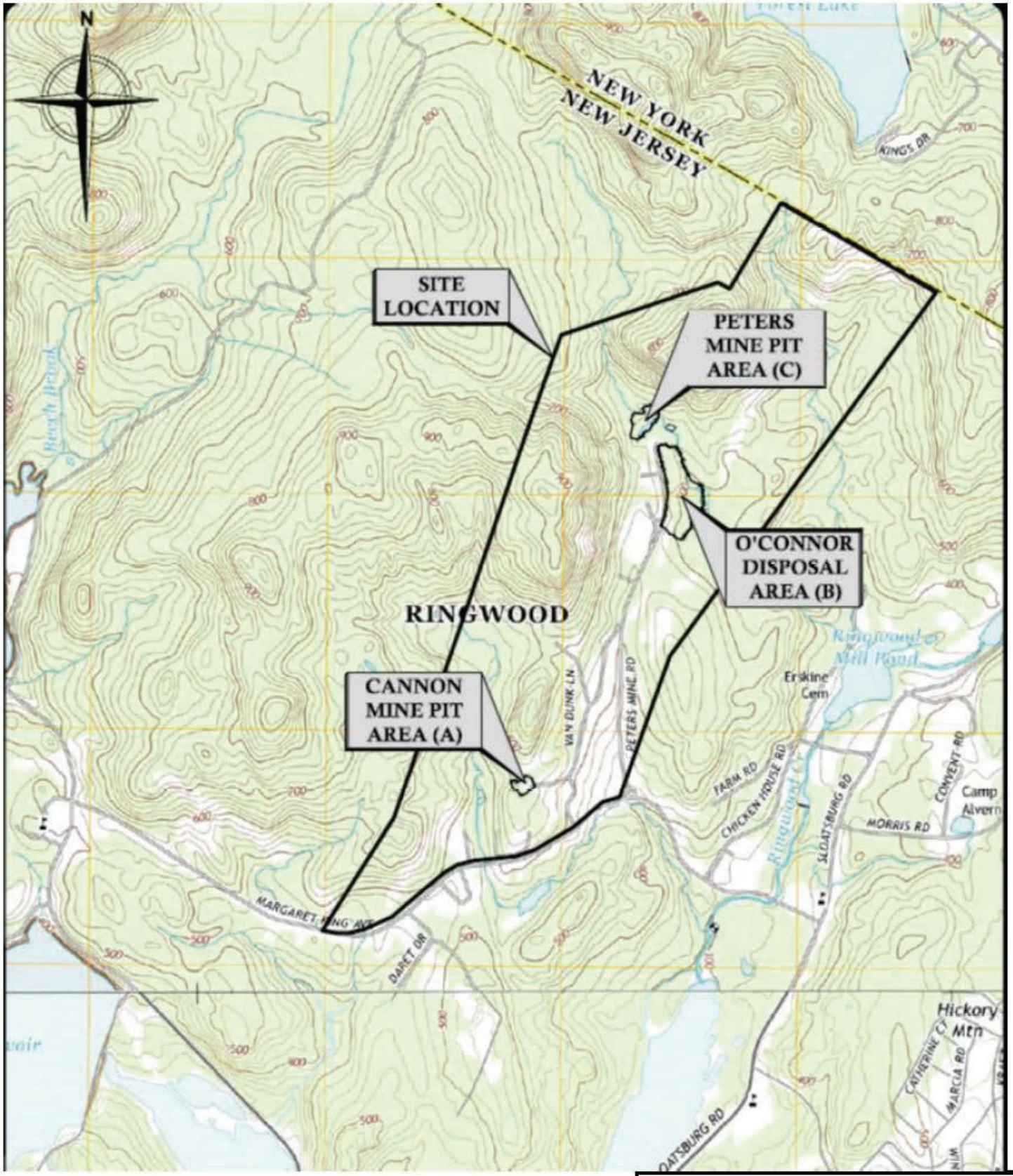
RECON will coordinate the sampling, analysis, waste profiling, and subsequent disposal of any paint waste, drums, drum carcasses and/or drum remnants with the Construction Manager. All activities will be in accordance with Technical Specification Section 02 60 00 (Removal and Disposal of Contaminated Materials). In accordance with the RAWP, paint waste, removed drums, and drum content will be disposed off-site.

Paint waste and paint waste comingled with soil will be segregated for sampling, analysis and disposal. If any excavated drum is full or partially full, the drum contents will be sampled for waste characterization using the procedures outlined in the Field Sampling Plan (Appendix F of the RAWP). Upon receipt of the laboratory analytical results, the waste profiles for all waste streams addressed in this Paint/Drum Plan will be completed.

Based on previous paint waste and drum removal activities conducted at the Site, paint waste and/or drum contents may exhibit one or more hazardous characteristics. In this event, the waste will be managed as hazardous material in accordance with applicable regulations. If hazardous or special wastes are identified during the waste characterization process, RECON will coordinate the waste profiling with the Construction Manager.

Drum remnants and empty drum carcasses as well as any drums determined to contain non-hazardous material will be staged in a separate stockpile area pending off-site disposal as non-hazardous waste at an approved facility. Any drum(s) containing accumulated, non-hazardous water will be overpacked in approved United States Department of Transportation shippable containers and disposed of off-site in accordance with Technical Specification Section 02 60 00 (Removal and Disposal of Contaminated Materials).

Upon acceptance at the disposal facility, all excavated paint waste (with or without comingled soil), drums containing hazardous or non-hazardous solids or semi-solid materials, drums containing hazardous or non-hazardous liquids, and any drum carcasses or remnants will be transported off-site to an approved disposal facility as described in Section 7.0 of the Transportation and Disposal Plan dated December 2020 which is provided as Appendix H of the OU2 RAWP.



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RINGWOOD MINE / LANDFILL SITE
REMEDIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LOCATION MAP

Figure: 1-1	Date: 11/18/20

Appendix H

TRANSPORTATION & DISPOSAL PLAN

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Transportation & Disposal Plan

Ringwood Mines/Landfill Superfund Site

Ringwood, Passaic County, NJ

Prepared for:

FORD MOTOR COMPANY

December 2020

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1.0 INTRODUCTION

This Transportation and Disposal Plan (T&D Plan) has been prepared by Remedial Construction Services, L.P. (RECON) on behalf of Ford Motor Company and the Borough of Ringwood (Client) for Operable Unit 2 (OU2) of the Ringwood Mines/Landfill Superfund Site (Site). OU2 for the Site covers the land areas of concern (ACs) known as the Peters Mine Pit (PMP) Area, the O'Connor Disposal Area (OCDA), and the Cannon Mine Pit (CMP) Area shown in Figure 1. Background information on each of the three land ACs is presented in the Remedial Action Work Plan (RAWP; December 2020) to which this T&D Plan is appended.

The purpose of this T&D Plan is to provide the scope, means and methods for management of excavated materials, including soil, fill, and waste designated for off-site disposal, and clean fill materials imported to the Site for use in the implementation of the OU-2 RA. This T&D Plan also outlines the procedures to be adhered to in order to ensure traffic and worker safety within the project area, and the safety and well-being of the Upper Ringwood and Borough of Ringwood (Borough) communities. This T&D Plan identifies the potential waste streams that may be generated during RA implementation as well as the proposed disposal facilities, trucking companies, and truck routes.

This T&D Plan will comply with applicable provisions of Chapter 7.0 (Traffic) of the Borough Municipal Code, and changes will be subject to approval by the Borough and the Ringwood Police Department.

2.0 RESPONSIBILITIES

RECON has assigned an experienced and knowledgeable team to manage and perform this RA project. RECON's project organization is designed to ensure that the key personnel on the RECON project management team have the required resources to be successful. The focal leadership point for the project will be RECON's Project Manager, Larry Endicott. Mr. Endicott will be supported by RECON's on-site project management team (Project Team) which will consist of:

Construction Manager	Douglas Jumper
Superintendent	Scott Sutton
Superintendent	Carl Walker
Site Safety Officer	Rodney Cockerel
Quality Control Manager/Project Engineer	Brad Houston

RECON's Project Team will be responsible for:

- Communicating the T&D Plan and designated transportation routes to all project personnel, subcontractors, and vendors.
- Conducting daily safety and informational meetings with onsite personnel in accordance with the Site-Specific Health and Safety Plan (HASP; Appendix B of the RAWP), including traffic safety measures/controls, and evaluating and addressing project area hazards related to vehicular, truck and heavy equipment traffic.
- Establishing Site traffic control measures.

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- Communicating with the client representatives and the Borough regarding implementation of traffic control measures and discussing any modifications, if/as necessary, including changes in school bus schedules in Upper Ringwood.
- Maintenance of this T&D Plan and management of any changes.
- Investigating any on-site or project area-related traffic incidents.
- Reporting of near miss incidents pursuant to Section 3.7 of the project HASP included in Appendix B of the OU-2 RAWP to the Site Safety Officer and the on-site Client Representative.

3.0 TRAFFIC ROUTES

Traffic routes to each work area are shown on attached **Figures 2-1 and 2-2**. Site-related vehicular traffic, including trucks and heavy equipment transporters, will use Peters Mine Road to access the work areas for the PMP Area and the OCDA. The CMP Area will be accessed from Horseshoe Bend Road. The location of construction entrances and exits, and the proposed site layout for each of the three land ACs are depicted on attached **Figures 2-3 (CMP Area) and 2-4 (OCDA and PMP)**.

All vehicles entering and exiting the Upper Ringwood roadways will adhere to a 15 miles per hour (mph) speed limit, and flag persons and the appropriate traffic control devices and/or signage will be utilized along the traffic routes. The use of flag persons, traffic control devices and signage will be in accordance with Section 4.0 of this T&D Plan and will be subject to change based on input from the Borough and the Ringwood Police Department.

The transportation routes beyond the Site to the off-site disposal facilities are discussed in Section 9.0 of this T&D Plan.

4.0 TRAFFIC CONTROL MEASURES

Traffic control measures will be determined (and may be adjusted should Site conditions change) by RECON's on-site Project Team, including the Site Safety Officer, through identification and evaluation of project area hazards and are subject to approval by the Borough and the Ringwood Police Department. The evaluation includes the following considerations:

- RECON will employ the "just in time" delivery method to limit the amount of truck traffic at the Site at any one-time.
- Overhead obstructions: power lines, low hanging tree branches, vegetation, and other hazards located along the truck routes on private and municipal roads within the Borough of Ringwood but should not be considered all inclusive.
- Traffic patterns and schedules, including the current school bus schedules, within the Borough of Ringwood.
- Airborne dust generation: dust emissions shall be controlled through air monitoring and dust suppression measures as detailed in the Community Air Monitoring Plan (Appendix D of the RAWP).

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- Driver visibility along route (e.g. blind corners, vegetation, and trees along travel paths present visibility hazards). Traveling with caution at the posted (or reduced) speed limits will mitigate such hazards. As backing of larger vehicles and equipment may also pose the same hazards, the use of flag persons are required when the operator is unable to maintain 360^{o} awareness.
- Evaluation of staging area surface conditions (flooding, ice, mud, etc.).
- Evaluation of construction entrances and egresses.
- Decontamination of vehicles and equipment prior to leaving the Site will take place in accordance with the Site-Specific HASP.

RECON's on-site field management staff will conduct daily safety meetings in accordance with the Site-Specific HASP, and these meetings will also include discussion of potential traffic hazards on and off the Site, the expected deliveries, and waste loading and transportation activities scheduled for each day. During the daily safety meeting, potential hazards will be discussed with the on-site project personnel, and mitigation measures and strategies will be employed, as necessary. All mitigation measures will be consistent with the provisions of this T&D Plan, and any proposed changes will be subject to approval by the Borough and the Ringwood Police Department.

All personnel visiting the Site, including vendors and subcontractors, will receive a Site orientation briefing that will include the T&D Plan details and rules for vehicle operation while on the Site. Each Site briefing will include a current map of the approved on-site transportation routes. All known hazards that exist on site and within the truck route will be communicated to all visitors during their safety orientation or daily safety briefing. Since routes may change, the traffic route maps will be updated on an as needed basis, posted in the RECON Site trailer, and supersede previous versions. Again, any changes to this T&D Plan or to the traffic routes will be subject to approval by the Borough and, upon approval, addressed in the daily safety meetings.

4.1 GENERAL RULES FOR ON-SITE TRAFFIC

The following is a list of general rules for on-site traffic. All personnel operating vehicles on site, including visitors and delivery vendors will be provided with this Plan and will be expected to follow the procedures and policies contained herein. Violation of any of the rules of this T&D Plan will result in the immediate expulsion of the person(s) violating the rule from the project.

- Trucks shall not arrive to the Site prior to 8:00 am nor depart from the Site after 5:00 pm, unless approval is given by the client representatives as well as the Borough of Ringwood.
- Truck traffic to and from Margaret King Avenue to the Upper Ringwood roadways shall be restricted during periods of Upper Ringwood school bus activity. Such restrictions shall be developed with input from the Borough and the Ringwood Police Department.
- At a minimum, one flag person shall be used to manage truck traffic from Peters Mine Road and Peltzold Road onto Margaret King Avenue as described in Section 4.2.
- All traffic control devices that are not applicable at any specific time shall be covered or removed.
- Traffic cones shall be a minimum of 36 inches in height.

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- Cell phone use is not permitted while operating a motor vehicle on site.
- Where vehicular traffic hazards exist because of work activities, administrative and/or engineering controls will be developed to mitigate the hazard.
- The effectiveness of traffic control set ups will be evaluated by walking or driving the Upper Ringwood traffic routes looking for evidence of poor controls and near misses such as swerving traffic, vehicles braking quickly, skid marks, blind spots, etc.
- Vehicles will be provided sufficient advanced warning of the upcoming work areas.
- In accordance with the Site-Specific HASP and this T&D Plan, all project personnel working within designated work zones or near vehicular traffic will wear high visibility clothing such as orange, yellow or yellow-green shirts, jackets, or vests. During wet or inclement weather, similarly colored rainwear will be worn.
- Project personnel working near traffic and vehicles must always maintain situational awareness.
- Vehicular operators shall stay mindful of all traffic control signs and cones.

4.2 TRAFFIC CONTROL DEVICES

Traffic control devices such as cones, signage and/or barricades may be used to direct traffic flow along the vehicular traffic routes from the three land AC work areas and along the Upper Ringwood roadways onto Margaret King Avenue. Once on Margaret King Avenue, all vehicles must adhere to the posted speed limits and other road signs. Appropriate signage and/or barricades will be placed along the traffic routes described in Section 3.0 of this T&D Plan as necessary to ensure the safety of the local residents and all project-related personnel. Signs not being used will be covered or removed.

Placement of traffic control devices will be determined prior to the start of work in each land AC and will be subject to approval by the Borough and the Ringwood Police Department. In addition, any changes to the traffic control device placement will be discussed with on-site project personnel during each day's HASP safety briefing.

4.3 TRAFFIC CONTROL FLAG PERSONS

During periods of truck traffic, including deliveries and waste off-loading, RECON will provide one or more flag persons to direct traffic through the work area and Upper Ringwood roadways in addition to the use of appropriate signage. At a minimum, one flag person will be provided to direct truck traffic during implementation of the CMP Area RA construction activities at the corner of Peltzold Avenue and Margaret King Avenue. At a minimum, one flag person will also be provided to direct truck traffic during implementation of the PMP Area and the OCDA RA construction activities at the intersection of Peters Mine Road and Margaret King Avenue. Additional flag persons may be utilized during periods of heavy truck traffic at the intersections of Peters Mine Road and the Upper Ringwood side streets along the truck traffic route in the event it is deemed necessary by the Borough.

All flag persons will be equipped with the following:

- Reflective vests.

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- Two-way communication.
- Proper flagging devices such as flags or handheld two-sided "**STOP"** and "**SLOW"** sign.

In addition, when more than one flag person is used, the flag persons shall always be in the sight of each other or have direct communications. In addition, a flag person shall never turn his or her back to on-coming traffic.

4.4 GENERAL RULES FOR OFF-SITE TRAFFIC

All transportation vendors will be provided with a copy of this Plan and will be expected to follow all the procedures discussed herein. RECON will coordinate truck traffic to ensure that they are arriving when they are needed so they can be brought directly into and out of the site in an efficient manner, so trucks are not waiting on the Borough roads for entry into the site. RECON will use flag persons when needed to escort trucks and heavy equipment transport vehicle traffic exiting the ACs onto adjacent streets as previously described in Section 4.3. All such activity will adhere to applicable federal (Occupational Safety and Health Administration [OSHA], United States Environmental Protection Agency [USEPA]), state (New Jersey Department of Transportation [DOT]), and local (Borough) laws and regulations. Special caution will be exercised when entering or leaving the work areas and the Site onto Margaret King Avenue to avoid causing cross traffic to come to a sudden stop. All vehicles arriving to and exiting the Site will adhere to posted speed limits traffic control signs and all vehicular traffic laws. Violations to any of the rules identified in this T&D Plan will be evaluated on a case-by-case basis based on the severity of the infraction. Typically, RECON will issue a warning to the driver or vehicle operator for their first infraction and their behavior will be continuously monitored to ensure that they do not violate any more traffic rules. Any repeat violations or severe first violation of any of the rules of this T&D Plan will result in the immediate expulsion of the person(s) violating the rule from the project.

Offsite transportation routes for trucks exiting the Site for transportation of the various waste streams to the disposal facilities are discussed in Section 9.0 of this T&D Plan.

5.0 WASTE MANGEMENT

As detailed in Section 7.6 of the RAWP, RECON will perform the segregation of waste encountered during excavation and cut/fill operations. Waste may consist of bulky debris, tires, cardboard, plastic, paint sludge, drums, and other deleterious objects. Waste streams will be staged in separate stockpiles on waste containment pads for further decontamination if necessary (e.g., metal objects), for sampling and analysis prior to disposal.

RECON will coordinate disposal with the Ford Motor Company approved disposal facilities identified in Technical Specification Section 00 73 01, 1.5A. In accordance with Section 7.6 of the RAWP, samples will be collected at the required frequency defined by the disposal facility and analyzed for all required parameters by a New Jersey-certified laboratory. Once approved profiles and acceptance criteria has been secured, RECON will schedule the transportation and disposal of the waste streams. Disposal manifests will be provided with all information filled out for signature by the Client or the Client's representative.

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RECON will construct a temporary on-site truck scale to weigh trucks hauling waste materials in accordance with Technical Specification 34 78 14 (Portable Axle Scale) to ensure compliance with local, state, and federal over-the-road weight restrictions and to allow for daily waste material tracking. The truck scale will consist of the installation of a portable, two axle module scale rated to handle up to 60,000-pounds per axle. The scale will be installed on a paved, level surface by an experienced scale installation company with calibration being performed prior to the off-site transportation of any waste materials.

RECON will ensure that all trucks associated with this project are following this T&D Plan and HASP included in Appendix B of the OU-2 RAWP. The vendors will be instructed to relay to all transport drivers to remain in the vehicle throughout the loading operations. RECON will reiterate this instruction to all drivers arriving at the Site. The drivers will tarp their trucks prior to leaving each of the three land AC work areas. Trucks entering and exiting the ACs will be directed to stay on clean roads and/or access pathways to minimize the need for decontamination to the maximum extent possible. Prior to leaving the Site, each truck will be inspected and either directed to the decontamination pad, if necessary, or to the stabilized construction entrance and the on-site truck scale. As previously stated, RECON will employ the "just in time" delivery method to limit the amount of truck traffic at the Site at any one-time. All shipments shall be accompanied by a waste manifest/bill of lading that will be signed by the Client or the Client's Representative prior to leaving the Site. All records will be kept on-site and transmitted to the Client or the Client's Representative weekly.

6.0 WASTE HANDLING PROCEDURES

As detailed in Section 7.6 of the RAWP, various waste streams may be encountered at each of the three land AC work areas, including bulky debris, tires, cardboard, plastic, dried paint waste, drums and/or drum remnants, etc. Waste streams will be staged in separate stockpiles depending on their type and physical appearance, i.e., metal debris, remnant drum carcasses, paint waste, etc. RECON will sample the various waste streams in accordance with each disposal facilities requirements. Disposal will follow the procedures as described above.

For the PMP Area, as described in Section 7.4.2 of the RAWP, unexcavated materials will be staged in 500-cubic yard stockpiles, and RECON will perform sampling of the material to be analyzed for the characteristics of hazardous waste as follows:

- Corrosivity
- Ignitability
- Reactivity (sulfide, cyanide)
- TCLP metals

In the PMP Area, the proposed excavated soil stockpile layout is shown on **Figure 2-4**. The proposed layout is subject to modification following inspection of the area after clearing and grubbing is completed. The location of stockpiles in relation to the adjacent residential properties and other considerations will be taken into account before the stockpile layout is finalized.

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Upon review of the analytical results by the Client's Representative, an immediate determination will be made as to whether the material will be transported for off-site disposal or reused as backfill above the water table. RECON will either designate the material as backfill for the PMP Area or collect additional samples to develop a proper waste characterization. In the latter event, the waste profile will be completed as required by the appropriate disposal facility(s).

7.0 PROPOSED DISPOSAL FACILITIES AND WASTE TYPES

The facilities to be utilized for disposal of waste materials off-site will be chosen among the following Ford Motor Company approved disposal facilities, subject to final approval of the USEPA as a part of the OU2 RAWP. Waste must meet the disposal facility's acceptability criteria and comply with local, state, and federal regulations, as well as the facility's permit requirements. Construction waste will also be managed in accordance with Technical Specification 01 74 19 (Construction Waste Management and Disposal).

Disposal facilities and waste streams are summarized in **Table 1**.

Table 1: *Waste Disposal Facilities*

Facility	EPA Permit/ID Number	Proposed Waste Streams
Heritage Thermal Services 250 Saint George St. East Liverpool, OH 43920	*OHD 980 613 541*	Hazardous Waste (e.g. Impacted Soil/Paint Waste)
Heritage Environmental Services 7901 W. Morris St. Indianapolis, IN 46231	IND 093 219 012	Hazardous Waste (e.g. Impacted Soil/Paint Waste)
Heritage Landfill 4370 W CR 1275N Roachdale, IN 46712	IND 980 503 890	Hazardous Waste (e.g. Impacted Soil/Paint Waste)
Waste Management of Fairless Facility 1000 New Ford Mill Rd. Morrisville, PA 19067	PA DEP Permit # 101699	Non-Reusable Bulky Waste (e.g., Construction and Demolition (C&D) Debris, Appliances, Tires, Vehicle Parts)
Republic Environmental Systems 2869 Sandstone Dr. Hatfield, PA 19440	PAD 085 690 592	Non-Reusable Bulky Waste (E.g. C&D Debris, Appliances, Tires, Vehicle Parts)
Chemical Waste Management Facility 36964 Alabama Highway 17 North Mile Marker 163 Emelle, AL 35459	ALD 000 622 464	Hazardous Waste (e.g. Impacted Soil/Paint Waste)
Gaeta Recycling Facility 278 West Railway Ave Paterson, NJ 07503	Not Applicable	Recyclable Waste

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8.0 TRANSPORTERS

All waste transportation vehicles shall comply with local, state, and federal laws. The list of transportation vendors is provided below. RECON has included the regulatory transporter permits in **Attachment A**.

- **Horwith Truck, Inc.** Subcontractor to both Waste Management and Heritage
- **JD Trucking** Subcontractor to both Waste Management and Heritage
- **United Trucking** Subcontractor to Waste Management
- **Heritage** Heritage Waste Solutions

9.0 TRANSPORTATION ROUTES

The anticipated trucking routes from the Site to each disposal facility are shown on the figures included in **Attachment B**. Actual routes may change based on traffic patterns. Offsite trucking and transportation will adhere to the rules described in Section 4.4 of this T&D Plan.

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Figures

LEGEND

= Proposed Route into and out of AOC

NOTE: Not To Scale

N

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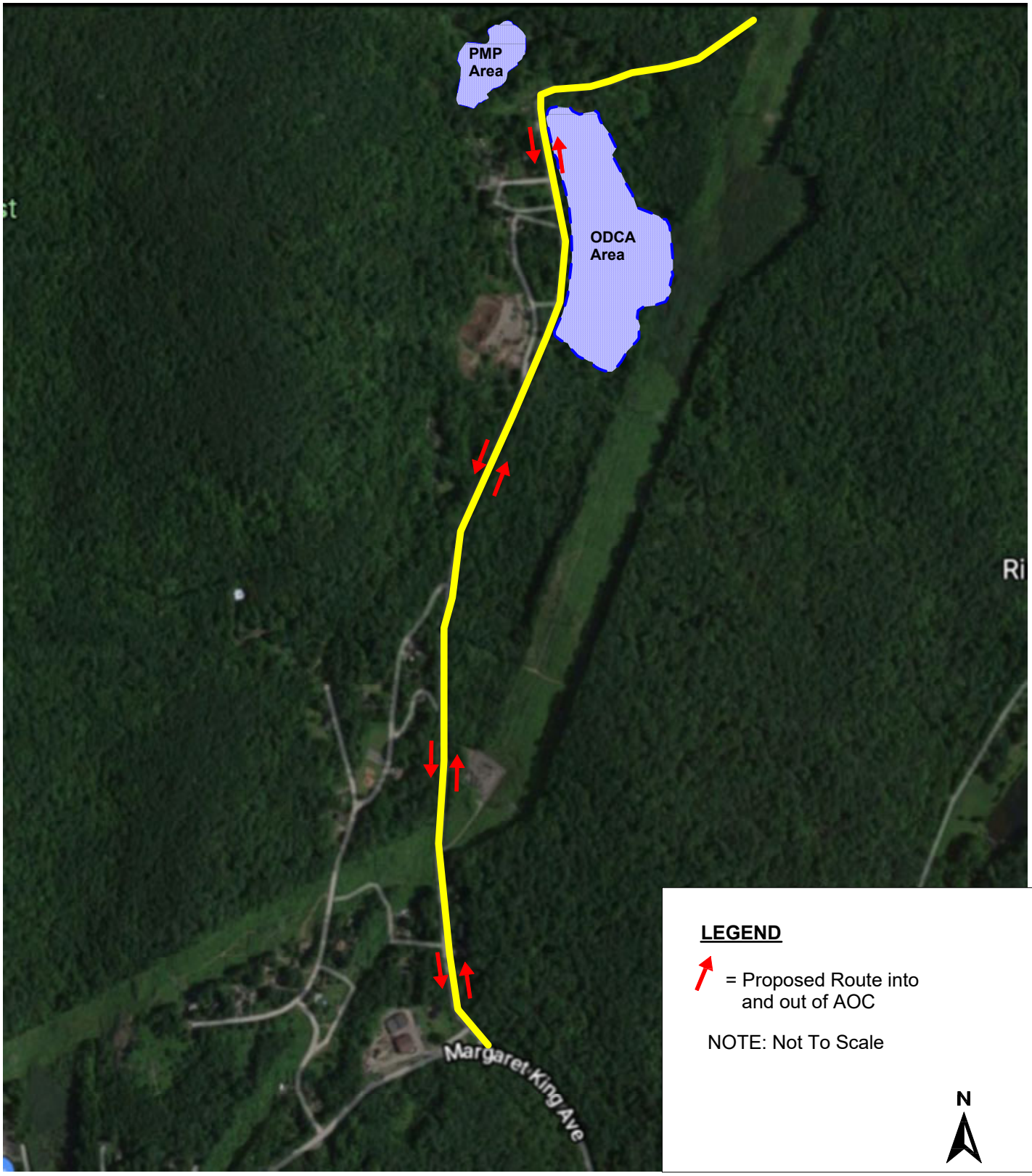
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Proposed Truck Access Route
CMP Area

Figure: 2-1 | **Date: 11/18/20**



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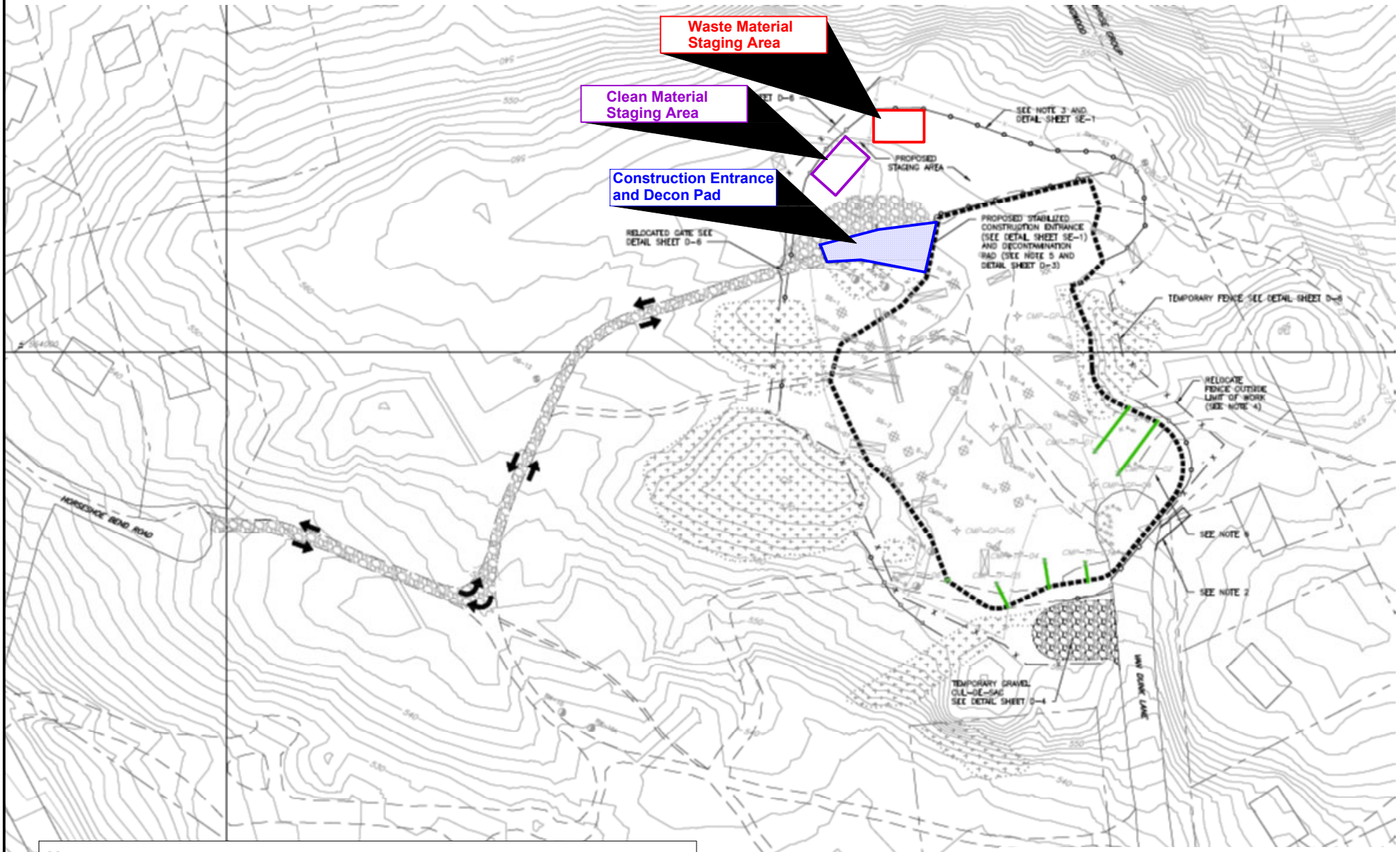
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Proposed Truck Access Route
PMP and ODC Areas

Figure: 2-2	Date: 11/18/20



Notes:

Not To Scale
Final Site Layout will be field determined by RECON Site Management

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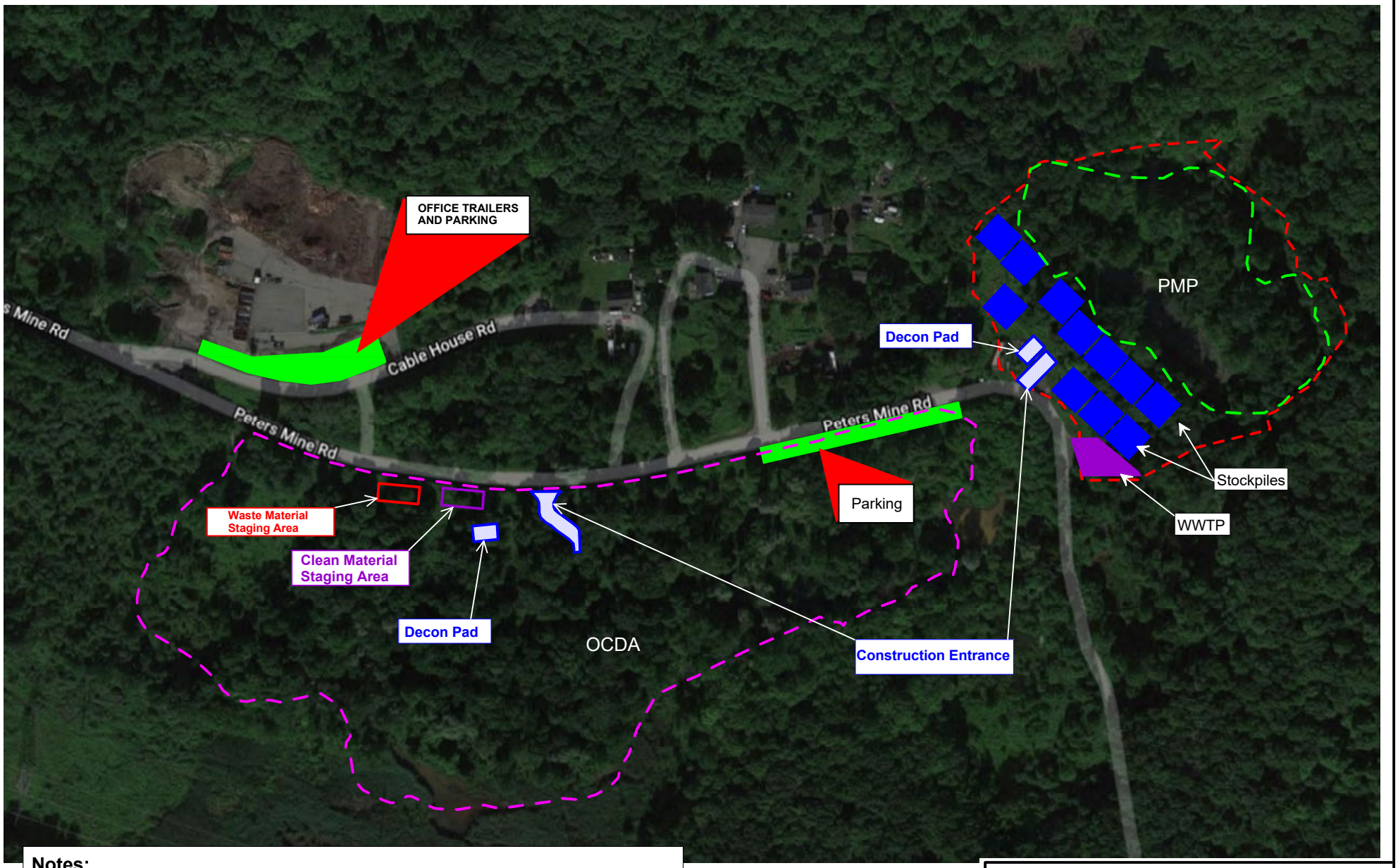
CANNON MINE PIT AREA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LAYOUT PLAN

Figure: 2-3

Date: 11/18/20



Notes:

Not To Scale - Site features are approximate
Final Site Layout will be field determined by RECON Site Management

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PMP & OCDA
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

SITE LAYOUT PLAN

Figure: 2-4 | **Date: 12/16/20**

Attachment A

CUSTOMER AUDIT HANDBOOK

Heritage Environmental Services, LLC
7901 West Morris Street
Indianapolis, Indiana 46231

(317) 243-0811
www.heritage-enviro.com

EPA ID No. IND 093 219 012

HERITAGE ENVIRONMENTAL SERVICES, LLC

AUGUST 2020

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1. PURPOSE

The purpose of this document is to provide current and potential clients environmental compliance information regarding this Heritage Environmental Services, LLC ("Heritage") facility.

Many clients require an audit package prior to or while using our permitted facility for secondary materials management. This package is intended to be complete and comprehensive in fulfilling your audit requirements. Heritage will be happy to answer questions not addressed in this document.

CORPORATE INFORMATION

1.1. BUSINESS PRINCIPLES

Our primary purpose is protection of human health and the environment. Starting in our customer's workplace, we want to be involved in protecting health through industrial hygiene and safety consulting. Materials that are discarded or lost from a manufacturing or commercial operation become "secondary materials." Some are wastes, but many can be reclaimed or reused. In all of our treatment or reclamation activities, we want to minimize risks to our employees and to our industrial and residential neighbors. We will be guided by and remain in compliance with federal, state, and local laws and regulations.

In all of our secondary material management activities, we will follow the hierarchy of prevention first, reclamation or reuse second, detoxification and treatment third, and disposal last. We recognize that the technical limitations created by chemical and economic realities of the world preclude both the total elimination of secondary materials and their reclamation or reuse in all instances. However, it is our corporate philosophy to seek the high environmental ground - to take "the path less traveled." This approach to management of the environment will bring us the respect of our customers as well as their business.

We respect all of the individuals who make up our company and solicit their creative thought. A Company is a group of people working together for a common goal. Each of us has different day-to-day jobs, but there is no exclusive territory for good ideas. We must continue to facilitate an open communication system that will capture, recognize, and reward creative thoughts.

We believe in equal employment and encourage the hiring and promoting of all minority groups. When a minority is a qualified applicant for an open position, he or she shall be given equal consideration in receiving that position. Managers are expected to treat all employees equally.

We believe in education, training, certification, registration, and all other forms of self-improvement and peer recognition. To be the best at anything, you must have a thorough understanding of your job. To retain knowledge and skills, you must use them regularly.

We want to provide environmentally sound and economic services to our customers. This is the basis of our business.

We expect to contribute a full day's work for a fair day's pay. Self-esteem is largely related to feeling that you are making a real contribution. If you work in our industry, you are making a real and important contribution to society.

We want to be the best in everything we do - at the top of the list is safety. Safe work results from thorough planning. We have found if you perform work safely, it's also done efficiently.

We want to foster a teaching attitude. Rather than complain about how something is done, we want to teach how to do it properly.

We expect all company personnel to be free from alcohol and/or drug dependence. In order to make the sound decisions required to meet all other company principles, we believe it is necessary for our people to be free from any chemical dependency.

1.2. SERVICE OFFERINGS

Secondary materials management is Heritage's principal business. Heritage offers the following services: hazardous waste treatment, storage, and disposal, transportation, remediation, and industrial services.

1.3. CORPORATE COMPLIANCE DEPARTMENT

The Heritage Corporate Compliance Department exists to both support and evaluate the efforts of the operational managers at each business unit and facility. Support is provided in terms of updates on new regulatory requirements, interpretations of existing requirements, renewal and major modifications of permits, negotiating with federal and state regulatory agencies, and commenting on proposed rules at the federal and state level.

1.4. HERITAGE CORPORATE STRUCTURE

Heritage Environmental Services, LLC is a privately held firm. Heritage Environmental Services, LLC does not have a parent company. Heritage began in 1970 as "Industrial Liquid Waste Disposal" (ILWD) providing oil reclamation and industrial waste disposal services. The ILWD processing facility and landfill were in Bartholomew County, Indiana.

1987, ILWD, Inc. changed its name to Heritage Environmental Services, Inc. (Heritage). On June 1, 1998, Heritage Environmental Services, Inc. formed a new company named Heritage Environmental Services, LLC. Its subsidiary Heritage Transport, Inc. also formed a new company named Heritage Transport, LLC. The successor companies hold all operating assets, including the RCRA and non-hazardous waste facilities. All business conducted by the former companies were assumed by Heritage Environmental Services, LLC without a change in ownership or management. Table 1-1 shows the location and regulatory status of Heritage TSD facilities.

Table 1: FACILITY LOCATIONS AND REGULATORY STATUS

FACILITY	DESCRIPTOR	PERMIT DATES
Heritage Environmental Services, LLC - IND 093219012 7901 W. Morris Street Indianapolis, IN 46231 (317) 243-0811	Effective Date: Expiration Date:	12/31/2019 12/31/2024
Heritage Landfill (Hazardous Wastes) - IND 980503890 4370 W CR 1275N Roachdale, IN 46172 (765) 435-2704	Effective Date: Expiration Date:	3/13/2020 3/13/2025
Heritage Industrial Waste Landfill - FP 67-04 4370 W CR 1275N Roachdale, IN 46172 (765) 435-2704	Effective Date: Expiration Date:	7/18/2017 6/15/2022
Heritage Environmental Services, LLC - MOD 981505555 8525 N.E. 38th St. Kansas City, MO 64161 (816) 453-4321	Effective Date: Expiration Date:	08/27/2019 08/26/2029
Heritage Environmental Services, LLC - AZD 081705402 284 E Storey Road Coolidge, AZ 85128 (520) 723-4167	Effective Date: Expiration Date:	11/29/2013 11/29/2023
Rineco Chemical Industries, Inc. – ARD 981057870 819 Vulcan Road Benton, AR 72015 (501)-778-9089 (28H-RN2)	Effective Date: Expiration Date:	4/2/2019 4/2/2029
Heritage Thermal Services, LLC – OHD 980613541 1250 Saint George Street East Liverpool, OH 43920 (330)385-7337 (02-15-0589)	Effective Date: Expiration Date:	1/17/2019 1/17/2029

2. GENERAL FACILITY INFORMATION

The Indianapolis facility is a RCRA Part B permitted, commercial off-site facility. The facility's location and mailing address is 7901 West Morris Street, Indianapolis, Indiana 46231. The facility is owned and operated by Heritage Environmental Services, LLC and the SIC code is 4953 (NACIS 562211).

2.1. SITE HISTORY

Heritage purchased the original facility acreage for the permitted facility from Penn-Central Properties. The land had been used for agricultural purposes prior to construction of the facility. The facility became operational in 1978.

2.2. LOCATION

The Indianapolis facility is located at 7901 West Morris Street in Marion County, Indiana (latitude 39 degrees 44 minutes 52 seconds, longitude 86 degrees, 18 minutes, and 35 seconds). The facility is located on the far west side of the City of Indianapolis approximately one-half mile west of Girls School Road on the south side of Morris Street. (See Figures 1 and 2).

Surrounding land use includes industrial, residential, and undeveloped lands. The 1991 estimated population within a 1-mile radius is 1,300. There are no hospitals within the vicinity of the facility. There are two schools located approximately one mile from the facility. The nearest surface water is Julia Creek, which runs along the northwest corner of the fenced area.

Heritage owns approximately ninety acres on the west side of Indianapolis. The fenced area surrounding the permitted facility encloses approximately eleven acres. The Heritage Transport, LLC (HT) transfer facility is located directly south of the treatment center. Access to the treatment center by HT trucks is gained through the south entrance.

2.3. PHYSICAL DESCRIPTION

A site map of the facility is included as Figure 2. Heritage manages wastes in tank systems, container storage areas, containment buildings, and in miscellaneous units. Heritage has no land disposal units on-site; therefore neither run-on/run-off control nor groundwater monitoring is required. There are no lagoons, ponds, pits, or waste piles on-site.

The hazardous waste process tanks are located inside and have adequate containment. The hazardous waste storage tanks are located outside and have secondary containment adequate to contain 100% of the largest tank and the twenty-five-year/twenty-four-hour storm event. Containment structures are constructed of chemically resistant coated concrete. Tanks have level indicators, high level alarms, and conservation vents. Tanks are visually inspected daily. All hazardous waste tanks have been elevated for leak detection purposes. Ultrasonic tank thickness inspections are conducted every five years. Table 2-1, Permitted and Constructed Hazardous Waste Tanks, summarizes additional information.

All containers of hazardous waste are stored inside and therefore run-on/run-off control is not needed. Containers containing free liquids are stored in chemically resistant concrete coated bays of sufficient volume to contain ten percent of the volume of the containers in the bay. All containers are arranged with a minimum aisle space of two feet.

Heritage operates two containment buildings at the facility for the management of large volume waste materials (e.g., contaminated soil, debris, etc.). These special use buildings were designed and constructed with dual synthetic liners beneath the buildings and air pollution control equipment in accordance with the requirements of 40 CFR Part 264, Subpart DD.

Figure 1: Site Location Map

Figure 2: Facility Map

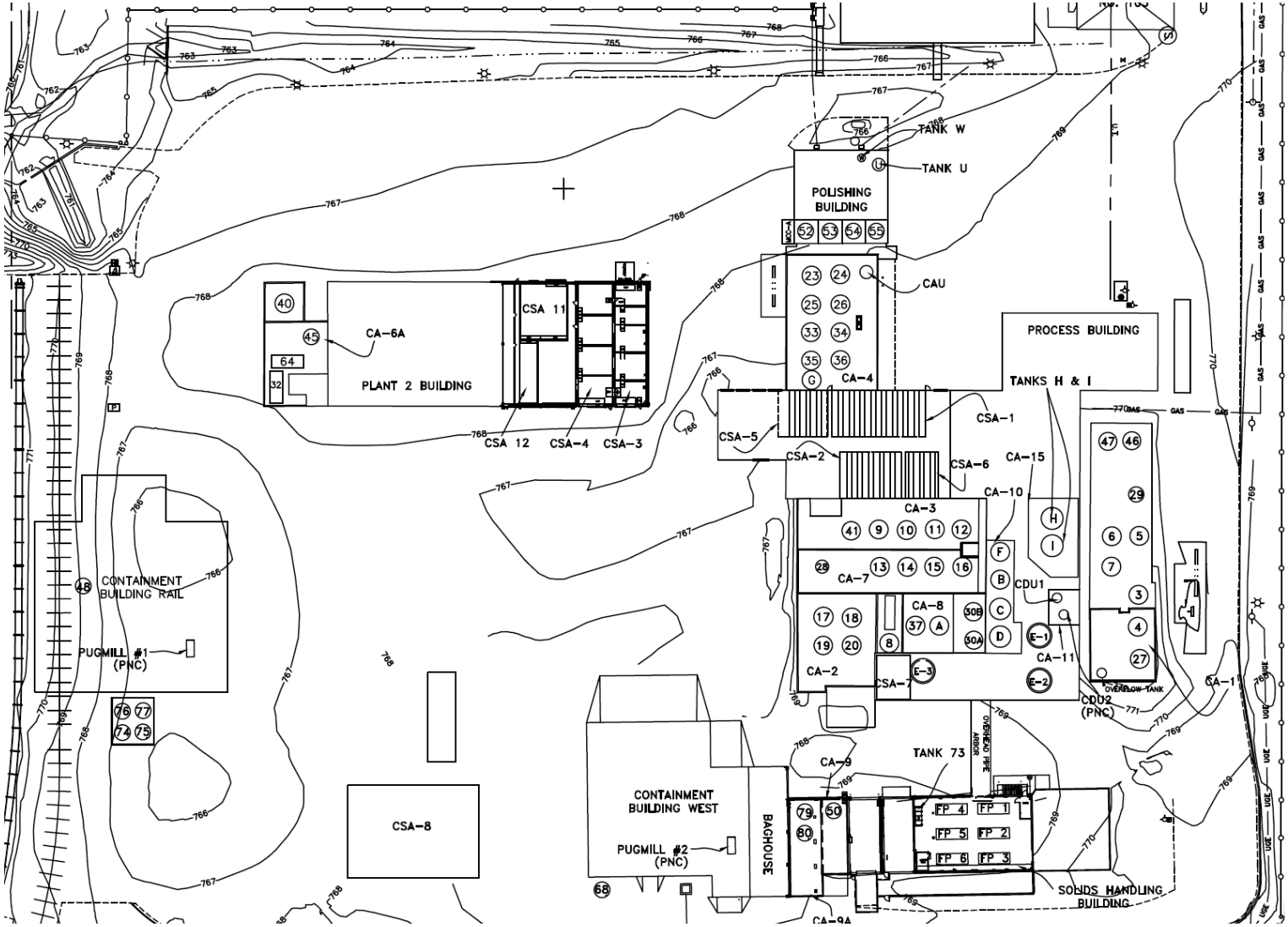


Table 2: Permitted and Operating Hazardous Waste Tanks

Tank #	Tank Vol (Gal)	Contents	Install Date	Construction Material
9	29,395	Waste Acid	1978	coated carbon steel
10	29,395	Waste Acid	1978	coated carbon steel
11	29,395	Waste Acid	1978	coated carbon steel
12	29,395	Waste Acid	1978	coated carbon steel
13	32,344	Sludges and Caustics	1978	carbon steel
14	32,344	Sludges and Caustics	1978	carbon steel
15	32,344	Sludges and Caustics	1978	carbon steel
16	32,344	Sludges and Caustics	1978	carbon steel
17	29,395	Supplemental Fuel	1978	carbon steel
18	29,395	Supplemental Fuel	1978	carbon steel
19	29,395	Supplemental Fuel	2011	carbon steel
20	29,395	Supplemental Fuel	2011	carbon steel
23	29,395	Hazardous Wastewater	1978	carbon steel
24	29,395	Hazardous Wastewater	1978	carbon steel
25	29,395	Wastewater	1978	carbon steel
26	29,395	Wastewater	1978	carbon steel
33	29,395	Wastewater	1978	carbon steel
34	29,395	Wastewater	1978	carbon steel
35	29,395	Wastewater	1978	carbon steel
36	29,395	Wastewater	1978	carbon steel
41	13,053	Waste Acid	1990	crossed-linked polyethylene
50	13,379	Dry Wastes	1989	carbon steel
73	2,570	Wastewater Treatment	2012	Double wall linear polyethylene
A	11,544	Treatment/Storage	2000	carbon steel
B	8,086	Treatment/Storage	1978	carbon steel
C	11,002	Treatment/Storage	2010	carbon steel
D	11,002	Treatment/Storage	1978	coated carbon steel
E-1	12,666	Treatment/Storage	1982	coated carbon steel
E-2	11,510	Treatment/Storage	2005	coated carbon steel
E-3	8,876	Treatment/Storage	1988	carbon steel
F	7,006	Wastewater Treatment	1993	carbon steel
G	10,093	Wastewater Treatment	1995	carbon steel
CAU	877	Treatment/Storage	1991	carbon steel
CDU-1	1,469	Treatment/Storage	1990	carbon steel
H	20,153	Treatment/Storage	2003	FRP
I	20,153	Treatment/Storage	2003	FRP
J	586	Treatment/Storage	2014	Cross-linked Polyethylene
K	586	Treatment/Storage	2014	Cross-linked Polyethylene

Tank #	Tank Vol (Gal)	Contents	Install Date	Construction Material
9	29,395	Waste Acid	1978	coated carbon steel
10	29,395	Waste Acid	1978	coated carbon steel
11	29,395	Waste Acid	1978	coated carbon steel
12	29,395	Waste Acid	1978	coated carbon steel
13	32,344	Sludges and Caustics	1978	carbon steel
14	32,344	Sludges and Caustics	1978	carbon steel
15	32,344	Sludges and Caustics	1978	carbon steel
16	32,344	Sludges and Caustics	1978	carbon steel
17	29,395	Supplemental Fuel	1978	carbon steel
18	29,395	Supplemental Fuel	1978	carbon steel
19	29,395	Supplemental Fuel	2011	carbon steel
20	29,395	Supplemental Fuel	2011	carbon steel
23	29,395	Hazardous Wastewater	1978	carbon steel
24	29,395	Hazardous Wastewater	1978	carbon steel
25	29,395	Wastewater	1978	carbon steel
26	29,395	Wastewater	1978	carbon steel
33	29,395	Wastewater	1978	carbon steel
34	29,395	Wastewater	1978	carbon steel
35	29,395	Wastewater	1978	carbon steel
36	29,395	Wastewater	1978	carbon steel
41	13,053	Waste Acid	1990	crossed-linked polyethylene
50	13,379	Dry Wastes	1989	carbon steel
73	2,570	Wastewater Treatment	2012	Double wall linear polyethylene
A	11,544	Treatment/Storage	2000	carbon steel
B	8,086	Treatment/Storage	1978	carbon steel
C	11,002	Treatment/Storage	2010	carbon steel
D	11,002	Treatment/Storage	1978	coated carbon steel
E-1	12,666	Treatment/Storage	1982	coated carbon steel
E-2	11,510	Treatment/Storage	2005	coated carbon steel
E-3	8,876	Treatment/Storage	1988	carbon steel
F	7,006	Wastewater Treatment	1993	carbon steel
G	10,093	Wastewater Treatment	1995	carbon steel
L	1513	Treatment/Storage	2014	Cross-linked Polyethylene

2.4. STAFFING

The facility employs approximately 90 people. The following represents the categories of employees: professionals including management, shift and department supervisors, laboratory technicians, hazardous waste technicians, and drivers. The support staff, accounting, and document control account for seven positions.

Key facility employees are as follows (see Appendix B for résumés):

VP of Fixed Facilities	Winde Hamrick
Plant Manager	Chris Patchon
Compliance Manager	Chris Ray

2.5. LABORATORY SERVICES

Heritage Environmental Services, LLC operates a QA/QC laboratory for fingerprint analysis on incoming wastestreams and process and discharge analysis. The laboratory has the following equipment: gas chromatograph, atomic absorption spectrophotometer, Penske Martin and Setaflash flash point testers, bomb calorimeter, centrifuge, Perstorp Cyanide Analyzer, TCLP Extractor, spectrophotometers, pH meters, and ventilation hoods.

2.6. SECURITY

Heritage operates twenty-four hours per day, seven days per week. The entire facility is surrounded by a six-foot fence with three strands of barbed wire. All required warning signs are posted. The one personnel and three vehicle gates to the facility remain normally closed. The entrances are equipped with motorized gates operated by electronic cards. Employees are issued cards to gain access to and egress from the site. The general public must enter through the vehicle gate at the northeast corner of the facility. Visitors identify themselves before gaining access, and a visitor logbook is maintained. Surveillance cameras are located throughout the facility. Monitors are viewed at the receptionist desk, the control room, and the communications center. There is adequate lighting to conduct business twenty-four hours per day.

2.7. PREPAREDNESS AND PREVENTION

Heritage maintains a fire alarm system, and fire extinguishers are located throughout the facility. There are two fire hydrants on-site. The nearest fire department is located less than one mile to the east. Telephones and a public address system allow for communication within the facility. Selected employees carry two-way radios. Heritage has both a Contingency Plan and a Spill Prevention Control and Countermeasures (SPCC) Plan. The treatment center has an Emergency Response Team (ERT). Emergency agreements have been made with the local fire department, police department, spill response contractor, and a local medical clinic.

2.8. GEOLOGICAL AND HYDRO-GEOLOGICAL INFORMATION

Heritage is not located within a well-field protection district. The nearest residential ground water well is within a quarter mile radius. The Heritage facility is not required to conduct groundwater monitoring and has not conducted such monitoring in the past.

The area surrounding the facility is characterized as a hummocky disintegration moraine (till) of low relief (Harrison, 1963). The facility is approximately 770 feet above National Geodetic Vertical Datum ("NGVD" or mean sea level). Surficial soils in the area are mapped as either Crosby silt loam (silts or ML) on broad flats and gentle ridgetops, or Brookston silty clay loam (silty clays or CL) in depressions, flats, and narrow drainageways on undulating till plains (Sturm and Gilbert, 1978). The soils are somewhat poorly to very poorly drained with low permeabilities. Both have high seasonal water tables with ponding occurring in the Brookston soil. Small areas of Miami-Crosby and Miami silt loams (silt or ML) characteristic of drainage ways on undulating till plains are present adjacent to Julia Creek, which is located northwest of the facility, and the Thompson Bailey Ditch (south of the facility) (Sturm and Gilbert, 1978).

Surface waters of Julia Creek and the Thompson-Bailey Ditch flow generally southwest away from the

facility and merge just southwest of the facility. Julia Creek then flows west into the East Fork of White Lick Creek. The confluence of the two creeks is located approximately one mile southwest of the facility.

In the vicinity of the facility, depth to bedrock ranges from approximately 107 feet (Citizens Gas Test Number 96) to approximately 166 feet (Citizens Gas Test Number 86). The bedrock surface is described as having moderate relief and slopes gently east toward the bedrock valley beneath the White River. All of the wells except two near U.S. 36 (approximately 1 mile north of the facility, Cloverleaf Number 2 and Citizens Gas Test Number 99) encountered shales and sandstones of the Borden Group at the bedrock surface. The two wells near U.S. 36 encountered a thin limestone bed at the bedrock surface. A thin limestone bed was also identified and drilled through in Citizen Gas Test Number 86, Citizens Gas Test Number 95, and Seegers Number 2. In each case, the limestone is underlain by a black shale and overlain by various colored shales and sandstones. The thin limestone layer is identified as the Rockford Limestone and serves as the basal marker bed for the Borden Group (Shaver, et al., 1970). The black shale beneath the Rockford Limestone is the New Albany Shale.

Unconsolidated sediments in the vicinity of the facility consist of various intervals of till and intervening sand and gravel. Unconsolidated glacial sediments are noted in the Indiana Department of Natural Resources, Division of Water (DNR) well logs for the area immediately surrounding the facility. The clays noted on the well logs are glacial tills that display low permeabilities and act as hydrologic confining units. In the vicinity of the facility, the first zone of saturated, permeable sediments range in depth from ten to twenty feet below grade. Water bearing units (designated aquifers) are confined aquifers based on DNR log data. The depth to the uppermost aquifer in the vicinity of the facility ranges from approximately fifty to seventy-five feet below grade.

Groundwater in the uppermost aquifer (not the first zone of saturated permeable sediments) would be expected to flow from west to east beneath the facility property (Herring 1976). There are no significant industrial users of groundwater registered with the Indiana Department of Natural Resources within ½ mile of the facility.

2.9. STORMWATER MANAGEMENT

All stormwater collected in secondary containment structures for hazardous waste tanks is treated through the facility appropriately and discharged to the publicly owned treatment works (POTW).

2.10. ATMOSPHERIC INFORMATION

No part of the hazardous waste facility is located in a hundred-year flood plain or coastal high-hazard zone. The normal annual precipitation is 39.84 inches (National Weather Service). The prevailing wind speed and direction are 9.6 miles per hour from the southwest (National Weather Service).

2.11. QUALITY, ENVIRONMENTAL, SAFETY MANGEMENT SYSTEM

Heritage Environmental Services is committed to meeting customers' expectations in a manner that protects human health and the environment. To aid in our efforts, we have incorporated an environmental-quality-safety management system into our business process that focuses on continual improvement and conforms to ISO 9001 quality requirements, ISO 14001 environmental requirements and OHSAS 18001 health and safety requirements. Heritage self-certifies its integrated management system.

3. FACILITY ENVIRONMENTAL COMPLIANCE

3.1. PRIMARY CONTACTS

The primary governmental agency for environmental management is the Indiana Department of Environmental Management (IDEM). IDEM representatives inspect the facility a minimum of four times per year. The Office of Air Quality for IDEM inspects the facility about annually. The CWA Authority, which is the firm that owns and operates the POTW for the City of Indianapolis, also inspects the facility annually. The following is a list of appropriate agency contacts.

- IDEM Inspector – Roger Wilson – (317) 234-6963
- IDEM Permit Writer - Paula Bansch – (317) 232-3243
- Office of Environmental Services - Air Permitting – Brian Wright– (317) 234-6544
- White River Environmental Partnership (POTW Discharge) - Tim Heider – (317) 639-7048

3.2. PERMITS – COPIES OF THE APPROPRIATE PERMITS ARE INCLUDED IN APPENDIX C

3.2.1. Air Permit

Heritage received a Minor Source Operating Permit (097-22634-00122) for specified emission sources and associated pollution control devices renewed on January 2, 2013. Heritage is not currently required to conduct any air monitoring of specific emission sources as a condition of the air registration. An Annual Compliance Notification is due March 1st.

3.2.2. Publicly Owned Treatment Works Permit

Heritage discharges treated wastewater to the local publicly owned treatment works (POTW). The current permit is effective February 1, 2017 through January 31, 2022. Wastewater is monitored daily by a twenty-four hour composite sampler. Although Heritage occasionally discovers isolated parameter excursions and self-reports these to the City of Indianapolis, Heritage does not have chronic problems in meeting the sewer discharge standards. The facility is subject to categorical pretreatment standards (40 CFR 437) for metals and organics subcategories.

3.2.3. Stormwater

The Indianapolis facility operates under Indiana Department of Environmental Management general permit #INR500008 for stormwater discharges associated with industrial activity in accordance with 327 IAC 15-6.

As part of the general permit, Heritage collects samples on an annual basis for total suspended solids, oil & grease, chemical oxygen demand, nitrate plus nitrite nitrogen, total Kjeldahl nitrogen, total phosphorus, carbonaceous biochemical oxygen demand, and pH. In addition, the permit requires annual analysis for cyanide, antimony, arsenic, cadmium, chromium, cobalt, lead, mercury, nickel, silver, tin, titanium, vanadium, zinc, 2,4,6 trichlorophenol, 2 methylphenol, 4 methylphenol, and 2, 3 dichloroaniline. Heritage also has a storm water pollution prevention plan.

3.2.4. RCRA Part B Permit

The current RCRA Part B permit became effective on December 31, 2019 for a period of five years until December 31, 2024. The Waste Analysis Plan includes test / sampling methods, and waste acceptance procedures. Before acceptance of waste it must be evaluated through the wastestream approval process. Once a waste arrives on-site, it is sampled and fingerprint analyses are run specific to the waste type. The results must fall within predetermined limits to be approved for acceptance. Heritage samples each bulk load and at least ten percent of the drums in each wastestream. Compatibility tests are conducted prior to unloading wastes into a tank.

3.3. RECORDKEEPING

The operating record tracks the method and date of each waste's treatment and storage. Heritage has implemented a bar code system to track containerized wastes through the facility.

3.4. ENVIRONMENTAL MONITORING

Heritage does not conduct any groundwater or routine surface water environmental monitoring. Heritage does not conduct disposal at the Indianapolis site. Corrective Action investigations do not require any groundwater monitoring. Heritage monitors treated wastewater prior to discharge as required by the industrial discharge permit.

3.5. COMPLIANCE HISTORY

Table 3 summarizes the facility environmental compliance history

Table 3: Indianapolis Five Year Compliance History – IND 093 219 012

Statute	Inspection Type	Lead Agency	Date	Finding	Description/Status
RCRA	COMPLIANCE INSPECTION	State	3/4/19	Violations or Compliance Issues Were Found	Incomplete inspection record for materials, pending close out from IDEM
RCRA	COMPLIANCE INSPECTION	State	2/20/19	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	11/8/18	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	9/25/18	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	EPA	6/20/18	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	3/19/18	Violations or Compliance Issues Were Found	Late submission of unmanifested waste report and failure to process a partial rejection in 60 days. Both issues have been addressed.
RCRA	COMPLIANCE INSPECTION	State	12/14/17	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	6/30/17	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	6/30/17	No Violations Were Found	n/a
RCRA	RECORD REVIEW	State	6/16/17	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	9/15/16	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	6/28/16	No Violations Were Found	n/a
RCRA	COMPLIANCE INSPECTION	State	3/30/16	Violations or Compliance Issues Were Found	Issues corrected during inspection and re-trained on coating inspections. No further action required.
RCRA	COMPLIANCE INSPECTION	State	9/22/15	Violations or Compliance Issues Were Found	Issues corrected during inspection and provided a written response to the IDEM on December 18, 2015. IDEM issued Return-to-Compliance letter on May 9, 2016.

3.6. CORRECTIVE ACTION

Heritage's federal permit required that a RCRA Facility Investigation ("RFI") be conducted at two Solid Waste Management Units operating at the facility based on a RCRA Facility Assessment conducted by the USEPA. Heritage submitted an RFI Work Plan for the two units as required by the federal permit. The first unit is the Filtercake Receiving Unit. The Filtercake Receiving Unit is a concrete floor within a building that received filter cake from the facility's aqueous treatment system and solids that do not contain free liquids that was constructed in 1979. The Filtercake Receiving Unit served as the management unit for materials that require stabilization prior to landfilling at the Heritage landfill in Roachdale, Indiana. The second unit is the Process Receiving Unit that received sludge on a curbed concrete floor for management within the facility's aqueous treatment tanks. Heritage discontinued this practice approximately more than ten years ago but continues to stage containers in the unit prior to processing. In December 1993, Heritage added a degraded sump in Tank Farms 3 and 7 as an additional Solid Waste Management Unit as part of the RFI. Storage tanks in Tank Farms 3 and 7 hold acid and caustic wastestreams.

Heritage submitted the initial RFI Work Plan to the USEPA Region 5 in 1991. In December 1993, Heritage submitted a revised RFI Work Plan based on USEPA comments. The USEPA approved the RFI Work Plan in September 1997. In February 1998, Heritage conducted extensive soil sampling at the Filtercake Receiving Unit for volatile organic compounds, semivolatile organic compounds, and 40 CFR Part 264 Appendix IX inorganic parameters. In 1999, Heritage conducted soil sampling in accordance with the RFI work plan at the Process Receiving Unit for volatile organic compounds, semivolatile organic compounds, and 40 CFR Part 264 Appendix IX listed metals and cyanide. In 1999, Heritage also conducted soil sampling at Tank Farms 3 and 7 for selected constituents. In the Fall of 1999, the USEPA requested that Heritage provide data from Tank Farms 3 and 7 for all 40 CFR Appendix IX listed metals (except mercury) and cyanide. Documents presenting data collected during the RFI at the Solid Waste Management Units were provided to the USEPA and the Indiana Department of Environmental Management. Based on correspondence from the USEPA in February 2001 and a subsequent modification to the facility RCRA operating permit, the Filtercake Receiving Unit and the Process Receiving Unit will not require further action under the Corrective Action program. Although metals were not present above industrial default concentrations at Tank Farms 3 and 7, the USEPA required Heritage to conduct additional soil sampling at Tank Farms 3 and 7. Heritage completed testing in 2001 and submitted documentation to the USEPA. Chloroform was detected below Tank Farms 3 and 7 in soil at a concentration above residential land use but below industrial land use standards. Heritage is evaluating an environmentally restrictive covenant for this area of the facility for chloroform with the USEPA.

4. FACILITY TREATMENT CAPABILITIES

4.1. ACCEPTABLE WASTE TYPES

Heritage can accept both bulk and containerized wastes from both over-the-road vehicles and rail. Over-the-road transporters delivering wastes must be approved by Heritage prior to shipment. Heritage can treat liquids, solids, and sludge forms of various types of wastes. These wastes include, but are not limited to organics (including halogenated and non-halogenated solvents), oils, phenols, paints and pigments, cyanides, corrosives, heavy metal-bearing wastes, high biochemical oxygen demand (BOD) wastes, metal sludges, lab packs, and nonhazardous wastes. Heritage is approved to accept CERCLA wastes. Heritage does not accept radioactive wastes, TSCA-regulated wastes,

etiological wastes, dioxins, or furans.

4.2. ACCEPTABLE WASTE CODES

Heritage can store the following hazardous wastes in containers and tanks:

D001-D043	F001-F012	F019	F024-F025	F032
F034-F035	F037-F039	K001-K011	K013-K052	K060-K062
K064-K066	K069	K071	K073	K083-K088
K090-K091	K093-K118	K123-K126	K131-K132	K136
K140-K145	K147-K151	K156-K159	K161	K169-K172
K174-K177	P001-P018	P020-P024	P026-P031	P033-P034
P036-P051	P054	P056-P060	P062-P078	P081-P082
P084-P085	P087-P089	P092-P099	P101-P106	P108-P116
P118-P123	P127-P128	P185	P188-P192	P194
P196-P199	P201-P205	U001-U012	U014-U039	U041-U053
U055-U064	U066-U099	U101-U103	U105-U138	U140-U174
U176-U194	U196-U197	U200-U211	U213-U223	U225-U228
U234-U240	U243-U244	U246-U249	U271	U278-U280
U328	U353	U359	U364	U367
U372	U373	U387	U389	U394
U395	U404	U408-U411		

4.3. EXPLANATION OF TREATMENT AND DISPOSAL CAPABILITIES

The Indianapolis facility is not a site of ultimate disposal and, therefore, does not have a limited disposal capacity for closure purposes.

4.3.1. Storage

The RCRA Part B permit allows 143,770 gallons of hazardous waste storage in containers, 767,682 gallons in tanks, and 3,609 cubic yards in containment buildings.

4.3.2. Metals Reclamation/Specialty Metal Salts Manufacturing

Heritage has been aggressively pursuing metal reclamation and use/reuse alternatives through the efforts of the Heritage Research and Development Committee. These efforts are in accordance with Heritage business principles and are outlined in the written Heritage Waste Minimization Program. Heritage has identified several promising metal-bearing wastes for evaluation for recovery and reuse opportunities.

4.3.3. Aqueous Treatment

Corrosive wastes, heavy metal wastes (including hexavalent chromium), and high BOD wastes are treated in the aqueous treatment system (Figure 3). Wastes are treated by oxidation, reduction, neutralization, precipitation, filtration, and stabilization. The treated wastewater is discharged under an industrial discharge permit to the publicly owned treatment works (POTW). The filter press sludge generated from filtration is stabilized on-site with cementitious reagents. The resulting stabilized treatment residue is landfilled at the Heritage Landfill, Roachdale, Indiana.

4.3.4. Cyanide Destruction

The cyanide destruction unit employs a proprietary process that destroys cyanide, including complex cyanide, independent of the cyanide concentration. The cyanide destruction unit (CDU) can destroy cyanide in both liquid and solid matrices without the use of chemical reagents or chemical oxidation. Heritage can also treat cyanide with conventional alkaline chlorination

processes.

4.3.5. Carbon Adsorption/Chemical Oxidation

Aqueous wastes that are minimally contaminated with organics are treated through the carbon adsorption or chemical oxidation systems and discharged to the POTW.

4.3.6. Stabilization

Wastes that pass the paint filter test and can be stabilized to meet applicable land disposal regulations can be stabilized using cementitious reagents.

4.3.7. Fuels Blending

Heritage blends characteristic and listed hazardous wastes to be used as fuels for boilers and industrial furnaces (BIFs).

4.3.8. Lab Pack

Lab Pack services offers a special waste management program to characterize, package, document, transport, and dispose of hazardous and non-hazardous small container waste.

Heritage chemists identify and segregate wastes according to DOT, EPA, and disposal guidelines for packaging. Heritage packages, labels, and manifests the waste in compliance with state and federal regulations for transportation to one of the Heritage facilities.

4.3.9. Brokerage

Heritage stores and accumulates hazardous and non-hazardous waste for off-site processing and disposal. Heritage uses the waste management hierarchy to direct materials to the most appropriate third party firm. Examples of accumulated wastes are solvents, batteries, and metal-containing wastes for reclamation and liquid and solid wastes for incineration.

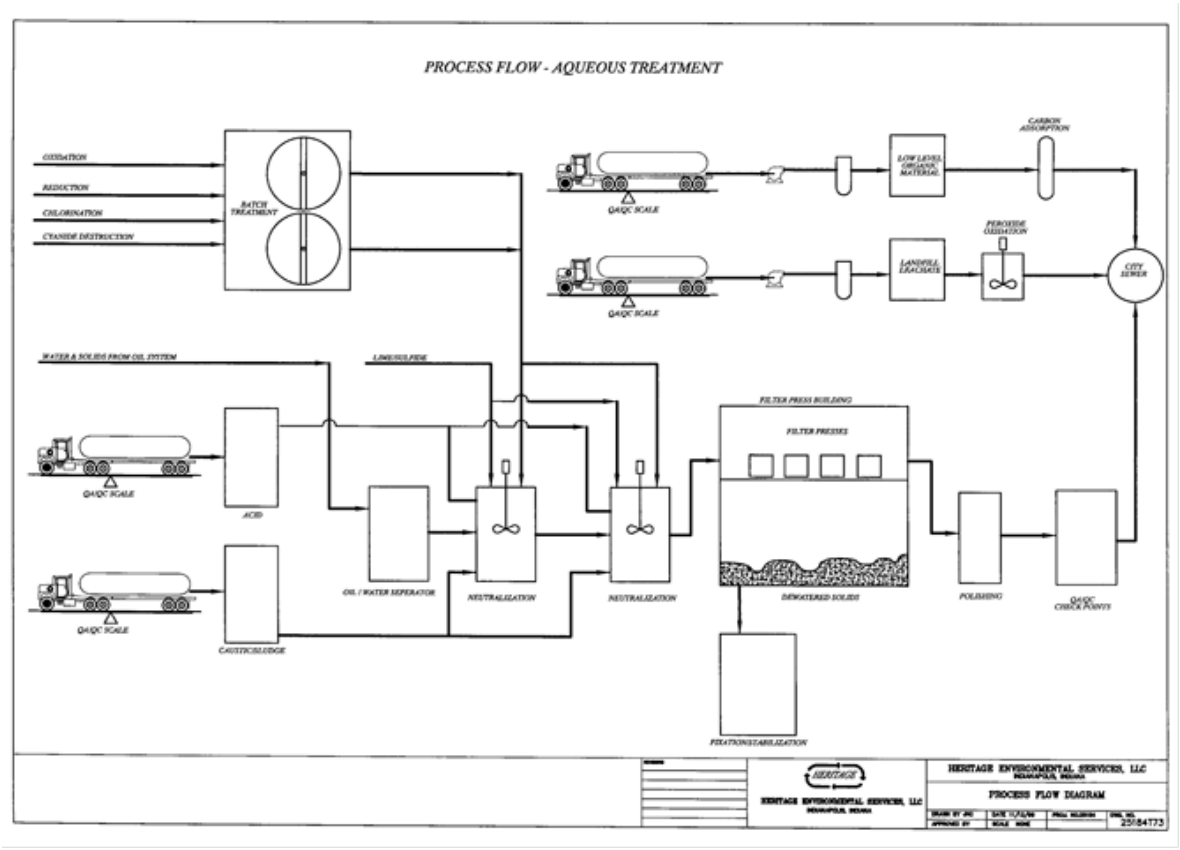
4.3.10. Handling Codes

Handling codes (40 CFR 264, Appendix I) that can be applied to activities conducted on site include S01, S02, T21, T22, T23, T24, T27, T31, T36, T40, T41, T49, and T50.

4.4. WASTE MINIMIZATION/POLLUTION PREVENTION

A written Waste Minimization Program has been developed, and targets are set as part of the corporate strategic planning effort. Scientific management of secondary materials in accordance with the waste management hierarchy is one of Heritage's ten business principles. Heritage's efforts include optimization of treatment processes, use/reuse of secondary materials, recycling of secondary materials, and toxics use reduction in treatment processes.

Figure 3: Process Flow Diagram



5. WASTESTREAM APPROVAL PROCESS

Prior to any wastestream being accepted into a Heritage facility, the generator or authorized representative must complete the approval process. Before a wastestream can begin the approval process, the generator is required to submit a completed wastestream survey form. A credit application must be completed if credit arrangements have not been made with Heritage. Each wastestream to be considered for approval needs a complete, accurate, and signed survey form.

As set forth by RCRA regulation (40 CFR 262.11), the generator is responsible for the hazardous waste determination. Once the technical review of the survey form and any required analytical is complete, pricing is determined, and a quotation is issued. The generator must sign the quotation, return it to Heritage, and schedule shipments with Heritage.

6. ULTIMATE DISPOSAL OF WASTES

The stabilized treatment residue generated from aqueous treatment and stabilization is landfilled at the RCRA Part B permitted Heritage Landfill located near Roachdale, Indiana. The Heritage Landfill is a RCRA Part B permitted land disposal facility. Table 6-1 outlines the major firms Heritage uses for third party disposal.

Table 4: Major Third Party Facilities

Facility	EPA ID#	Types of Material
Covanta, Niagara Falls, NY	NYD986930543	Non-hazardous wastes
INMETCO, Ellwood City, PA	PAD087561015	Nicad batteries
Waste Management, Kaiser, MO	MOR000504456	Fluorescent Light Bulbs
Buzzi, Greencastle, IN	IND006419212	Supplemental Fuels
Covanta, Indianapolis, IN	N/A	Nonhazardous wastes
Danville Landfill, Danville, IN	N/A	Nonhazardous wastes
Rineco, Benton, AR	ARD981057870	Supplemental Fuels
SET Environmental, Houston, TX	TXD055135388	Cylinders
RSR Quemetco Inc, Indianapolis, IN	IND000199653	Lead Acid Batteries

7. COMMUNITY INVOLVEMENT

Heritage founded, contributes to, and participates in the Southwest Community Awareness Association (SCAA). The SCAA promotes interface between residents and industry in the area. Heritage periodically conducts open houses for the community and local agencies.

Heritage offers a $500 per year scholarship and summer employment to one graduating senior at a local high school in the area of each fixed facility. The scholarships are awarded to students seeking science or environmental education at the college of their choice. Many students have benefited by the "real world" experience gained at Heritage while completing their college studies.

Heritage is a member of the following associations in the Indianapolis area: Indianapolis Chamber of Commerce, Indiana Chamber of Commerce, Indiana Environmental Institute (IEI), Environmental Quality Control (EQC), Indiana Recycling Coalition (IRC), Indiana Association of Chemical Recyclers (IACR), Indiana Manufacturers Association (IMA), Indy West Daybreakers Kiwanis Club, Industry Partners for Safety Awareness (ISPA), and the Japan-America Society.

Heritage has contributed to the Indianapolis Zoo, Connor Prairie, YMCA, White River Greenway Community, Indiana Wildlife Federation, Indianapolis Police League, Shrine Circus, Purdue University, IUPUI Scientists Apprenticeship Summer Internship Program, Ben Davis Youth Sports Association, Earth Day Indiana, Indianapolis Public Schools Underprivileged Children Program, and Putnam County Habitat for Humanity.

8. TRAINING AND MEDICAL SURVEILLANCE

8.1. TRAINING

Personnel training records include job titles, description of training, and records of the training. Personnel training records are kept indefinitely. Workers receive RCRA, HAZCOM (29 CFR 1910.1200), HAZWOPER (29 CFR 1910.120), and DOT training that meets or exceeds federal and state regulations.

8.2. MEDICAL SURVEILLANCE

Heritage has developed a medical surveillance program to assess and monitor worker health and fitness at the initiation of, during, and at the termination of employment.

An initial comprehensive medical examination is conducted as a baseline prior to employment. Periodic examinations are conducted on an annual, pre-job, and as-needed basis. Exit examinations are also offered. All medical records are maintained as required by OSHA 29 CFR 1910.20. The Service Centers maintain the OSHA Form 300, and other forms necessary for worker compensation claims and employee exposure records for operations within their service territory. The Corporate Compliance Department aggregates and evaluates safety statistics on a routine basis.

9. SAFETY STATISTICS

As stated in the Heritage Business Principles, we want to be the best in everything we do - at the top of the list is safety. Heritage is committed to the reduction of work-related injuries and illnesses. Table 9-1 lists the interstate experience modification rate as calculated by Tobias Insurance Agency, Inc. for the last five years. Table 9-2 provides an overview of the Bureau of Labor Statistics OSHA Injury and Illness data for the past five years.

Table 5: Corporate Experience Modification Rate (EMR)

YEAR	INTERSTATE
2019	0.85
2018	0.82
2017	0.89
2016	0.82
2015	0.82
2014	0.73

Table 6: Corporate OSHA Injury and Illness Data

CATEGORY	2015	2016	2017	2018	2019
Lost Workday Cases	1	0	2	4	4
Restricted Workday Cases	3	3	5	13	6
Medical Treatment Cases	8	5	5	6	12
Total Recordable Cases	***12***	***8***	***12***	***23***	***23***
Total Hours Worked	1,847,216	1,769,098	3,661,658	3,509,280	3,279,851
Lost Workday Case Rate	0.11	0.00	0.11	0.23	0.24
Recordable Case Rate	1.30	0.90	0.66	1.31	1.40
Total Lost & Restricted Days	249	91	242	748	400
Freq / DART Rate (LT+RT Injuries)	0.43	0.33	0.38	0.97	0.61
Severity Rate	26.96	10.29	13.53	42.63	24.39
Total First Aid Cases	34	70	83	113	126

*2017 - 2019 data includes all Heritage Environmental Companies (HES, HTS, HIS, Rineco)

10.SUBSTANCE ABUSE PROGRAM

It is the goal of Heritage to operate a zero tolerance, drug-free workplace. The use of drugs and alcohol on the job negatively affects the productivity, safety, and stability of the workplace and will not be tolerated. Therefore, Heritage has established this drug abuse and alcohol policy to promote safety and to reduce accidents, risks of property loss, injury to company employees, or injury to the public. The management of Heritage will enforce uniform testing for determination of ability to work and appropriate disciplinary action. Possession, consumption, or sale of alcohol or controlled substances on Heritage and/or customers' property is forbidden and will result in termination. All applicants, employees, temporary employees, company agents and company subcontractors and subject to this program

Testing Circumstances - Pre-Employment, Annual, Reasonable Cause/Suspicion, Post-Accident, Pre-Access

Positive Test Results / Detection Limits

SUBSTANCE	POSITIVE EMIT	CUT OFF GC/MS
6-Acetylmorphine	10.0 ng/mL	10.0 ng/mL
Amphetamines	500 ng/mL	250 ng/mL
Barbiturates	300 ng/mL	300 ng/mL
Benzodiazepines	300 ng/mL	300 ng/mL
Cannabinoids Marijuana	50 ng/mL	15 ng/mL
Cocaine Benzoylecgonine	150 ng/mL	100 ng/mL
Hydrocodone / Hydromorphone	300 ng/mL	100 ng/mL
Methadone	300 ng/mL	300 ng/mL
MDMA Methylenedioxymetha	500 ng/mL	250 ng/mL
Opiates / Codeine / Morphine	2000 ng/mL	2000 ng/mL
Oxycodone / Oxymorphone	100 ng/mL	100 ng/mL
Phencyclidine (PCP) Phencyclidine	25 ng/mL	25 ng/mL
Propoxyphene	300 ng/mL	200 ng/mL
Alcohol Breath Analysis	.04%	.04%
Alcohol Breath Analysis (Stand Down)	.02 -.039%	.02 - .039%

11.FINANCIAL INFORMATION

11.1. GENERAL FINANCIAL INFORMATION

Heritage Environmental Services, LLC ("Heritage") is a privately held corporation. Heritage is not a subsidiary of a parent corporation. Heritage does not release financial reports to the investment community and is not required to complete SEC Form 10K. Heritage does not release information to Dun and Bradstreet (D&B). Information published by D&B regarding Heritage should be considered incomplete and inaccurate. In special circumstances, certain financial information is released to customers after an Agreement of Confidentiality is executed. Heritage does not have a bond rating.

11.2. FINANCIAL ASSURANCE AND LIABILITY INSURANCE (SEE APPENDIX D FOR CERTIFICATE)

Heritage has financial assurance to cover the closure of the facility. The financial assurance instrument was last updated June 2019. The closure cost estimate is $5,413,831. This mechanism for this is a letter of credit with a standby trust fund. Heritage maintains insurance coverage equal to or exceeding the regulatory minimums for:

1. Comprehensive General Liability
2. Pollution Legal Liability
3. Worker's Compensation and Employer's Liability
4. Automobile Liability

APPENDIX A HERITAGE CORPORATE RESUMES

HERITAGE®

Winde Hamrick
Executive Vice President, HES

Education/Training

- Purdue University, West Lafayette, IN
  - B.S. in Chemical Engineering
- OSHA 40-Hour HAZWOPER
  - 29 CFR 1910.120
- Hazardous Materials Transportation Training
  - 49 CFR 172 Subpart H
- RCRA Waste Management
  - 40 CFR 265.16
- CPR/First Aid certified

Relevant Scope of Work Areas

- Has had Waste Treatment experience since 1987
- Expert in Waste Technologies
- Strong knowledge of chemical interactions relevant to process safety
- Working knowledge of RCRA, DOT, OSHA
- Strong leader, results focused
- Creative problem solver

Registrations/Licenses/Affiliations

Professional Engineer, State of Indiana
Class D Industrial Wastewater Treatment Plant Operator, State of Indiana

Summary

Ms. Hamrick has been with Heritage since 1991. She oversees the operations of Heritage's treatment facilities, Subtitle C landfill, incinerator, and information technology department. Her strengths are in TSD operations with a focus on chemical safety and efficiency. Ms. Hamrick started her career at Heritage in the consulting group. Prior to her current assignment, Ms. Hamrick's responsibilities also included managing regional sales, transportation, customer service and wastestream approvals, field and technical services. Before joining the Heritage team, she worked in industry as a production supervisor and as an environmental engineering consultant.

Project Experience

- Implemented various new treatment technologies at Heritage's TSD operations as a result of changing customer needs as well as changing regulations.
- Assisted in pilot testing and start-up of treatment operations at customer sites.
- Executed both engineering and administrative changes in operations to improve process safety at TSDs.
- Improved business flow to enhance the customer experience.

heritage-enviro.com 877.436.8778

HERITAGE®

Craig Hogarth
Director of Safety & Compliance

Education/Training

- Michigan State University, East Lansing, MI
  - MS, Geological Sciences
- Western Michigan University, Kalamazoo, MI
  - BS Geological Sciences
- Indiana State University, Indianapolis, IN
  - Certificate in Safety Management and Industrial Hygiene

Registrations/Licenses/Affiliations

Licensed Professional Geologist in Indiana, Illinois, & Kentucky

Relevant Scope of Work Areas

- Corporate Environmental & Safety Management
- Environmental Permitting & Implementation
- Regulatory Interpretation
- Waste Characterization and Disposal of Complex Wastes and LDR Compliance
- Sampling and Analysis for Environmental Compliance Purposes
- Environmental Training
- Environmental Due Diligence
- Soil and Ground Water Contamination Assessment and Management
- Auditing Third Party Waste Management Facilities

Summary

Mr. Hogarth is responsible for managing Heritage's corporate environmental and safety management effort. Mr. Hogarth also provides expertise to the company with complex waste determinations, environmental training, regulatory analysis and interpretation, and provides environmental management guidance at the corporate level for Heritage employees. Mr. Hogarth has worked for Heritage since 1995. Prior to working at Heritage, Mr. Hogarth worked as an environmental consultant since 1990.

Project Experience

- Prepare applications and obtain environmental operating permits for treatment storage and disposal facilities under RCRA, for discharge of industrial wastewater to Publicly Owned Treatment Works under the CWA, discharge of storm water from industrial facilities under the CWA, 401/404 permitting process in multiple states and EPA regions.
- Program management for RCRA corrective action activities at several Heritage locations involving RCRA Facility Investigation, Screening Ecological Risk Assessment, Environmental Restrictive Covenants, and related activities.
- Project manager for a RCRA Facility Investigation at steel manufacturer. Work included preparation of work plans, implementation of approved work plans, and preparation of technical reports including a removal action for one area.
- Technical manager for a successful exclusion (e.g., "delisting") from hazardous waste regulation at the federal and state level for Electric Arc Furnace dust generated by a steel mill.

- Project manager for Phase I site assessment, removal and closure of six underground storage tanks, installation of new tank systems to replace underground storage tanks, and site investigation at a dry-cleaning facility.
- Responsible for preparation and implementation of multiple RCRA compliance related documents and programs necessary for large quantity generators. Documents include contingency plans, sampling and analysis plans for compliance with generators treating in tanks and containers, personnel training programs, tank integrity assessments, facility inspections, waste minimization plans, complex waste determinations and testing schemes, land disposal restriction compliance, and similar compliance related activities.
- Provided numerous environmental training programs with primary focus on RCRA compliance for Heritage employees and Heritage customers.
- Project manager for decommissioning efforts at a former large truck maintenance operation. Project involved underground storage tank removal, release investigations, and clean closure for four underground storage tanks. Related activities included inventory, consolidation, and disposal of all chemicals at the facility; removal of asbestos, decontamination of above ground tanks, and decontamination of paint booths.
- Project manager for site investigations, coordination with regulatory agency, remediation. design, and construction for two sites with soil and ground water impacted with chlorinated solvents. An engineered system was installed at one facility. Natural attenuation with ground water monitoring was approved by the regulatory agency for the second facility.
- Prepared Oil Pollution Act of 1990 Facility Response Plan for a refinery in Region VI
- Prepared a document submitted to the United States Army Corps of Engineers documenting that a RCRA closure for a surface impoundment was implemented in "substantial compliance" with the National Contingency Plan.
- Participated on the Technical Committee for a CERCLA site conducting feasibility studies, remediation of soil and ground water contaminated with heavy metals -and chlorinated hydrocarbons.
- Conducted facility wide environmental compliance audits for aluminum die casting, concrete manufacturing plant, and refrigerator rack manufacturing operations. Conducted technical peer review of environmental compliance audit documents.
- Prepared RCRA closure plans for a waste pile and container storage area in response to a consent order. Implemented closure of the two units. Provided RCRA consulting services to ensure compliance with the appropriate generator standards.
- Provided technical expertise in the negotiation of a consent order involving RCRA Part B permitting, RCRA corrective action, and compliance with all generator standards for a secondary lead smelter.
- Implemented closure plan for a thermal desorber at a Heritage facility
- Prepared approximately 15 permit modifications for the Heritage facility in Kansas City, Missouri to maintain an up-to-date permit for the facility and maintain compliance with permit standards.
- Prepared industrial wastewater discharge permit applications for several facilities involved in metal finishing and rubber part manufacturing operations. Prepared individual NPDES permit

application for a refinery discharging storm water, contaminated ground water, and several other non-contact refinery streams.

- Performed multiple Phase I site assessments for various customers. Responsible for technical peer review of numerous other Phase I and Phase H environmental site assessments.
- Assisted several companies with addressing generator compliance issues associated with compliance inspections performed by state regulators. Prepared responses to Notices of Violation, assisted companies with documenting information rebutting inspector's findings, and prepared documents for companies to ensure compliance with the regulatory standards.
- Directed site investigation and coordinated remediation of a release involving nitric acid, hydrofluoric acid containing lead. Conducted remediation activities during plant shutdown, prepared documents for state agencies and managed remediation crews performing work under an accelerated schedule.
- Prepared RCRA facility investigation Work Plans and Quality Assurance Project Plans for two permitted facilities in USEPA Region V.
- Managed extensive site assessment for acquisition of a refinery. Continued with providing post acquisition services that have included continuing ground water investigations, free product recovery, and regulatory compliance consulting.
- Managed preparation of a Part B Permit Application for a Heritage owned treatment, storage and disposal facility. Participated in developing comments concerning RCRA corrective action, closure, tank storage, and container storage for other Heritage facilities.
- Prepared a detailed work plan to perform a plant wide engineering and hydrogeologic investigation for a closed chemical plant. Activities included: identification and description of tasks to be performed; preparation of a detailed budget and schedule; compilation of site specific performance specifications and field operations procedures; and preparation of drilling, surveying, and laboratory, and bid packages.
- Directed preparation of a RCRA Part B Permit Application for a closed chemical plant. The permit application included: revisions to the Part A application, closure and post-closure care plans, Solid Waste Management Unit identification, development of all required maps and figures, design of a ground water detection monitoring program, geology report, technical review of the entire permit application, and technical review of an exposure information report.
- Prepared a clean closure demonstration plan for an "equivalency demonstration" under the HSWA amendments for a closed interim status surface impoundment. Activities included: summarizing unit operations, summarizing environmental characterizations, incorporation of a baseline risk assessment to evaluate clean closure, and development of a conceptual sampling program to demonstrate clean closure.
- Provided technical and administrative management for continual environmental compliance activities at a refinery. Activities included: documentation of a land treatment demonstration, preparation and subsequent revision of a RCRA Facility Investigation work plan; preparation and updating of land treatment closure plans; regulation review and planning for Clean Water Act and RCRA issues at the facility, evaluation and response to regulatory concerns and inquiries; and hydrogeologic investigation of a hydrocarbon spill with free product and dissolved constituents.

- Supervised preparation of clean closure certification reports for six hazardous waste management tanks containing fisted or characteristic wastes.
- Planned, implemented, and managed a plant wide preliminary survey to evaluate the potential for soil and ground water contamination at a chemical plant. Activities included: work plan preparation, collection and testing of 250 samples from 125 soil boring locations, installation of selected monitor wells, and preparation of a report and appendices for submittal to the regulating agency.
- Managed ground water sampling and analysis programs for industrial clients. Sampling Programs included ground water quality assessment and RCRA required monitoring programs (detection and compliance). Activities included: preparation of sampling plans; coordination with the clients, sampling personnel, and commercial laboratories; statistical analysis of ground water data; and report preparation.
- Directed collection of municipal water well data, evaluated validity of the data, and aided in development of a computer program designed to prioritize water wells on the basis of aquifer impact and cost of production.
- Prepared Feasibility Study of ground water remedial alternatives for a Superfund site and assisted in preparation of remedial investigation reports.
- Performed and managed an investigation of a leaking underground storage tank. Project included: preliminary site investigation, installation of monitor wells, data collection, report preparation, and development, of a site specific corrective action program.
- Performed hydrogeologic investigations for several clients. Activities included: monitor well installation and development; ground water sampling and analysis, soil boring installation, soil sampling and analysis, aquifer testing, cone penetration testing, hydrogeologic data collection and evaluation, data management, and report preparation.

APPENDIX B KEY FACILITY EMPLOYEE RESUMES

HERITAGE®

CHRISTOPHER M. RAY
Plant Compliance Manager

Education/Training

- Purdue University, West Lafayette, IN
  - B.S. in Environmental Health
- OSHA 40-Hour HAZWOPER
  - 29 CFR 1910.120
- Indiana State University, Terre Haute, IN
  - Safety and Industrial Hygiene Certificate
- Indiana State Purdue University, Indianapolis, IN
  - Hazardous Materials Management Certificate

Area of Expertise

- Manifest and LDR management including but not limited to completion procedures, rejection procedures, un-manifested waste reports, tracking procedures, and correcting procedures.
- RCRA Inspections for Part B permitted Treatment, Storage, and Disposal Facilities including but not limited to area inspections, coating inspections, subpart BB/CC inspections, and SPCC inspections.
- Knowledge of different types of reporting including but not limited to biennial reporting, Indiana annual reporting, Sara Title III tier 2, Self-Monitoring reports, Discharge Monitoring reports, Landfill subtitle D quarterly reports.
- Knowledge of the ISO 14001 standard with special focus on Non-conformance and Preventive and Corrective Action and Communications.
- RCRA regulation pertaining to Part B permitted Treatment, Storage, and Disposal facilities.
- Knowledge of asbestos shipment and disposal regulations.

Project Experience

- Element Champion of Non-conformance, preventive, and corrective action and communication for ISO 14001.
- Maintain and write Standard Operation Procedures for the treatment plant
- Waste Determination of wastes produced at the treatment plant
- Created training modules for Manifest and LDR training
- Conducts Annual Compliance Training
- Conduct internal Plant audits

APPENDIX C PERMITS

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
HAZARDOUS WASTE MANAGEMENT PERMIT

Name of Permittee: Heritage Environmental Services, LLC

Facility Location: 7901 West Morris Street, Indianapolis

EPA Identification Number: IND093219012

Issuance Date: December 31, 2019

Expiration Date: December 31, 2024

Authorized Activities

Pursuant to Indiana Environmental Statutes (IC 13) and the rules promulgated thereunder and codified in Title 329 of the Indiana Administrative Code, Article 3.1 (329 IAC 3.1), the State permit conditions (hereinafter called the permit) of the Resource Conservation and Recovery Act of 1976 (RCRA) permit are issued to Heritage Environmental Services, LLC (HES) (hereinafter called the Permittee) to operate a hazardous waste facility located in Indianapolis, Indiana, Section 15, Township 15 North, Range 2 East at latitude 39^0 44' 520" and longitude 68^0,18' 035" Clermont Quadrangle, on the U.S. Geological Survey topographic map.

The State RCRA program is authorized under 40 CFR Part 271 and Section 3006 of RCRA to administer the hazardous waste management program in lieu of the Federal program, including administration of most of the Hazardous and Solid Waste Amendments (HSWA) of 1984.

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The Permittee is authorized to conduct the following hazardous waste management activities:

	STORAGE		TREATMENT		DISPOSAL
X	Container	X	Tank		Injection Well
X	Tanks	X	Pug Mills, Filter Presses		Landfill
X	Containment Buildings	X	Containment Buildings		Land Application

Federal regulations 40 CFR Parts 260 through 270 have been incorporated by reference. Where exceptions to incorporated Federal regulations are necessary, these exceptions will be noted in the text of the State rule. 329 IAC 3.1-1-7

The conditions of this permit were developed in accordance with the following applicable provisions of 329 IAC 3.1:

☑ ID & Listing of Hazardous Waste
329 IAC 3.1-6
40 CFR 261 Subparts A, B, C, D, and Appendices I, II, III, VII, VIII, IX, X

☑ Standards for Owners and Operators of Treatment, Storage, and Disposal Facilities
329 IAC 3.1-9
40 CFR 264 Subparts A, B, C, D, and E

☐ Ground Water Protection
329 IAC 3.1-9
40 CFR 264 Subpart F

☑ Closure and Post-Closure
329 IAC 3.1-9
40 CFR 264 Subpart G

☑ Financial Requirements
329 IAC 3.1-15

☑ Use and Management of Containers
329 IAC 3.1-9
40 CFR 264 Subpart I

☑ Tank Systems
329 IAC 3.1-9
40 CFR 264 Subpart J

☐ Surface Impoundments
329 IAC 3.1-9
40 CFR 264 Subpart K

☐ Waste Piles
329 IAC 3.1-9
40 CFR 264 Subpart L

☐ Land Treatment
329 IAC 3.1-9
40 CFR 264 Subpart M

☐ Landfills
329 IAC 3.1-9
40 CFR 264 Subpart N

☐ Incinerators
329 IAC 3.1-9
40 CFR 264 Subpart 0

☑ Corrective Action for Solid Waste Management Units
329 IAC 3.1-9
40 CFR 264 Subpart S

☐ Drip Pads
329 IAC 3.1-9
40 CFR 264 Subpart W

☑ Miscellaneous Units
329 IAC 3.1-9
40 CFR 264 Subpart X

☐ Air Emission Standards for
Process Vents
329 IAC 3.1-9
40 CFR 264 Subpart AA

☑ Air Emission Standards for
Equipment Leaks
329 IAC 3.1-9
40 CFR 264 Subpart BB

☑ Air Emission Standards for Tanks
Surface Impoundments and Containers
329 IAC 3.1-9
40 CFR 264 Subpart CC

☑ Containment Buildings
329 IAC 3.1-13
40 CFR 264 Subpart DD

☑ Hazardous Waste Permit Programs
329 IAC 3.1-13
40 CFR 270 Subparts A, B, C, and D

☑ Inspection and Investigation
329 IAC 3.1-1-3 and 329 IAC 3.1-1-4

☑ Enforcement
329 IAC 3.1-1-5

Permit Approval

The Permittee must comply with all terms and conditions of this permit. This permit consists of the conditions contained herein (including those in any Attachments) and the applicable rules and requirements contained in 329 IAC 3.1 and 40 CFR 260 through 270 as specified in the permit. Applicable rules are those which are in effect on the date of issuance of this permit. (See 329 IAC 3.1-13; 40 CFR 270.32)

This permit is based on the assumption that the information submitted in the permit application attached to the Permittee's letter dated November 6, 2017, (VFC# 80564427) and subsequent amendments (VFC# 80637868) is accurate and that the facility has been or will be constructed and/or operated as specified in the application. The IDEM Virtual File Cabinet (VFC) may be viewed online from the IDEM homepage at www.IN.gov/idem.

Any inaccuracies found in the application may be grounds for the modification, revocation and reissuance, or termination of this permit (329 IAC 3.1-13-7), and potential enforcement action. The Permittee must inform the Indiana Department of Environmental Management (IDEM) of any deviation from, or changes in, the information in the application which would affect the Permittee's ability to comply with the applicable rules or permit conditions.

Pursuant to IC 13-15-5-3 and IC 4-21.5-3-5(f), this permit takes effect fifteen (15) days from receipt of this notice. If you wish to challenge this decision, IC 13-15-6-1 and IC 4-21.5-3-7 require that you file a Petition for Administrative Review. If you seek to have the effectiveness of the permit stayed during administrative review, you must also file a Petition for Stay. The petition(s) must be submitted to the Office of Environmental Adjudication, Government Center North, Room 103, 100 North Senate Avenue, Indianapolis, Indiana 46204, within fifteen (15) days after your receipt of this notice. The petition(s) must include facts demonstrating that you are either the applicant, a person aggrieved or adversely affected by the decision, or otherwise entitled to review by law. Identifying the permit, decision, or other order for which you seek review by permit number, name of the applicant, location, or date of this notice will expedite review of the petition. Additionally, IC 13-15-6-2 requires that a Petition for Administrative Review must include:

1. The name and address of the person making the request.
2. The interest of the person making the request.
3. Identification of any persons represented by the person making the request.
4. The reasons, with particularity, for the request.

20CH1006

5. The issues, with particularity, proposed for consideration at the hearing.

6. Identification of the terms of the permit which, in the judgment of the person making the request, would be appropriate in the case in question to satisfy the requirements of the law governing licenses of the type granted or denied by the Commissioner.

Pursuant to IC 4-21.5-3-1(f), any document serving as a petition for review or review and stay must be filed with the Office of Environmental Adjudication. Filing of such a document is complete on the earliest of the following dates:

1. the date on which the petition is delivered to the Office of Environmental Adjudication, Government Center North, Room N103, 100 North Senate Avenue, Indianapolis, Indiana 46204;

2. the date of the postmark on the envelope containing the petition, if the petition is mailed by United States mail; or

3. the date on which the petition is deposited with a private carrier, as shown by a receipt issued by the carrier, if the petition is sent by private carrier.

The portions of the permit for which a Petition for Stay has been filed will take effect at the expiration of the additional fifteen (15) day period unless or until an Environmental Law Judge stays the permit in whole or in part. This permit shall remain in effect until five (5) years from the effective date unless revoked and reissued, modified, or terminated (329 IAC 3.1-13-7), or continued in accordance with IC 13-15-6-3.

This permit terminates and supersedes any other State hazardous waste management permit.

Issued this 31st day of December 2019.

By: Rebecca Eifert Janiskan
Rebecca Eifert Janiskan, Chief
Permits Branch
Office of Land Quality

20CH1006

Heritage Environmental Services
Indianapolis, Indiana
IND093219012

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INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Eric J. Holcomb
Governor

Bruno L. Pigott
Commissioner

August 12, 2019

65-42 WQS/RJB
Ms. Winde F. Hamrick
Heritage Environmental Services LLC
7901 W Morris St
Indianapolis, Indiana 46231

Dear Ms. Winde F. Hamrick:

Re: **Notice of Sufficiency (NOS)**
Industrial Stormwater
NOI Submittal
Heritage Environmental Services LLC
7901 W Morris St
Indianapolis, IN
Marion County
Permit #: INRM01210

The Notice of Intent (NOI) letter submitted for the above referenced facility has been reviewed for completeness by staff of the Indiana Department of Environmental Management (IDEM). The NOI submittal meets the requirements of the National Pollutant Discharge Elimination System (NPDES) general permit rules for stormwater discharge associated with industrial activity (327 IAC 15-6).

An NPDES general permit number is assigned to each facility that has submitted an NOI to comply with 327 IAC 15-6. This number is used as an identification number and should be included with any future correspondence submitted to IDEM relating to the NPDES general permit for stormwater. The general permit number assigned to this facility is: **INRM01210**.

Permittees can now manage their permit on-line, including permit amendments, renewals, terminations, and exclusions (i.e. no exposure) through the Regulatory Service Portal (RSP). The RSP may be accessed at http://www.in.gov/idem/5964.htm.

A permit issued under 327 IAC 15-6 is valid for a period of five (5) years from the date the Department receives the NOI letter. This facility has a permit start date of **July 22, 2019**. The permit start date is the date the permit is effective at your facility and will establish the schedule for the submittal of all required elements specified in the Rule.

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19SD3039_I INI Rule 6 Stormwater NOS

It is important that all activities associated with your facility are in compliance with the requirements of 327 IAC 15-6 (Rule 6). The following are dates, based on the permit start date for which information is to be submitted to IDEM.

1. A Stormwater Pollution Prevention Plan Checklist (State Form 51287) of the general permit rule must be submitted no later than three hundred sixty-five (365) days from **July 22, 2019**. The submittal of a checklist is required for all initial and renewal NOI letters.
2. An Industrial Stormwater Discharge Monitoring Report (State Form 53590) shall be submitted annually. Permit year one (1) stormwater discharge monitoring report must be submitted no later than three hundred sixty-five (365) days from **July 22, 2019.** Please refer to 327 IAC 15-6-7.3 for guidance on the required information to be included with your analytical results submittal.
3. An Annual Report (State Form 54185) shall be submitted annually to IDEM containing information from the previous year of regulation. Permit year one (1) annual report must be submitted no later than three hundred sixty-five (365) days from **July 22, 2019**.

For additional information related to permit requirements, please refer to 327 IAC 15-6 and the stormwater program website at http://www.in.gov/idem/stormwater/. Program forms are available on the program website or on the Forms Page at http://www.in.gov/idem/5157.htm (Scroll to the bottom of the page, the forms are listed under the heading Stormwater and Wetlands).

The General Permit issued for the above referenced facility will expire on **July 21, 2024**. Permittees who continue to operate shall submit a renewal NOI letter not less than ninety (90) days prior to the expiration date.

Any questions regarding this letter may be directed to the Stormwater Permit Coordinator at 317-233-1864 or 800-451-6027, extension 1864. Questions may also be emailed to the program email account of Stormwat@idem.IN.gov.

Sincerely,

Randy J. Braun

Randy J. Braun, CPESC, CPMSM
Section Chief
Stormwater and Wetlands
Office of Water Quality

19SD3039_I INI Rule 6 Stormwater NOS

IMPORTANT NOTICE – ACTION REQUESTED:

327 IAC 15-6-7.3 requires monitoring of several effluent parameters for industrial stormwater discharges associated with your facility. Monitoring reports have typically been submitted via U.S. Mail using the "Rule 6 Industrial Stormwater General Permit Discharge Monitoring Report (State Form 53590)"

In an effort to meet federal U.S. EPA requirements for electronic submittals, you are required to submit federal discharge monitoring reports (DMRs) as well as your sampling data on a routine basis. IDEM will no longer accept paper DMR forms. All NPDES permit holders are required to submit their monitoring data to IDEM using NetDMR.

Please contact Rose McDaniel at (317) 233-2653, Helen Demmings at (317) 232-8815 or Gary Starks (317) 232-8694 for more information on NetDMR, or email questions to NetDMR@idem.IN.gov. Information is also available on the IDEM website at http://IN.gov/idem/cleanwater/2422.htm.

19SD3039_I INI Rule 6 Stormwater NOS

CWA Authority, Inc.

AUTHORIZATION TO DISCHARGE

INDUSTRIAL WASTEWATER TO THE MUNICIPAL SEWER SYSTEM

In compliance with CWA Authority, Inc. Resolution No. 2-2011 including amendments and the "Sewage Disposal Service Tariff Rates, Terms, and Conditions for Sewage Disposal Services within Marion County, Indiana,"

HERITAGE ENVIRONMENTAL SERVICES, LLC

is authorized to discharge industrial wastewater to the Indianapolis municipal sewer system from a facility located at

7901 West Morris Street
Indianapolis, Indiana 46231

This permit renewal shall become effective ***February 1, 2017.***

This permit and the authorization to discharge wastewater shall expire at midnight, ***January 31, 2022.*** In order to renew authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as required by the CWA Authority, Inc. no later than sixty (60) days prior to the date of expiration.

Signed this 04 day of January, 2017 by authority of the Director of Environmental Stewardship, CWA Authority, Inc.

Ann McIver, QEP
Director
Environmental Stewardship

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

Minor Source Operating Permit Renewal
OFFICE OF AIR QUALITY

Heritage Environmental Services, LLC
7901 West Morris St.
Indianapolis, Indiana 46231

(herein known as the Permittee) is hereby authorized to operate subject to the conditions contained herein, the source described in Section A (Source Summary) of this permit.

This permit is issued to the above mentioned company under the provisions of 326 IAC 2-1.1, 326 IAC 2-6.1 and 40 CFR 52.780, with conditions listed on the attached pages.

Indiana statutes from IC 13 and rules from 326 IAC, quoted in conditions in this permit, are those applicable at the time the permit was issued. The issuance or possession of this permit shall not alone constitute a defense against an alleged violation of any law, regulation or standard, except for the requirement to obtain a MSOP under 326 IAC 2-6.1.

Operation Permit No.: M097-30950-00122	
Issued by: Jeff Ach for Nathan Bell Nathan C. Bell, Section Chief Permits Branch Office of Air Quality	Issuance Date: January 2, 2013 Expiration Date: January 2, 2023

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control numbers for this information collection are 0579-0054, 0088, 0129, 0198, 0238, 0257, 0306, 0310. The time required to complete this information collection is estimated to average 1.25 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

FORM APPROVED OMB NUMBER 0579-0054/0088/0129/0198/0238/0257/0306/0310

UNITED STATES DEPARTMENT OF AGRICULTURE ANIMAL AND PLANT HEALTH INSPECTION SERVICE PLANT PROTECTION AND QUARANTINE	**COMPLIANCE AGREEMENT**
1. NAME AND MAILING ADDRESS OF PERSON OR FIRM Deborah Edwards Heritage Environmental Services, LLC 7901 West Morris Street Indianapolis, IN 46231 Phone: (317) 486-2892 Fax: (317) 486-2852	2. LOCATION Bill Berry Heritage Environmental Services, LLC. (Landfill) 4370 West, County Road 1275 North Roachdale, IN 46172 Phone: (765) 435-2704 Fax: (765) 435-3716

3. REGULATED ARTICLE(S)

Non-sterilized Foreign soil; or Foreign & Domestic soil; or Domestic soil (HI and/or U.S. territories) - LANDFILL DISPOSAL

4. APPLICABLE FEDERAL QUARANTINE(S) OR REGULATIONS

7 CFR Part 330 and 7 CFR 301

5. WE AGREE TO THE FOLLOWING:

I. Transfer and Noncompliance

A. This agreement may be immediately cancelled or revoked for noncompliance.

B. This compliance agreement is non-transferable.

C. Any person who knowingly violates the Plant Protection Act (PPA) (7 U.S.C. 7701 et seq.) and/or the Animal Health Protection Act (AHPA) (7 U.S.C. 8301 et. seq.) may be criminally prosecuted and found guilty of a misdemeanor which can result in penalties, a one-year prison term or both. Additionally, any person violating the PPA and/or the AHPA may be assessed civil penalties of up to $250,000 per violation or twice the gross gain or gross loss for any violation that results in the person deriving pecuniary gain or causing pecuniary loss to another, whichever is greater

II. Procedures, protocols and limitations established in 'General Stipulations' (attached).

6. SIGNATURE	7. TITLE	8. DATE SIGNED
DC Edwards	Vice President	07/26/2011

The affixing of the signatures below will validate this agreement which shall remain in effect until cancelled, but may be revised as necessary or revoked for noncompliance.

9. AGREEMENT NO.
IN-FR-SLF-007

10. DATE OF AGREEMENT
[05/24/2011]

11. PPQ/CBP OFFICIAL (NAME AND TITLE)	12. ADDRESS
Nick Johnson, Bdg#:5515 USDA-APHIS-PPQ, PLANT HEALTH SAFETY SPECIALIST	USDA-APHIS-PPQ 3059 North Morton Street Franklin, Indiana 46131
13. SIGNATURE	
14. U.S. GOVERNMENT/STATE AGENCY OFFICIAL (NAME AND TITLE)	15. ADDRESS
16. SIGNATURE	

Authorization:

This Compliance Agreement authorizes the Permittee of **[Heritage Environmental Services, LLC 4370 West, County Road 1275 North, Roachdale, IN 46172]** to receive untreated regulated DOMESTIC and/or FOREIGN soil for **Landfill disposal.** Untreated regulated soil may also be managed at the Permittee's location at 7901 West Morris Street, Indianapolis, IN, 46231 prior to landfill disposal.

APPENDIX D CERTIFICATES OF INSURANCE / EMR LETTER

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 07/29/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Lyndsay Myers
AssuredPartners of Indiana, LLC 1-317-844-7759	PHONE (A/C, No, Ext): 317-595-7392 FAX (A/C, No):
10401 N. Meridian #300	E-MAIL ADDRESS: Lyndsay.Myers@assuredpartners.com
Indianapolis, IN 46290	INSURER(S) AFFORDING COVERAGE / NAIC #
INSURED	INSURER A: GREENWICH INS CO 22322
Heritage Environmental Services, LLC	INSURER B: XL INS AMER INC 24554
5400 W 86th Street	INSURER C: XL SPECIALTY INS CO 37885
Indianapolis, IN 46268	INSURER D: ZURICH AMER INS CO 16535
	INSURER E: IRONSHORE SPECIALTY INS CO 25445
	INSURER F: TOKIO MARINE PACIFIC INS LTD 11216

COVERAGES **CERTIFICATE NUMBER:** 59883755 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY	X	X	GEC000304120	08/01/20	08/01/21	EACH OCCURRENCE	$ 1,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 100,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						MED EXP (Any one person)	$ 5,000
	POLICY X PRO-JECT LOC						PERSONAL & ADV INJURY	$ 1,000,000
	OTHER:						GENERAL AGGREGATE	$ 2,000,000
							PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
B	AUTOMOBILE LIABILITY	X	X	AEC000304320	08/01/20	08/01/21	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
C	X UMBRELLA LIAB X OCCUR	X	X	UEC00183618	08/01/20	08/01/21	EACH OCCURRENCE	$ 10,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$ 10,000,000
	DED X RETENTION $ 10,000							$
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N	N/A	X	WC929886320	08/01/20	08/01/21	X PER STATUTE OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N (Mandatory in NH)						E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
E	POLLUTION LEGAL LIABILITY			002855804	08/01/20	08/01/21	EACH 15,000,000 AG	30,000,000
P	CPL/ PROFESSIONAL			PPK2163928	08/01/20	08/01/21	EACH 15,000,000 AG	30,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER IS ADDITIONAL INSUREDS ON A PRIMARY NON-CONTRIBUTORY BASIS FOR GENERAL LIABILITY (INCLUDING ONGOING AND COMPLETED OPERATIONS) AND AUTO LIABILITY; WAIVER OF SUBROGATION APPLIES IN FAVOR OF THE A FORENAMED ADDITIONAL INSUREDS FOR GENERAL LIABILITY, AUTO LIABILITY AND WORKERS COMPENSATION POLICIES; BUT ONLY WHERE REQUIRED BY WRITTEN CONTRACT, AND WHERE ALLOWABLE BY LAW. UMBRELLA TO FOLLOW FORM

CERTIFICATE HOLDER

HERITAGE ENVIRONMENTAL SERVICES AND ITS

SUBSIDIARIES AND AFFILIATES
7901 W. MORRIS ST.
INDIANAPOLIS, IN 46231
USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

AssuredPartners of Indiana, LLC
10401 N. Meridian Street | Suite 300
Indianapolis, IN 46290
Phone: 317-844-7759 | Fax: 317-815-6036

July 28th, 2020

Mike Karpinski
Heritage Environmental Services, LLC
6510 Telecom Drive
Suite 400
Indianapolis, IN 46278

Re: Heritage Environmental Services, LLC
Workers Compensation Experience Modification

Dear Mike:

Occasionally your clients request your historical Workers Compensation Experience Modification Factors. The following Factors represent your Experience Rating as calculated by the National Council on Compensation Insurance, Inc. (NCCI):

August 1, 2020:	0.81
August 1, 2019:	0.83
August 1, 2018:	0.81
August 1, 2017:	0.89
August 1, 2016:	0.82
August 1, 2015:	0.82

Thank you, and please let us know if you have any questions.

Very truly yours,

AssuredPartners of Indiana, LLC

Nicholas E. Schafer, CIC, AIS, AINS
nick.schafer@assuredpartners.com

/ns

APPENDIX E USDOT HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR (S) 2019-2022

Registrant: HERITAGE ENVIRONMENTAL SERVICES LLC
ATTN: Alexander Bensley
6510 TELECOM DRIVE
INDIANAPOLIS, IN 46278

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 043019550023BD Effective: July 1, 2019 Expires: June 30, 2022

HM Company ID: 9097

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with PHMSA; and

(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, PHH-52, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, D C 20590, telephone (202) 366-4109.

APPENDIX F CERTIFICATION OF COMPLIANCE – DOT SECURITY PLAN

Heritage Environmental Services, LLC
7901 West Morris Street
Indianapolis, IN 46231

CERTIFICATE OF COMPLIANCE

Heritage Environmental Services, LLC certifies that it has complied with 49CFR172 Subpart I requirements to implement a security plan at the Treatment, Storage, and Disposal facilities located in Indianapolis, Indiana and Roachdale, Indiana.

Heritage Environmental Services, LLC has in place a security plan that covers the following criteria:

- Background, Objectives, and Overview
- Personnel Security
- Unauthorized Access
- En route Security
- Security Training
- Security Structure

All drivers and personnel of these facilities have been trained in the security plan.

All questions concerning the Heritage Environmental Services, LLC Indianapolis Treatment Center Security Plan can be directed to Steven Danenman, Compliance Manager, at (317)486-2722.

Steven Danenman
Compliance Manager

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 07/02/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Willis Towers Watson Northeast, Inc. c/o 26 Century Blvd P.O. Box 305191 Nashville, TN 372305191 USA	CONTACT NAME: Willis Towers Watson Certificate Center PHONE (A/C, No, Ext): 1-877-945-7378 FAX (A/C, No): 1-888-467-2378 E-MAIL ADDRESS: certificates@willis.com
INSURED Clean Earth Environmental Solutions, Inc. 350 Poplar Church Road Camp Hill, PA 17011	INSURER(S) AFFORDING COVERAGE — NAIC # INSURER A : ACE American Insurance Company — 22667 INSURER B : Indemnity Insurance Company of North Ameri — 43575 INSURER C : Allied World Assurance Company US Inc — 19489 INSURER D : INSURER E : INSURER F :

COVERAGES **CERTIFICATE NUMBER:** W17142176 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [ ] PRO-JECT [ ] LOC [ ] OTHER:			HDO G71449294	06/30/2020	06/30/2021	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 5,000,000 $ 5,000,000 $ 100,000 $ 5,000,000 $ 5,000,000 $ 5,000,000
A	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [X] HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY			ISA H25301948	06/30/2020	06/30/2021	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 5,000,000 $ $ $
	[ ] UMBRELLA LIAB [ ] OCCUR [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $						EACH OCCURRENCE AGGREGATE	$ $
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N: No (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WLR C67455782	06/30/2020	06/30/2021	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 3,000,000 $ 3,000,000 $ 3,000,000
A	Excess Workers Compensation			WCU C67455824	06/30/2020	06/30/2021		See Page 2

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

SEE ATTACHED

CERTIFICATE HOLDER

Evidence of Coverage

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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AGENCY CUSTOMER ID: _____

LOC #: _____

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
Willis Towers Watson Northeast, Inc.	Clean Earth Environmental Solutions, Inc. 350 Poplar Church Road Camp Hill, PA 17011
POLICY NUMBER See Page 1	
CARRIER: See Page 1 / NAIC CODE: See Page 1	EFFECTIVE DATE: See Page 1

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: 25 FORM TITLE: Certificate of Liability Insurance

Excess Workers Compensation:
Part One: Statutory

Part Two:
Bodily Injury by Accident, Each Accident: $3,000,000
Bodily Injury by Disease, Policy Limit: $3,000,000
Bodily Injury by Disease, Each Employee: $3,000,000

INSURER AFFORDING COVERAGE: Allied World Assurance Company US Inc NAIC#: 19489
POLICY NUMBER: 0312-3010 EFF DATE: 04/06/2020 EXP DATE: 04/06/2021

TYPE OF INSURANCE:	LIMIT DESCRIPTION:	LIMIT AMOUNT:
Contractor's Pollution/Prof.	Per Incident:	$10,000,000
	Aggregate:	$10,000,000

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SR ID: 19817852 BATCH: 1733629 CERT: W17142176

Clean Earth Environmental Solutions, Inc.
PSC Environmental Services LLC
Clean Earth Specialty Waste Solutions, Inc.
Luntz Acquisition (Delaware), LLC
21st Century Environmental Management of Nevada, LLC
21st Century Environmental Management, LLC of Rhode Island
Chemical Pollution Control of Florida, LLC
Chemical Pollution Control, LLC of New York
Northland Environmental, LLC
General Environmental Management of Rancho Cordova LLC
Burlington Environmental, LLC
Solvent Recovery, LLC
PSC Recovery Systems, LLC
Republic Environmental Systems (Pennsylvania), LLC
Republic Environmental Systems (Transportation Group), LLC
Republic Environmental Recycling (New Jersey), Inc.
Nortru, LLC
Allworth, LLC
Rho-Chem, LLC
Chemical Reclamation Services, LLC
Philip Reclamation Services, Houston, LLC

CleanEarth.

Clean Earth of North Jersey, Inc.

Facility Audit Package

October 2020

115 Jacobus Avenue
Kearny, NJ 07032
Phone: (973) 344-4004
Fax: (973) 344-4004
Website: https://cleanearthinc.com/locations/kearny

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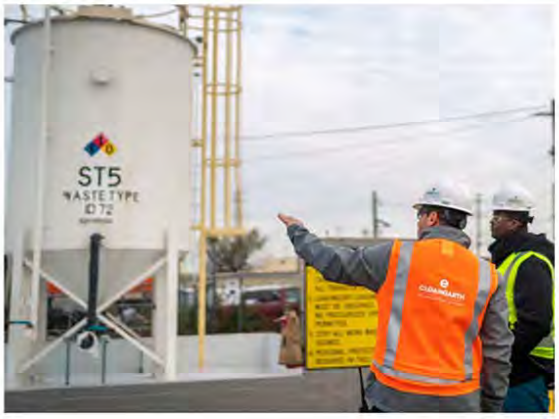
g) Corporate Health and Safety Plan
h) Primary Contacts and Key Personnel

Facility Quick Reference Guide

Kearny

105 Jacobus Avenue
Kearny, NJ 07031



Facility Contact

T 973.344.4004
F 973.344.8652

Customer Service

T 973.344.4004
F 973.344.8652

Receiving Hours

7:00 a.m. to 5:30 p.m., Monday - Friday

Facility Access

Easy truck access from NJ Turnpike - Exit 15E
Direct on-site rail service

Facility Type

RCRA Part B Permitted Treatment, Storage and Disposal Facility (TSDF) that accepts Hazardous & Non-Hazardous Waste

Treatment Platform

Chemical Fixation (or stabilization) of RCRA Hazardous Waste, Solidification of Non-Hazardous Waste, Fuel Blending and Bulk Solid Transfer

Capacity

Hazardous Waste: 249,500 gallons (or tons equivalent)
Non-Hazardous / Industrial Waste: 2,800 tons per day

EPA ID

NJD991291105

Services

- Sampling
- Rail Service
- Lab Packing
- Transportation
- Laboratory Analysis
- Technical Assistance
- Project Management
- Materials Management
- Solidification of Liquids & Sludges
- Fuel Blending of Liquids, Sludges, & Solids
- Hazardous & Non-Hazardous Waste Processing
- Stabilization of Heavy Metal Liquids, Sludges, & Solids

Acceptable Material Within Our TSDF Network

Various Hazardous and Non-Hazardous Industrial Waste, including but not limited to, RCRA, listed and TSCA Waste, Contaminated Soil, Liquids, Sludge, Solids, Debris, and Electronics

- PCBs
- Aerosols
- Solvents
- Asbestos
- Lab Packs
- Oily Waste
- Drill Cuttings
- Industrial Waste
- Pharmaceuticals
- Flammable Solids
- Contaminated Soil
- RCRA Medical Waste
- Non-Hazardous Materials
- Universal Waste - Recycling
- Waste Water (bulk / non-bulk)
- Hazardous Liquid (bulk / non-bulk)
- Non-Hazardous Regulated Medical Waste, including Soft Chemotherapy Waste

Purpose

The purpose of this document is to provide current and potential clients with environmental compliance information regarding Clean Earth of North Jersey (CENJ), located in Kearny, New Jersey.

Many Clients require an audit package prior to or while using our permitted facility for management of hazardous and non-hazardous waste. This package is intended to be complete and comprehensive in fulfilling your audit requirements. Requests for additional information may be directed to Clean Earth's Customer Service Manager or Director of Environmental Compliance.

About Clean Earth

Clean Earth, LLC (Clean Earth) is one of the largest specialty waste companies in the United States providing remediation, disposal, recycling, and beneficial reuse solutions for contaminated soil, dredged material, and hazardous and non-hazardous waste. Our vast portfolio of technologies and services touches nearly every industry that generates waste including energy, infrastructure, commercial, industrial, retail, and healthcare markets.

It is our unique capability of providing a one-source, full-service solution to handle multiple waste streams from a single customer that separates us from the competition. Our processes are detailed, our due diligence is tireless, and our results provide unmatched recycling solutions for our customers with the utmost in customer service.

Everyday Clean Earth takes a hands-on, dedicated approach to recycling and beneficially reusing waste that would otherwise go into landfills. Allow our team of experts to provide a customized waste disposal and recycling solution for your company, tailored to your needs, and your goals.

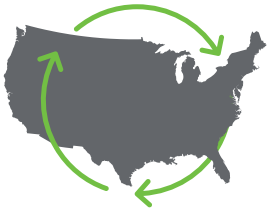
Vision Mission and Values

OUR VISION

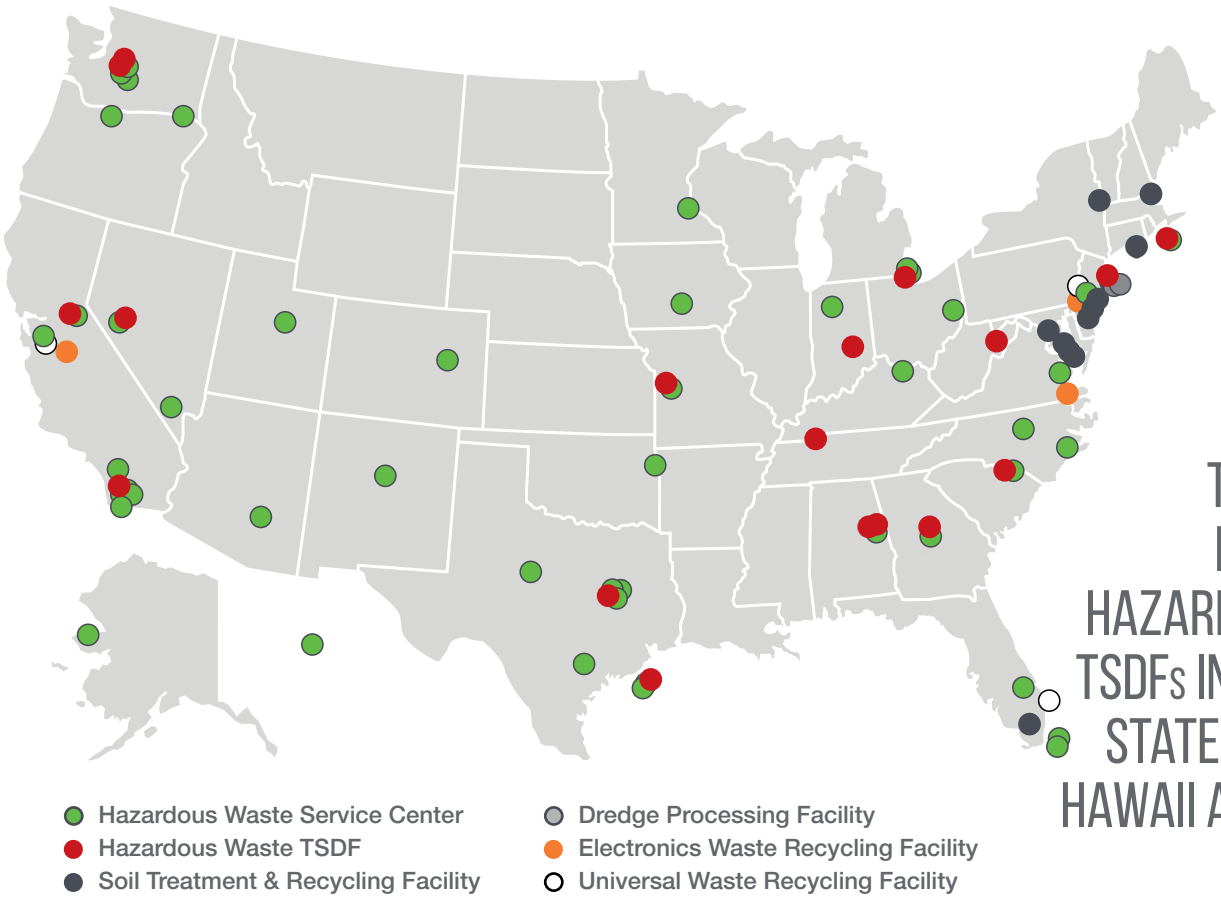
To create a better future for
our people, partners, and planet.

OUR MISSION

We turn specialty waste
into recycling opportunities.



INTERNALLY	OUR VALUES	EXTERNALLY
Safety and integrity are everything.	**Do the right thing.**	Integrity drives loyalty.
Accountability builds a stronger team.	**Do what you say you're going to do.**	Reliability builds trust with customers.
Our team "gets it done" despite roadblocks.	**Commit to excellence.**	We work hard for our customers every day.
Close-knit teams deliver better results.	**Build Relationships**	Real connections deliver better solutions.
Communication should be open, honest, and often.	**Communicate effectively.**	We listen, learn, and lead.
We value creativity and welcome change.	**Share and embrace new ideas.**	Customers look to us for fresh thinking.
Serving each other helps us serve customers.	**Have a service mindset.**	We deliver when customers need it most.
Consistently take thoughtful action.	**Take the initiative.**	We turn challenges into opportunities.



THE LARGEST NETWORK OF HAZARDOUS WASTE TSDFs IN THE UNITED STATES, INCLUDING HAWAII AND ALASKA.

SERVICES & SOLUTIONS

HAZARDOUS WASTE

- Aerosols
- Asbestos
- Contaminated Soil
- PCBs
- Oily Waste
- Drums
- Lab Packs
- Industrial Waste
- Pharmaceuticals
- Solvents
- Flammable Solids
- Non-Hazardous Mateerials
- Waste Water (bulk / non-bulk)
- Hazardous Liquid (bulk / non-bulk)

ON-SITE FIELD SERVICES & TRANSPORTATION

- On-site Soil and Logistics Management
- On-site Laboratory Chemical Packaging
- On-site Hazardous Waste Management
- Hazardous and Non-hazardous Waste Transportation

SOIL TREATMENT

- Thermal Desorption
- Bioremediation
- Chemical Fixation
- Physical Treatment
- Soil Screening
- Soil Sampling
- Laboratory Analysis

ELECTRONICS & UNIVERSAL WASTE

- Batteries
- Lamps / Bulbs
- Mercury Containing Items
- Electronic Equipment
- Paints*
- Pesticides / Herbicides*

ENVIRONMENTAL SUPPORT SERVICES

- Excavation, Material, and Disposal Plans
- Map and Grid
- Sampling Plans
- Waste Classification Guidance
- Field Sampling Services
- Approval Reviews

DREDGED MATERIAL PROCESSING

- Clean and Contaminated Dredged Material
- Marine Debris and Sediment
- Fresh Water Sediment
- Pier Demolition Debris

CCP MANAGEMENT

- Pretreatment, Handling, Logistics, and Placement
- Aeration Basins
- Holding Lagoons
- Ponds and Impoundments
- Land Application
- Structual Fill Projects
- Power Plant Waste Support Services

CONSTRUCTION DEBRIS

- Rock, Brick, Block, Asphalt, and Concrete

AEROSOLS & CONSUMER COMMODITIES

- Pressurized Steel, Aluminum Cans, Glass, and Plastics

HARSCO

CleanEarth™

Environmental solutions
for specialty waste streams

HARSCO ENVIRONMENTAL

Environmental solutions
for industrial byproducts

HARSCO RAIL
Enabling TECHNOLOGY IN MOTION

Railway track maintenance
and new track constructions

HARSCO CORE VALUES

At the center of all we do is our Code of Conduct, which underpins our ethical business practices worldwide.

Our uncompromising commitment to moral and ethical principles

Actively focusing on customer satisfaction by listening to our customer's needs, and consistently delivering value that exceeds expectations

We are focused on creating exceptional value for our employees, customers, and shareholders

Creating an environment where all people are actively included

We respect all individuals and value their contributions

We are committed to ensuring a safe, appealing work environment, market-competitive benefit programs and investing in our employees' personal development

General Facility Information

Clean Earth's hazardous waste facility located in Kearny, New Jersey is one of only two commercial Resource Conservation and Recovery Act (RCRA) Part B permitted facilities in the New York metro area and the largest manager of RCRA waste in the state of New Jersey. As a fully permitted RCRA TSDF for the treatment and processing of hazardous and non-hazardous soils, bulk liquids, bulk solids, and drums, this hazardous waste facility is the disposal facility of choice for hazardous waste materials. This state-of-the-art facility has an on-site certified laboratory for analysis of contamination, a stabilization facility, and is the only rail served hazardous waste facility with indoor-trans-loading capabilities within the tri-state area. Clean Earth uses a state-of-the-art emissions control system that is an integral part of its chemical fixation process. The facility is owned and operated by Clean Earth LLC, Hatboro, Pennsylvania.

The NAISCS code for the facility is 562211.

a) Location

The CENJ Facility is located at 115 Jacobus Avenue, Hudson County, Kearny, New Jersey (latitude 40 degrees 44 minutes and 22 seconds, longitude 74 degrees, 6 minutes, and 41 seconds). The facility occupies approximately 5.8 acres. The facility is located in a heavily industrialized area and the CENJ site is surrounded by sites which have been used in the past and continue to be used for various industrialized activities. The site is bordered to the North by property owned by Public Service Electric and Gas, to the East by Conrail right-of-way and then Jacobus Avenue, to the South by former Syncon Resins facility (a NPL listed site), and to the West by the Passaic River.

b) Operating Hours

Receiving hours for the CENJ Facility are 7:00 a.m. through 5:30 p.m. Monday through Friday.

c) Site History

From March 10, 1910, to June 26, 1963, the property was owned by the Foundation Company; a New York Corporation, which dissolved in 1969. The Foundation Company, according to its certificate of incorporation, appeared to be involved in all aspects of the construction industry. Available information indicates that the Foundation Company used the property to store construction equipment and material. It is also believed that the explosive materials and paints were stored on the site during this period. Current addresses for former Foundation Company officials are unknown.

From June 26, 1963, to November 15, 1972, the property was owned by Robert P. Herzog, Trustee in Bankruptcy for the Apex Equipment and Leasing Corporation (Apex), a NJ Corporation. From the certificate of incorporation for this company, it appears that the company was involved in the trading of various types of heavy equipment. However, it is not known how Apex used the property in question. Apparently, the company went bankrupt during the time that it owned the property, as the property was sold by a Trustee in Bankruptcy in 1972. Current addresses for former officials of Apex are unknown.

From November 15, 1972, through October 19, 1979, the property was owned by Jacobus Realty, a New Jersey partnership. It is not known how the property was used during this period. Offices for Jacobus Realty in 1979 were located at 91 E. Peddie Street, Newark, NJ. A current address for this former property owner is unknown.

From October 19, 1979, through March 6, 1980, the property was owned by the Schuyler Service Company, a New Jersey Corporation, Warren Disch, President. Mr. Disch was involved with marine salvage and construction activities. It is also believed that small quantities of waste oils were stored on site. A current address for Schuyler Service Co. is not known.

March 6, 1980, to February 2, 1987, Lot 14 was registered as being owned by Salvatore and William Moscatello, partners, trading as Evergreen Partnership with offices located at 115 Jacobus Avenue, Kearny, NJ Lot 14 was purchased by the Evergreen Partnership on March 6, 1980, and lots 14A and 14R were purchased by the Evergreen Partnership on December 28, 1983, lots 14A and 14R were owned by Warren R. Disch.

From 1983 until 1990, Mr. Disch leased Lot 14R from S&W. S&W started the operation of its hazardous waste treatment, storage and transfer facility on Lot 14 and 14A during this period, on October 3, 1984. Prior to 1984, Lot 14 was used for the storage of empty tractor trailer trucks and Lot 14R was used for wooden pallet reconditioning operations.

From February 2, 1987, until December 30, 1998, the registered owner of the property was Melon Leasing Corporation, Inc., with offices located at 115 Jacobus Avenue, Kearny, NJ. The property was registered as being leased to Amtech Environmental Corporation. During this ownership period, S&W continued to operate its hazardous waste treatment, storage and transfer facility on the property.

Amtech and Melon are property holding companies, having owned only the S&W facility and improvements thereon, which were leased to S&W. The two affiliated companies had no employees and no operations other than real estate. No separate financial statements were prepared for Amtech or Melon. S&W, Melon and Amtech were all owned by the same individual.

On December 30, 1998, U. S. Plastic Lumber Corp. acquired 100% of the outstanding shares of S&W Waste, Inc., and purchased the real property and improvements from Amtech and Melon. After this purchase, S&W Waste, Inc. was operated as a wholly owned subsidiary of Clean Earth, Inc., the environmental services division of U. S. Plastic Lumber Corp.

On April 16, 2001, S&W Waste, Inc. changed its name to Clean Earth of North Jersey, Inc. Effective September 25, 2001, the Hazardous Waste Facility Permit was also changed to Clean Earth of North Jersey, Inc.

On September 9, 2002, CEI Holding Corp. acquired all of the assets of Clean Earth of North Jersey, Inc. from U. S. Plastic Lumber Corp. CEI Holding Corp. is doing business as Clean Earth, Inc.

On October 17, 2005, Clean Earth Holdings, Inc. acquired all of the assets of Clean Earth of North Jersey, Inc. from CEI Holding Corp. Clean Earth Holdings, Inc. is doing business as Clean Earth, Inc.

d) Site Description

The CENJ facility is permitted as a commercial hazardous waste treatment, storage, and transfer facility. The facility receives waste streams of various hazardous waste codes from off-site generators via highway and rail. The facility has a permitted maximum storage capacity of 249,500 gallons or its equivalent volume of hazardous waste at any one time. The wastes are stored and treated on-site in containers and tanks and within cells the Containment Building. Containers are stored in segregated areas to separate incompatible waste. In addition, all hazardous waste is treated, stored, and/or transferred within designated areas that are contained via concrete basins and curbing.

Existing waste treatment activities at the facility include the blending of wastes in tanks and tankers to meet the specifications of the end users. Additional waste treatment activities include the solidification/stabilization of waste solids, slurries and sludge in concrete cells, containers and containment building, container repackaging and the homogenization of waste in containers. The permitted hazardous waste container storage areas may also be used to store and/or manage solid waste per the Hazardous Waste Facility Permit.

Also conducted within the footprint of the hazardous waste facility, but not within the scope of this hazardous waste permit, is the management of non-hazardous waste. Activities include the management of non-friable asbestos, and the collection and transfer of large quantity universal waste materials such as batteries, pesticides, mercury containing devices, consumer electronics, lamps, and more. The above activities are conducted in accordance with other appropriate regulations and permits/approval from the New Jersey Department of Environmental Protection.

A site map of the facility is included in the appendix.

e) Geology and Hydrogeology

The general geological profile for this site can be characterized by four distinct strata, a silt and sand layer located at the upper portion of the profile, a clay layer which underlies the upper unit, a sand layer confined by the clay layer and a deep silty clay layer.

As part of CENJ's groundwater monitoring program, nine (9) monitoring wells and four (4) observation wells were installed at the site. During installation of these wells, groundwater was encountered at depths ranging from 3 feet to 4 feet below grade.

The information obtained from the installation of monitoring wells confirmed the existence of a continuous confining clay layer underlying a permeable shallow unit. Based on the available soil boring information from the monitor wells, observation wells, and soil borings completed on site, the upper portion of the geological profile at the site consists mainly of two units. The upper unit consists of a brown-gray poorly sorted sand, which was occasionally found to contain fragments of mollusk shells. This unit ranged in thickness from 2.5 feet to 7 feet. A second unit consisting of a gray plastic clay was observed under the sand unit. The depth to the clay layer ranged from 7.5 feet to 11.5 feet below grade.

While no investigation has been conducted to determine the thickness of the clay layer at the CENJ site, the following sediment profile was identified at the adjoining Syncon Resins site:

1) A 8-10 foot surficial fine to coarse sand layer
2) A 10 foot highly plastic clay layer
3) A 10 foot medium sand layer
4) A deep silty clay / very fine sand layer

A similar stratigraphy was identified at the nearby Monsanto Kearny Plant. The above soil profile appears to form part of the Pleistocene deposits of glacial origin previously described in the section titled "Regional Geology."

The native soils at the site are overlain by approximately 2.5 feet to 8 feet of fill materials. The fill materials observed in the soil boring included cinders, glass, ceramic, brick, coal, gravel, wood, concrete, asphalt, various sands, silts and clays.

In order to better define the nature of the confining clay layer that underlies the upper geological unit, Shelby tube samples were collected from the clay layer during the installation of certain monitoring wells.

Hydraulic conductivity tests were performed on the undisturbed soil samples contained in the Shelby tubes, using laboratory procedures in accordance with the standard procedures established by the American Society for Testing and Materials, ASTM, Designation D5084-90 "Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Well Permeameter." The hydraulic conductivity values obtained from the laboratory analysis of clay and silt soil samples fall into the "very low" permeability categories.

In several of the soil borings performed on the eastern portion of the property a dark gray silty clay with some black organic matter was observed at the base of the fill materials. The occurrence of these organic materials may indicate the presence of recent deposits at the CENJ site. However, it appears that any recent deposits present at the site have been disturbed by the historic filling activities and, therefore, are not likely to have significant effect on the hydraulic characteristics of the shallow hydraulic units in the vicinity of the site.

There are three primary aquifers at the site. The shallow aquifer consists of the uppermost sand unit of Pleistocene origin. Immediately underlying the shallow aquifer is an aquitard, which is approximately 10 feet thick unit of medium sand. This unit is confined from bedrock by another unit of silty clay. The second unit is a confined deep aquifer. The third aquifer is the weathered Brunswick shale.

Based upon a review of the soil boring logs and hydrogeological studies conducted at the Syncon Resins site and CENJ's site, the CENJ site is underlain by shallow and deeper aquifer systems. The upper aquifer is unconfined and bound by a low permeability layer acting as a barrier to vertical groundwater flow. The low permeability layer consists of highly plastic clay approximately 8 to 10 feet thick.

f) Stormwater Management

All stormwater is routed to and contained within a concrete retention basin equipped with a control valve prior to the discharge. CENJ discharges under an active stormwater NPDES permit.

g) Laboratory Services

The facility has an on-site laboratory for screening, fingerprint analysis and support for its treatment operations. The laboratory is certified by the NJDEP Office of Quality Assurance for various parameters and is equipped with Perkin Elmer Optima 5300 & 7300 ICPs for metals analysis, an Anton Paar PMA 5 to determine flashpoint, a Thermo Scientific Spectronic 200 for HexChrom, pH meters, and 3 Perkin Elmer Clarus GCs. The laboratory also has the ability to screen for oxidizers, sulfides and reactive cyanide as well as PCBs.

Compliance analyses are conducted by off-site third-party state certified laboratories.

h) Security

CENJ is typically operated from 7 a.m. to 5:30 p.m., five days per week. A six-foot fence with barbed wire is present on three sides of the facility with a natural barrier (The Passaic River) on the fourth side of the entire facility. Required warning signs are posted at the facility. There are two vehicle gates at the facility, each of the vehicle gates is equipped with a motorized barrier operated by electronic controls within the Scale house. Electronic security measures are engaged in various locations throughout the facility. In addition, there is a guard present at the facility 24-hours per day. Visitors must identify themselves before gaining access must register within the scale house.

i) Preparedness and Prevention

CENJ maintains a fire alarm along with numerous portable fire extinguishers located throughout the facility. The facility also has a dedicated fire supply line and fire hydrants that can help protect the facility in the case of a fire. The Containment Building Unit does maintain on-site fire protection. The nearest fire department, Kearny Fire Department is located approximately six miles to the Northwest. Telephones and handheld radios allow for communication within the facility.

CENJ maintains a Contingency Plan, a Spill Prevention Control and Countermeasures (SPCC) plan A Discharge Prevention, Containment and Countermeasure Plan (DPCC) and a Discharge Cleanup and Removal Plan (DCR). Emergency agreements have been made with the local fire department, police department, hospital and local spill response contractor. In addition, the facility does conduct routine emergency drills twice per year.

j) Recordkeeping

CENJ maintains a waste tracking system and records in an operating log, all the movements of waste throughout its storage, treatment and disposal at the facility. All waste characterization profiles, manifests, land disposal restrictions and related documents are kept on-site for a minimum of five years.

Facility Treatment Capabilities

a) Acceptable Waste Types

CENJ can accept bulk and containerized wastes from over-the-road vehicles as well as by rail. Prior to acceptance into the facility, wastes must first be profiled, characterized, and approved. The facility can handle liquids, solids, and sludge forms of various types of wastes. These wastes include but are not limited to organics (including halogenated and non-halogenated solvents), oils, phenols, paints, and pigments, lab packs, and non-hazardous wastes. This facility does not accept radioactive wastes, TSCA regulated wastes, etiological wastes, dioxins, furans, or bio-hazardous materials.

b) Waste Approval, Evaluation, and Acceptance

Prior to any wastestream being accepted into a Clean Earth facility, the generator or authorized representative must complete the pre-approval process. This process includes the completion and submittal of a “Generator Waste Characterization” profile. This profile gives Clean Earth information as to the generation of the waste as well as waste characteristics needed to safely handle, store and/or treat the waste in compliance with all Federal, State, and Local hazardous waste regulations.

Once the technical review of the profile and any required analytical testing is complete, pricing is determined, and a quotation is issued. The generator must sign the quotation, return it to Clean Earth, and schedule shipments in coordination with Clean Earth, prior to shipping.

If during the waste acceptance procedures, as specified in the Waste Analysis Plan, a discrepancy is identified with a waste shipment, the generator is contacted. Every effort is made to resolve the discrepancy with the generator. If the discrepancy cannot be resolved, the waste will be rejected. A notation with the reason for the rejection, the date of rejection and signature are noted in Section 19 of the manifest. The manifest and waste are returned to the transporter and the driver initials receipt of the waste being returned. Clean Earth Customer Service is available to identify and obtain approval at alternative facilities, upon request.

c) Treatment and Disposal Capabilities

CENJ is permitted to store and/or treat hazardous and non-hazardous waste for on-site and off-site processing and disposal. Existing waste treatment activities at the facility include the blending/bulking of waste in tanks and tankers to meet the specifications of off-site authorized industrial boilers or furnaces, solvent reclamation facilities, hazardous waste incinerators, marketers of hazardous waste fuel and treatment facilities; solidification/stabilization of waste solids, slurries, and sludges in concrete cells with the containment building and in containers; consolidation of waste shipments; transfer of waste shipments, and container/lab pack repackaging. All treatment activities are conducted within appropriately designed and constructed secondary containment units. The facility has a permitted maximum storage capacity of 249,500 gallons or its equivalent volume of hazardous waste at any one time.

In addition, Clean Earth uses the waste management hierarchy to direct materials to the most appropriate third-party firm. Examples of accumulated wastes are solvents, batteries, and metal containing wastes for reclamation and liquid and solid wastes for incineration.

d) Waste Minimization and Pollution Prevention

Clean Earth has an aggressive waste minimization/pollution prevention program both corporately and at each individual treatment center. A written Waste Minimization Program has been developed, and targets are set as part of the corporate strategic planning effort. Efforts include optimization of treatment processes, use/reuse of secondary materials, recycling of secondary materials, and toxics use reduction in treatment processes.

e) Ultimate Disposal of Waste

Either the completed waste characterization profile or the pretreatment outcome will determine the disposal methodology of the waste during processing. Flammable waste will be accumulated and bulked for use as waste fuel or incineration. Sludge and solids from either waste consolidation or treatment residuals will be sent for off-site solidification or to a Subtitle C landfill for hazardous waste or a Subtitle D landfill for non-hazardous waste.

Environmental Compliance

a) Permits

Copies of the appropriate permits are included in the Appendix.

1.1.1 Hazardous Waste Management Permit

In addition to the capability to store hazardous waste at this facility, CENJ can also store non-hazardous waste. Clean Earth's waste analysis plan (WAP) includes test methods, sampling methods, and specified procedures for off-site waste acceptance. Before a waste can be accepted it must be evaluated through the waste stream approval process. Upon arrival the paperwork is first reviewed for completeness and accuracy. Plant personnel review the paperwork for preparation of a fingerprint analysis, then sample the waste. The disposition of the waste determines the scope of the fingerprint analysis that will be conducted. These results must fall within predetermined limits or values before the waste is approved for acceptance. Each bulk load of waste is sampled prior to unloading and the non-bulk containers are usually composited into groups of no more than ten. Compatibility tests are conducted prior to the commingling of bulk wastes into any tank. The daily on-site inspection includes checks on tanks, security, signage and housekeeping. The weekly on-site inspection includes checks for safety and emergency response equipment.

1.1.2 Stormwater Permit

CENJ has a stormwater permit to discharge under NJPDES. As required by the permit, stormwater is monitored based on the permit requirements within the facility containment and before discharge to the Passaic River.

1.1.3 Air Permit

CENJ is registered as an air pollution facility with the Hudson Regional Health Commission and has been issued an air pollution control permit by the New Jersey Department of Environmental Protection.

1.1.4 Solid Waste Permit

CENJ is registered with the New Jersey Department of Environmental Protection as a transfer station for Non-Hazardous Solid Waste.

b) Environmental Monitoring

On-site environmental monitoring includes regular air monitoring of the Containment Building Unit and the air handling system, routine storm water monitoring, storage, facility and equipment inspections. In addition, per the NJDEP regulations, the facility undergoes routine inspection from a NJDEP inspector every two weeks.

Health & Safety

Clean Earth is committed to promoting a safe and healthy workplace to protect our team members - an essential requirement for our facilities and offices. Clean Earth's Safety Program is designed to support its Safety Vision of Zero Injuries. Clean Earth manages it safety program through a robust Safety Management System (SMS). The SMS consists of:

- Safety Policy which is a written commitment to Safety by Senior Management,
- Safety Risk Management program to address hazards based on acceptable risks,
- Safety Assurance Program to evaluate the effectiveness of our programs, to continuously improve upon them, and to identify new hazards, and
- Safety Promotion to include proper training, creating a positive culture, and to encourage participation and appropriate behaviors.

The information in the corporate Health & Safety manual constitutes a written Injury and Illness Prevention Plan (IIPP) which establishes Clean Earth's safety practices, protocols and the implementation process. An outline of the corporate Health and Safety Prevention Plan is included in the Appendix.

Training

Workers receive RCRA, HAZCOM (29 CFR 1910.1200) HAZWOPER (29 CFR 1910.120), Waste Analysis Plan and DOT training that meets or exceeds Federal and State regulations. Clean Earth conducts in-house and third-party training for all the RCRA, OSHA, and DOT curriculums. Personnel training records include job titles, description of training, and records of the training.

APPENDICES

Appendix A
Certificate of Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 4/30/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER McGriff Insurance Services 2500 Renaissance Blvd Suite100 King Of Prussia PA 19406-2639	**CONTACT NAME:** Cathy Faust **PHONE (A/C, No, Ext):** 610-233-4815 **FAX (A/C, No):** 610-279-8543 **E-MAIL ADDRESS:** cfaust@mcgriffinsurance.com
	INSURER(S) AFFORDING COVERAGE / **NAIC #** **INSURER A :** Zurich American Insurance Company / 16535
INSURED 150CLEANEAR Clean Earth, LLC 334 South Warminster Road Hatboro PA 19040	**INSURER B :** **INSURER C :** **INSURER D :** **INSURER E :** **INSURER F :**

COVERAGES **CERTIFICATE NUMBER:** 1704597104 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$
	[ ] CLAIMS-MADE [ ] OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	[ ] POLICY [ ] PRO-JECT [ ] LOC						PRODUCTS - COMP/OP AGG	$
	[ ] OTHER:							$
A	**AUTOMOBILE LIABILITY**			BAP008110602	3/1/2020	3/1/2021	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[X] ANY AUTO						BODILY INJURY (Per person)	$
	[ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	[X] HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	[ ] **UMBRELLA LIAB** [ ] OCCUR						EACH OCCURRENCE	$
	[ ] **EXCESS LIAB** [ ] CLAIMS-MADE						AGGREGATE	$
	[ ] DED [ ] RETENTION $							$
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N			WC819647609	3/1/2020	3/1/2021	[X] PER STATUTE [ ] OTH-ER	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [N] **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Named Insured:
CEHI Acquisition, LLC
Clean Earth Holdings, LLC
CEI Holding, LLC
Assessment & Remedial Design Technologies, Inc.
Accelerated Remediation Kinetics, LLC
Advanced Remediation & Disposal Technologies of DE, LLC
Allied Environmental Group, LLC
See Attached...

CERTIFICATE HOLDER

Clean Earth, Inc.
334 South Warminster Road
Hatboro PA 19040

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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AGENCY CUSTOMER ID: 150CLEANEAR

LOC #:

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
McGriff Insurance Services	Clean Earth, LLC 334 South Warminster Road Hatboro PA 19040
POLICY NUMBER	
CARRIER / NAIC CODE	EFFECTIVE DATE:

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: 25 **FORM TITLE:** CERTIFICATE OF LIABILITY INSURANCE

Clean Earth of Carteret, LLC dba Clean Earth of Connecticut dba Phoenix Soil –A Clean Earth Company
United Retek of Connecticut, LLC
Clean Earth of Maryland, LLC
Clean Earth of New Castle, LLC
Clean Earth of North Jersey, Inc.
Clean Earth of Philadelphia, LLC
Clean Rock Properties, Ltd.
Real Property Acquisition, LLC
Clean Earth Dredging Technologies, LLC
Clean Earth of Southeast Pennsylvania, LLC
Clean Earth of West Virginia, Inc
Clean Earth of Williamsport, LLC
Clean Earth of Georgia, LLC
Clean Earth of Southern Florida, LLC
Clean Earth Environmental Services, Inc.
Clean Earth of Greater Washington, LLC dba Clean Earth Aggregates
Gardner Road Oil, LLC DBA Clean Earth of Brandywine
AERC Acquisition Corporation dba AERC Recycling Solutions, A Clean Earth Company; dba DART, A Clean Earth Company
AES Asset Acquisition Corporation dba Clean Earth of Calvert City dba Clean Earth of Morgantown dba AES Environmental, LLC dba American Transportation Solutions, LLC
Clean Earth of Alabama, Inc.
MKC Acquisition Corporation MKC Acquisition Corporation dba MKC Enterprises, A Clean Earth Company
Environmental Soil Management, Inc
Environmental Soil Management of New York, LLC dba ESMI, A Clean Earth Company
Clean Earth of Michigan, LLC dba DART, Inc., A Clean Earth Company
Clean Earth Mobile Services, LLC

**Crime Policy Carrier: Travelers Casualty and Surety Company of America
Policy # 106696669 Policy Period: 3/1/2020 to 3/1/2021
Limit: $1,000,000
Evidence of Coverage

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CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 06/29/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Willis Towers Watson Certificate Center	
Willis Towers Watson Northeast, Inc. c/o 26 Century Blvd P.O. Box 305191 Nashville, TN 372305191 USA	PHONE (A/C, No, Ext): 1-877-945-7378	FAX (A/C, No): 1-888-467-2378
	E-MAIL ADDRESS: certificates@willis.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Ironshore Specialty Insurance Company	25445
INSURED Clean Earth, LLC 334 South Warminster Road Hatboro, PA 19040	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** W17009762 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [ ] PRO-JECT [ ] LOC [ ] OTHER:			001087009	06/30/2020	06/30/2021	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 500,000 $ 25,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
	AUTOMOBILE LIABILITY [ ] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [ ] HIRED AUTOS ONLY [ ] NON-OWNED AUTOS ONLY						COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ $ $ $
A	[ ] UMBRELLA LIAB [X] OCCUR [X] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $			001087109	06/30/2020	06/30/2021	EACH OCCURRENCE AGGREGATE	$ 10,000,000 $ 10,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N [ ] (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A					[ ] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ $ $
A	Professional Liability			001087009	06/30/2020	06/30/2021	Limit:	$1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

SEE ATTACHED

CERTIFICATE HOLDER

For evidence only

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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AGENCY CUSTOMER ID: _____

LOC #: _____

ADDITIONAL REMARKS SCHEDULE

AGENCY		NAMED INSURED
Willis Towers Watson Northeast, Inc.		Clean Earth, LLC 334 South Warminster Road Hatboro, PA 19040
POLICY NUMBER See Page 1		
CARRIER See Page 1	NAIC CODE See Page 1	EFFECTIVE DATE: See Page 1

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: 25 FORM TITLE: Certificate of Liability Insurance

INSURER AFFORDING COVERAGE: Ironshore Specialty Insurance Company NAIC#: 25445

POLICY NUMBER: 001087009 EFF DATE: 06/30/2020 EXP DATE: 06/30/2021

TYPE OF INSURANCE:	LIMIT DESCRIPTION:	LIMIT AMOUNT:
Contractor's Pollution Liab.	Limit:	$1,000,000

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SR ID: 19795878 BATCH: 1728852 CERT: W17009762

Additional Entities
CEHI Acquisition LLC
Clean Earth Holdings, LLC
CEI Holding, LLC
Clean Earth, LLC
Assessment & Remedial Design Technologies, Inc.
Accelerated Remediation Kinetics, LLC
Advanced Remediation & Disposal Technologies of DE, LLC
Allied Environmental Group, LLC
Carteret Asphalt Corporation
Clean Earth of Carteret, LLC dba Clean Earth of Connecticut dba Phoenix Soil –A Clean Earth Company
United Retek of Connecticut, LLC
Clean Earth of Maryland, LLC
Clean Earth of New Castle, LLC
Clean Earth of North Jersey, Inc.
Clean Earth of Philadelphia, LLC
Clean Rock Properties, Ltd.
Real Property Acquisition, LLC
Clean Earth Dredging Technologies, LLC
Clean Earth of Southeast Pennsylvania, LLC
Clean Earth of West Virginia, Inc
Clean Earth of Williamsport, LLC
Clean Earth of Georgia, LLC
Clean Earth of Southern Florida, LLC
Clean Earth Environmental Services, Inc.
Clean Earth of Greater Washington, LLC dba Clean Earth Aggregates
Gardner Road Oil, LLC DBA Clean Earth of Brandywine
AERC Acquisition Corporation dba AERC Recycling Solutions, A Clean Earth Company; dba DART, A Clean Earth Company
AES Acquisition Corporation
Clean Earth of Alabama, Inc.
MKC Acquisition Corporation MKC Acquisition Corporation dba MKC Enterprises, A Clean Earth Company
Environmental Soil Management, Inc
Environmental Soil Management of New York, LLC dba ESMI, A Clean Earth Company
Clean Earth of Michigan, LLC dba DART, Inc., A Clean Earth Company

Appendix B
Facility Permits

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BOB MARTIN
Commissioner

Division of Solid & Hazardous Waste
Bureau of Recycling & Hazardous Waste Management
401 East State Street
P.O. Box 420, Mail Code 401-02C
Trenton, NJ 08625-0420
Tel (609) 984-3438 Fax (609) 777-1951
www.state.nj.us/dep/dshw/recycling

RECEIVED 12/21/15

December 9, 2015

Michael D. Logan, Vice President
Compliance Plus Services, Inc.
P.O. Box 186
Hatboro, PA 19040

Re: Class 1 Modification of a Hazardous Waste Facility Permit for:
Clean Earth Of North Jersey, Inc.
South Kearny, Hudson County
Facility ID No.: NJD991291105
Permit No.: HWP140002

Dear Mr. Logan,

The Bureau of Recycling and Hazardous Waste Management (the Bureau) is in receipt of a Class 1 permit modification request for the above referenced facility, dated October 13, 2014. The modification request is to authorize the repackaging and consolidation of polychlorinated biphenyl (PCB) waste in authorized container storage areas. The request also seeks authorization to repackage containerized hazardous wastes in Areas A and B.

The Bureau has completed a review of the application, as well as the Response to Notice of Deficiency, dated February 23, 2015. Based on this review, the Bureau hereby approves the modification request, which appears as Conditions 87, 175, and 181 in the enclosed modified Hazardous Waste Facility Permit HWP140002. Note that Condition102 in the previous permit (HWP150004), which authorized the installation of steel wear plates in the Containment Building Unit, has been removed as part of this modification due to submission of certification of completion of construction.

Additionally, the Bureau is clarifying in condition 147 of this modified permit that new tanks ST-6 and ST-7 will be authorized to manage non-hazardous ID 72 waste once authorized by Clean Earth of

R. Heston

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAIL CODE 401-02C
DIVISION OF SOLID AND HAZARDOUS WASTE
P.O. Box 420
Trenton, New Jersey 08625-0420
Telephone: (609) 292-9880 Telecopier: (609) 984-0565
http://www.state.nj.us/dep/dshw

BOB MARTIN
Commissioner

JAN 19 2018

Christopher Dods, President
Clean Earth of North Jersey
105 Jacobus Avenue
South Kearny, NJ 07032

Re: Solid Waste Facility Permit - Minor Modification
Clean Earth of North Jersey Transfer Station/Material Recovery Facility (MRF)
Kearny Town, Hudson County
Facility ID No.: 230216
Permit No.: TRP150001

Dear Mr. Dods:

The Bureau of Solid Waste Permitting (Bureau) is in receipt of a Minor Modification Request dated November 12, 2015 from Compliance Plus Services for the construction and operation of two new storage tanks (ST-6 and ST-7), modification of the existing Loading Dock, and the resumption of acceptance of friable ID27A asbestos waste material at the above referenced facility. The request was submitted on behalf of Clean Earth of North Jersey (CENJ).

The construction of the new tanks and associated secondary containment area and the modifications to the existing Loading Dock were authorized via a letter from this Bureau on June 16, 2016. Based on CENJ's submittal of a Certification of Construction for the installation of the new tanks, the Bureau issued a letter on October 31, 2016 authorizing the use of tanks ST-6 and ST-7. The modifications to the existing Loading Dock have not been performed.

The Bureau has completed a review of the remaining portion of the modification request regarding the acceptance of friable ID 27A asbestos containing waste material and is approving the modification request. As such, the CENJ Solid Waste Facility Permit has been modified to include the new friable asbestos operations, the use of the new storage tanks, the modifications to the existing Loading Dock, and updated lot numbers for the site.

Enclosed is a revised Solid Waste Facility Permit, which includes revisions to the Approved Application, Drawings, and Associated Documents Section of the permit and revisions to former Conditions 28, 39, 40, 42, and 43. A new condition regarding reporting during an emergency event, which is being added to all Solid Waste Facility Permits, was added as Condition 35. A new

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAIL CODE 401-02C
Division of Solid & Hazardous Waste
P.O. Box 420
Trenton, New Jersey 08625-0420
Telephone: (609) 292-9880 Telecopier: (609) 984-0565
http://www.state.nj.us/dep/dshw

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

SOLID WASTE FACILITY PERMIT

Under the provisions of N.J.S.A. 13:1E *et seq.* known as the Solid Waste Management Act, this permit is hereby issued to:

CLEAN EARTH OF NORTH JERSEY

Facility Type:	Solid Waste Transfer Station Permit
Block & Lot Nos:	Block 289, Lots 14, 14.01, and 14.02
Municipality:	Kearny Town
County:	Hudson
Facility ID No.:	230216
Permit No.:	TRP150001

This permit is subject to compliance with all conditions specified herein and all regulations promulgated by the Department of Environmental Protection.

This permit shall not prejudice any claim the State may have to riparian land nor does it allow the registrant to fill or alter, or allow to be filled or altered, in any way, lands that are deemed to be riparian, wetlands, floodway or flood hazard area, or within the Coastal Area Facility Review Act (CAFRA) zone or are subject to the Pinelands Protection Act of 1979 or the Highlands Water Protection and Planning Act of 2004, nor shall it allow the discharge of pollutants to waters of this State without prior acquisition of the necessary grants, permits, or approvals from the Department of Environmental Protection.

May 5, 2014
Issuance Date

Anthony Fontana, Chief
Bureau of Solid Waste Permitting

October 23, 2014
Modification Date

January 19, 2018
Modification Date

May 5, 2019
Expiration Date

State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAIL CODE 401-02C
Division of Solid & Hazardous Waste
P.O. Box 420
Trenton, New Jersey 08625-0420
Telephone: (609) 292-9880 Telecopier: (609) 984-0565
http://www.state.nj.us/dep/dshw

CATHERINE R. MCCABE
Commissioner

MAR 0 8 2019

Bernard Guerin, Vice President
Clean Earth of North Jersey
105 Jacobus Avenue
Kearny, NJ 07032

Re: Notice of Administrative Completeness
Application for a Solid Waste Facility Permit - Permit Renewal
Clean Earth of North Jersey Transfer Station/Material Recovery Facility (TS/MRF)
Kearny Town, Hudson County
Facility ID No.: 230216
Permit No.: TRP190001

Dear Mr. Guerin:

The Bureau of Solid Waste Permitting (the Bureau) is in receipt of a Solid Waste Facility Permit renewal application received on February 4, 2018 for the above referenced facility. The application proposes no changes to the currently permitted operations.

The Bureau has completed a review of the application pursuant to N.J.A.C. 7:26-2.4(g)2, to determine if the submittal is administratively complete. Upon review, the Bureau has determined the renewal application for the Solid Waste Facility Permit is ADMINISTRATIVELY COMPLETE.

Since the Bureau has determined the renewal application is administratively complete, all conditions of the existing permit for the facility will remain effective pursuant to N.J.A.C. 7:26-2.7(c).

Within thirty (30) days of the date of this letter, please submit an additional three (3) hard copies of the application and three (3) digital copies (CDs) of the application for distribution to various federal, state, and local agencies for their review.

If you have any questions concerning this matter, please contact Robin Heston-Murphy of my staff at 609-984-4643 or by email at robin.heston-murphy@dep.nj.gov.

Sincerely,

Tom Byrne

for Anthony Fontana, Chief
Bureau of Solid Waste Permitting

c: Thomas Farrell, Chief, Bureau of Solid Waste Compliance and Enforcement
Gina Lugo, Supervisor, Bureau of Solid Waste Compliance and Enforcement
Jennifer Meyer, Bureau of Recycling and Hazardous Waste
Michael D. Logan, Vice President, Compliance Plus Services

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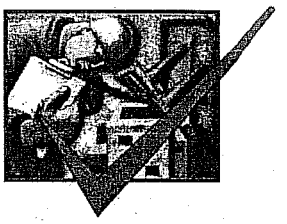
CPS

COMPLIANCE PLUS SERVICES



July 31, 2008

Via Electronic Mail & USPS Mail

Robert Fixter
Clean Earth of North Jersey, Inc.
105 Jacobus Avenue
S. Kearny, NJ 07032

RE: Authorizations Under U.S. Environmental Protection Agency Toxic Substances Control Act ("TSCA") to Manage Polychlorinated Biphenyl ("PCB") Waste at Clean Earth of North Jersey, Inc. ("CENJ"), 105 Jacobus Ave., South Kearny, Hudson County, NJ; EPA I.D. #NJD991291105

Dear Bob:

Pursuant to our discussions, provided below is a detailed review of the relevant authorizations that are in place related to the Clean Earth of North Jersey, Inc. (CENJ") facility's ability to act as a "Commercial Storer of PCB Waste" as defined under 40 CFR 761.3.

As you are aware, CENJ submitted a revised Notification of PCB Activity form to EPA on June 29, 1993 (see Exhibit 1) declaring its intent to act as a Commercial Storer facility (this was filed under CENJ's former name, S & W Waste, Inc.). Based on a recent review of EPA's PCB Waste Handler Database, CENJ (S & W Waste) continues to be listed as an active facility (see Facility Information sheet included in Exhibit 1). Subsequent to the filing of this notification, CENJ submitted an application to EPA Region II TSCA that was intended to demonstrate the facility's compliance with the technical performance standards for a commercial storage facility. Pursuant to the federal PCB regulations in effect at the time of this filing, prior authorization was required before PCB wastes could be managed at the facility.

Following EPA's issuance of revised regulations on June 29, 1998, commonly referred to as EPA's "PCB Mega-Rule", and the revisions that followed, EPA made sweeping changes to the management requirements for the storage and disposal of PCB wastes, including the addition of a provision that allowed RCRA TSDF's to store PCB's as commercial storers if they possessed either an EPA final Part B hazardous waste permit, an EPA hazardous waste facility authorization under interim status approval, or an authorized state hazardous waste permit issued pursuant to Section 3006 of the federal Resource Conservation and Recovery Act ("RCRA"). This is specified in 40 CFR 761.65(b)(2), attached as Exhibit 2, for facilities approved under 3004, 3005 or 3006 of RCRA. This is similarly plainly stated in EPA's PCB policy guidance document - the "PCB Q and A Manual", September 2001 Version - on pages 112 and 113 (Exhibit 3) which indicates that there is no longer any requirement to seek separate approval from EPA's TSCA division to store PCB's at RCRA permitted facilities.

Accordingly, since CENJ is a fully permitted RCRA authorized facility, and prior notice has been made to EPA of the facility's intended regulated PCB waste activities, the facility is authorized to store PCB waste in any storage unit at site that has been permitted to store hazardous waste. For the purpose of simplicity and waste tracking, CENJ has limited the units used for storage of PCB's to Container Storage Areas A and C as well as the East Pad of the QA/QC Dock. This is consistent

with statements in prior application correspondence that has been filed with NJDEP, including the 2004 Hazardous Waste Permit renewal application and its subsequent revisions.

I hope that this discussion sufficiently clarifies these applicable regulatory authorizations and provisions that permit CENJ to store PCB waste at its facility. If you have any additional questions or comments related to this matter, please do not hesitate to contact me at 215.734.1414.

Sincerely,

Michael D. Logan

Michael D. Logan, CHMM
Vice President, Environmental Services
Compliance Plus Services, Inc.
Corporate Consultant to the Clean Earth Companies
mlogan@cps-2comply.com

MDL/jan
Enclosure

cc: Averil Rance, Clean Earth, Inc.
George Tyler, Counsel, Tyler & Carmeli, P.C.
James Aversano, Counsel, Tyler & Carmeli, P.C.

N:\LETTERS\3200-3299\3274 - Ltr to Fixter on PCB storage.wpd

Exhibit 1

Notification of PCB Activity Form (Revised)

S&W WASTE INC.

June 29, 1993

Mr. Tom Sherman, Chief
Bureau of Hazardous Waste Engineering
33 Artic Parkway
CN028
Trenton, NJ 08625-0028

Re: PCB Notification Form

Dear Mr. Sherman:

Enclosed please find a copy of the Notification of PCB Activity form that was recently sent to the Chief of the Chemical Regulation Branch, Office of Toxic Substances, USEPA. S & W is now in the process of submitting a formal permit application to the USEPA and the DEPE. This action is the result of a recommendation from Mr. Dave Greenlaw of the Edison TSCA office. As far as the NJDEPE submittal is concerned it is my understanding that the application will be considered as part of the Part B renewal application that is currently under review.

S & W anticipates that the required documents for the inclusion of PCB storage in our Part B renewal application will be submitted to the Department by July 23, 1993. S & W will be preparing the State permit application first then we will proceed with the Federal permit application. If you may have any questions on this matter please call me at the below listed phone number.

Sincerely,

Robert Fixter
V.P. of Compliance

cc: William Moscatello, S & W Waste, Inc.
Jeff Sterling, NJDEPE Metro Field Office

115 Jacobus Avenue South Kearny, New Jersey 07032
TEL.- 201-344-4004 • SALES NO.- 201-578-4800
ADM. FAX- 201-344-1265 • SALES FAX-201-344-8652

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notification of PCB Activity

Form Approved
OMB No. 2070-0112
Approval expires 12-31-92

No information on this form may be claimed as TSCA CBI.

Return To.

Chemical Regulation Branch
Office of Toxic Substances TS-798
U.S. Environmental Protection Agency
401 M St., SW
Washington, DC 20460

For Official Use Only

TSCA PCB ID Number

I. Name of Facility: S&W Waste, Inc.

Name of Owner of Facility: William Moscatello

II. EPA Identification Number (If already assigned under RCRA): NJD991391105

III. Facility Mailing Address (Street or PO Box, City, State, & ZIP Code): 115 Jacobus Ave. S. Kearny N.J. 07032

IV. Location of Facility (No. & Street, City, State, & ZIP Code): 105 Jacobus Ave. S. Kearny NJ 07032

V. Installation Contact (Name and Title): Robert Fixter V.P. of Compliance

Telephone Number (Area Code and Number): (201) 344-4004

VI. Type of PCB Activity (Mark 'X' in appropriate box. See instructions.)

- [ ] A. Generator with onsite storage facility
- [X] B. Storer (Commercial)
- [ ] C. Transporter
- [ ] D. Permitted Disposer

VII. Certification

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Signature	Name and Official Title (Type or print)	Date Signed
Robert Fixter	Robert Fixter V.P. of Compliance	6/29/93

Paperwork Reduction Act Notice

The public reporting burden for this collection of information is estimated to average 1.5 hours per response. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information to the Chief, Information Policy Branch (PM-223), US Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked ATTENTION: Desk Officer for EPA.

EPA Form 7710-53(12-89)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 5 1993

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

Mr. Robert Fixter
Vice President of Compliance
S&W Waste, Inc.
115 Jacobus Avenue
S. Kearny, New Jersey 07032

Reference: Notification Form Dated June 29, 1993

Dear Mr. Fixter:

This is to notify you that the Environmental Protection Agency has received your request to either modify the entry or remove the facility from the PCB Activity Database System (PADS). EPA has taken the following action (as indicated by an "X") to respond to your request:

__X__ The modification you requested has been made; this is your confirmation. (Reference # 5013)

_____ In order to modify the database as you requested, a new form must be completed, signed, and submitted to this office. (Reference # _____) .

A Notification of PCB Activity Form has been enclosed; upon completion, it should be mailed to:

Operations Branch
Office of Pollution Prevention and Toxics (TS-798)
US Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

_____ A code has been inserted in the database to indicate that your company notified and subsequently requested withdrawal of the notification. This letter serves as your confirmation. (Reference # _____)

_____ Other (explanation provided).

Recycled/Recyclable
Printed on paper that contains
at least 75% recycled fiber

If you have any questions regarding the PCB Waste Handlers' database, please contact Toni White at (202) 260-3933.

Sincerely,

Tony Baney, Chief
Operations Branch

Facility Information Sheet

PCB Waste Handler Database

Facility Information

General Information:

Form ID: 5013 **PADS ID:** NJD991291105 **Form Code** 1

Facility Information:

Facility Name: S & W WASTE, INC.

Facilty Owner: WILLIAM MOSCATELLO

Contact Name FIXTER, ROBERT

Phone: (201)344-400 **Ext:**

Facility Mailing Address:

115 JACOBUS AVENUE
SOUTH KEARNY, NJ 07032

Location of Facility:

105 JACOBUS AVENUE
SOUTH KEARNY, NJ 07032

PCB Activity:

Generator: **Disposer:**

Storer: Active **Research:**

Transporter: Inactive **Smelter:**

Misc Information:

PADS Information:

Date Created: 7/29/1993

Date Signed: 6/29/1993

Last Modified: 7/29/1993

Note PADS - Additional Comments:

PADS Comments:

7/16/1993	Other	CHG MAIL ADD - CHANGE MAILING ADDRESS FROM 105 JACOBUS AVENUE
7/16/1993	Chg Fac Type	CHANGE FACILITY TYPE FROM TRANSPORTER TO COMM STORER

Verify the information for this record

Form ID: 5013 PADS ID: NJD991291105 Date Created: 7/29/1993

Facility Name: S & W WASTE, INC.

Facility Owner: WILLIAM MOSCATELLO

Contact Name: FIXTER, ROBERT

Phone: (201)344-4004 Ext:

Facility Mailing Address:

115 JACOBUS AVENUE

SOUTH KEARNY, NJ 07032

Location of Facility:

105 JACOBUS AVENUE

SOUTH KEARNY, NJ 07032

PCB Activity:

Generator:		Disposer:	
Storer:	Active	R & D:	
Transporter:	Inactiv	Smelter:	

Date Signed: 6/29/1993

Last Modified: 7/29/1993

Form Code: 1

OK Print Record Preview

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 5 1993

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

Mr. Robert Fixter
Vice President of Compliance
S&W Waste, Inc.
115 Jacobus Avenue
S. Kearny, New Jersey 07032

Reference: Notification Form Dated June 29, 1993

Dear Mr. Fixter:

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A Notification of PCB Activity Form has been enclosed; upon completion, it should be mailed to:

Operations Branch
Office of Pollution Prevention and Toxics (TS-798)
US Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

_____ A code has been inserted in the database to indicate that your company notified and subsequently requested withdrawal of the notification. This letter serves as your confirmation. (Reference # _____)

_____ Other (explanation provided).

Recycled/Recyclable
Printed on paper that contains at least 50% recycled fiber

If you have any questions regarding the PCB Waste Handlers' database, please contact Toni White at (202) 260-3933.

Sincerely,

Tony Baney, Chief
Operations Branch

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notification of PCB Activity

Form Approved
OMB No. 2070-0112
Approval expires 12-31-92

No information on this form may be claimed as TSCA CBI.

Return To

Chemical Regulation Branch
Office of Toxic Substances TS-798
U.S. Environmental Protection Agency
401 M St., SW
Washington, DC 20460

For Official Use Only

TSCA PCB ID Number

I. Name of Facility: S+W Waste, Inc.

Name of Owner of Facility: William Disciullo

II. EPA Identification Number (If already assigned under RCRA): NJD991391105

III. Facility Mailing Address (Street or PO Box, City, State, & ZIP Code): 115 Jacobus Ave. S. Kearny N.J. 07032

IV. Location of Facility (No. & Street, City, State, & ZIP Code): 105 Jacobus Ave. S. Kearny NJ 07032

V. Certification Contact (Name and Title): Robert Fiten V.P. of Compliance

Telephone Number (Area Code and Number): (201) 344-4004

VI. Type of PCB Activity (Mark 'X' in appropriate box. See instructions.)

- [ ] A. Generator with onsite storage facility
- [X] B. Storer (Commercial)
- [ ] C. Transporter
- [ ] D. Permitted Disposer

VII. Certification

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Signature: Robert Fiten

Name and Official Title (Type or print): Robert Fiten V.P. of Compliance

Date Signed: 6/29/93

Paperwork Reduction Act Notice

The public reporting burden for this collection of information is estimated to average 1.5 hours per response. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information to the Chief, Information Policy Branch (PM-223), US Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked ATTENTION: Desk Officer for EPA.

EPA Form 7710-53(12-89)

ACKNOWLEDGEMENT OF NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

09/12/2003

This is to acknowledge that you have filed a **Notification of Hazardous Waste Activity** for the installation located at the address shown in the box below to comply with Section 3010 of the Resource Conservation and Recovery Act (RCRA). Your EPA Identification Number for that installation appears in the box below. The EPA Identification Number must be included on all shipping manifests for transporting hazardous wastes; on all Annual Reports that generators of hazardous waste, and owners and operators of hazardous waste treatment, storage and disposal facilities must file with EPA; on all applications for a Federal Hazardous Waste Permit; and other hazardous waste management reports and documents required under Subtitle C of RCRA.

EPA I.D. NUMBER	→	NJD991291105
INSTALLATION NAME	→	CLEAN EARTH OF NORTH JERSEY INC
INSTALLATION ADDRESS	→	105 JACOBUS AVE KEARNY, NJ 07032
MAILING ADDRESS	→	105 JACOBUS AVE KEARNY, NJ 07032

EPA Form 8700-12AB (4-80)

USEPA - REGION 2
RCRA Programs Branch
290 Broadway, 22nd Floor
New York, NY 10007-1866

ATTN: RCRA NOTIFICATIONS
Tel : (212) 637-4106
Fax: (212) 637-3056

TO: CLEAN EARTH OF NORTH JERSEY INC
or Current Occupant
ATTN: ROBERT FIXTER
105 JACOBUS AVE
KEARNY, NJ, 07032

State of New Jersey

Department of Environmental Protection

Certifies That

CLEAN EARTH OF NORTH JERSEY

Laboratory Certification ID # 09397

having duly met the requirements of the

Regulations Governing the Certification of
Laboratories and Environmental Measurements N.J.A.C. 7:18 et. seq.

is hereby approved as a

State Certified Environmental Laboratory

to perform the analyses as indicated on the Annual Certified Parameter List which must accompany this certificate to be valid

Expires June 30, 2020

Michele M. Potter
Manager

THIS CERTIFICATE IS TO BE CONSPICUOUSLY DISPLAYED AT THE LABORATORY WITH THE ANNUAL CERTIFIED PARAMETER LIST IN A LOCATION ON THE PREMISES VISIBLE TO THE PUBLIC

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR(S) 2018-2020

Registrant: CLEAN EARTH OF NORTH JERSEY
ATTN: Cheryl Coffee
105 JACOBUS AVE
S KEARNY, NJ 07032

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 061818550343AB Effective: July 1, 2018 Expires: June 30, 2020

HM Company ID: 6839

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with PHMSA; and

(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, PHH-52, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590, telephone (202) 366-4109.

dump TRUCK

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

CLEAN EARTH OF NORTH JERSEY
105 JACOBUS AVE,
KEARNY, NJ 07032

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-403289**
Vin ID#: **1FVHCYBSXCHBV6826 NJ**
License Plate #: **AN481Y**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
CLEAN EARTH OF NORTH JERSEY
NJDEP #: **03002**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

~~178~~774549

Motor Vehicle Commission

NEW JERSEY

CHIEF ADMINISTRATOR
MOTOR VEHICLE COMMISSION

VEHICLE REGISTRATION

PLATE NO: XBSG23 GOOD THRU: 05/2020
VIN: 1GTN1TEH4EZ286585
GMC 2014 PKUP WT SIE GW: 6700 AX:2
CLEAN EARTH OF NO JERSEY IN COMMERCIAL 11
115 JACOBUS AVENUE DL:19329 76040 73020
SO KEARNY NJ 07302 RENEWAL PT:CM
EQ: 6700 FEE: 128.00 EV BA20191370073

CLEAN EARTH OF NO JERSEY IN
115 JACOBUS AVENUE
SO KEARNY NJ 07302

SEE IMPORTANT NOTICE ON REVERSE SIDE

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

CLEAN EARTH OF NORTH JERSEY
105 JACOBUS AVE,
KEARNY, NJ 07032

NJDEP Transporter Vehicle Registration Card

GMC Pickup

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-403290**
Vin ID#: **1GTN1TEH4EZ286585 NJ**
License Plate #: **XBSG23**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
CLEAN EARTH OF NORTH JERSEY
NJDEP #: **03002**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOLID WASTE TRANSPORTER
A-901 LICENSED
10821
EXPIRES JUNE 30, 2021

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE TRANSPORTER
A-901 LICENSED
403289
EXPIRES JUNE 30, 2021

NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

The New Jersey Department of Environmental Protection hereby grants you a NJPDES permit for the facility/activity named in this document. This permit is the regulatory mechanism used by the Department to help ensure your discharge will not harm the environment. By complying with the terms and conditions specified, you are assuming an important role in protecting New Jersey's valuable water resources. Your acceptance of this permit is an agreement to conform with all of its provisions when constructing, installing, modifying, or operating any facility for the collection, treatment, or discharge of pollutants to waters of the state. If you have any questions about this document, please feel free to contact the Department representative listed in the permit cover letter. Your cooperation in helping us protect and safeguard our state's environment is appreciated.

Permit Number: NJ0121525

Final: Stormwater Discharge Revoke & Reissue Permit Action

Permittee:
CLEAN EARTH OF NORTH JERSEY INC
115 JACOBUS AVE
Kearny, NJ 07032

Co-Permittee:

Property Owner:
CLEAN EARTH OF NORTH JERSEY INC
115 JACOBUS AVE
Kearny, NJ 07032

Location Of Activity:
CLEAN EARTH OF NORTH JERSEY INC
105 JACOBUS AVE
Kearny, NJ 07032-0000

Authorization(s) Covered Under This Approval	Issuance Date	Effective Date	Expiration Date
RF - Stormwater	12/01/2009	01/01/2010	12/31/2014

By Authority of:
Commissioner's Office

DEP AUTHORIZATION
Barry Chalofsky, P.P.
Bureau of Nonpoint Pollution Control
Division of Water Quality

(Terms, conditions and provisions attached hereto)

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code 401-02B
Division of Water Quality
Office of Permit Management
P.O. Box 420 – 401 E State St
Trenton, NJ 08625-0420
Phone: (609) 984-4428 / Fax: (609) 777-0432

BOB MARTIN
Commissioner

NJPDES PERMIT APPLICATION
NOTICE OF ADMINISTRATIVE COMPLETENESS

July 10, 2014

ROBERT FIXER
CLEAN EARTH OF NORTH JERSEY INC
115 JACOBUS AVE
KEARNY, NJ 07032

Re: Stormwater Discharge Renewal Permit Action
Cat: RF -Stormwater
NJPDES NJ0121525
CLEAN EARTH OF NORTH JERSEY INC
Kearny Town, Hudson County

Dear Mr. Fixer:

Your application dated 06/26/2014 and received on 07/10/2014 is administratively complete. Accordingly, it has been forwarded to the Bureau of Nonpoint Pollution Control for technical review. Any further inquiries concerning technical review of your application or the status of permit issuance should be directed to the Bureau of Nonpoint Pollution Control, which may be contacted by calling (609) 633-7021. When making phone inquiries, please refer to the NJPDES number and subject matter. Please note that during technical review, your reviewer may request further information.

In the event that the Department is unable to issue a new permit with an effective date on or before the expiration date of your current permit, pursuant to N.J.A.C. 7:14A-2.8(a) the conditions of an expired permit are continued in force until the effective date of a new permit provided a permittee submits a timely and complete permit application for renewal.

Please be advised that checklists and forms are revised from time to time. Before making any future submissions please contact our website at http://www.nj.gov/dep/dwq/forms.htm or contact me at (609) 984-4428 or via email at Anita.Veal@dep.nj.gov, for updated checklists and forms.

Sincerely,

Anita Veal

Anita Veal, MS, AADP
Office of Permit Management

cc: Central File-Administrative Record – MF: 123771 / PI: 48743

State of New Jersey
Department of Environmental Protection

James E. McGreevey
Governor

Bradley M. Campbell
Commissioner

Bureau of Release Prevention
P. O. Box 424
Trenton, N.J. 08625
Tel: (609) 633-0610 Fax: (609) 633-7031

JUN 0 8 2004

Robert Fixter
Vice President
Clean Earth Of North Jersey, Inc.
115 Jacobus Ave
Kearny, NJ 07032

Re: Discharge Prevention, Containment and Countermeasures (DPCC) and Discharge Cleanup and Removal (DCR) Plans **Annual Audit Inspection 2004**

Facility - Clean Earth Of North Jersey, Inc.
DIFF # - 090700151000

Dear Mr. Fixter:

The Bureau of Release Prevention (bureau) conducted an Annual Audit Inspection at your facility on May 11, 2004. Thank you for the cooperation extended to Anne Hernandez and Arthur Robinson of the bureau's Field Verification Section.

The results of the inspection indicate that there were no violations of N.J.A.C. 7:1E-1 et seq. found. This finding is based on the documents reviewed and areas inspected.

The bureau will continue to monitor and perform field inspections on any proposed facility upgrades. You are reminded that the department must be advised of any construction related changes (installation, new construction, substantial modification, replacement, etc.) to any aboveground storage tank, appurtenant structures, leak detection systems or other monitoring, prevention, or safety systems pursuant to the requirements of N.J.A.C. 7:1E-4.8(a) and (b). Plan amendments shall be acted upon by the department within 60 days of receipt of all required and requested information, data, etc.

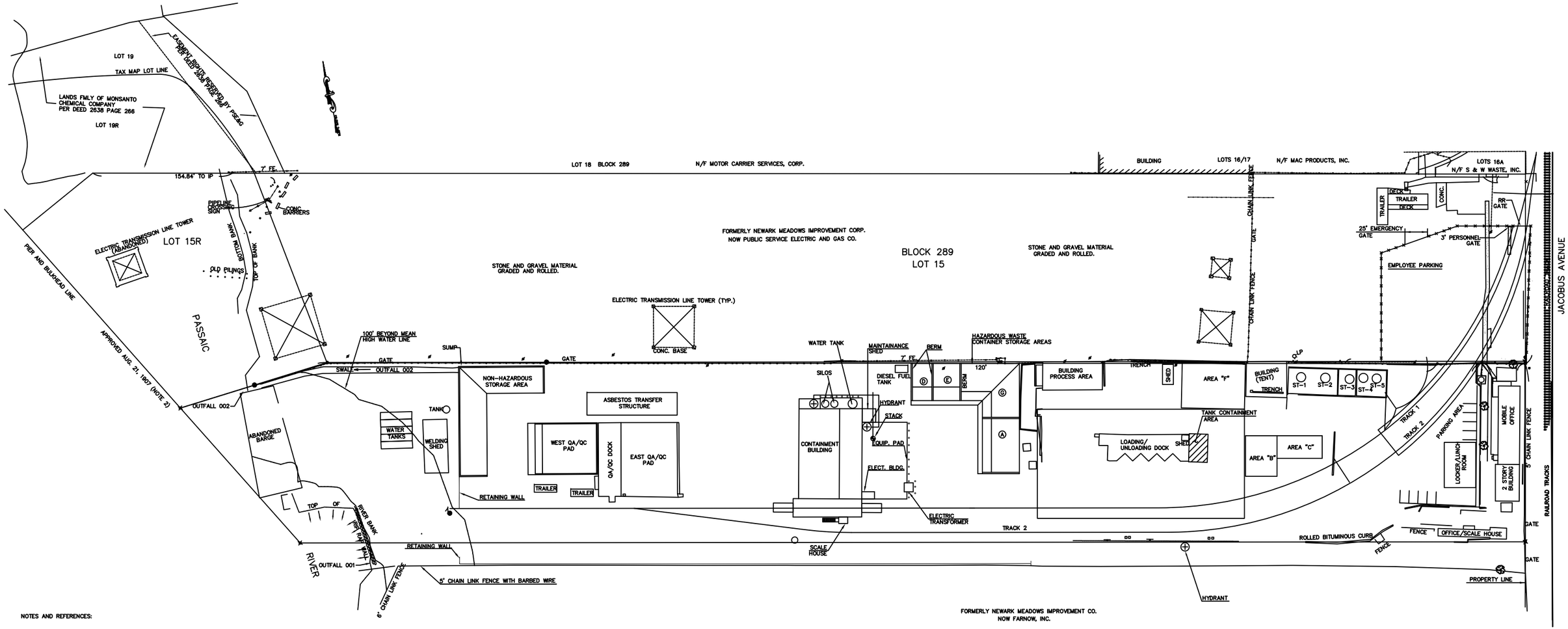
Again, thank you for the time and courtesy provided by facility staff during the audit process. We look forward to working with you in your efforts to operate a discharge-free facility that will safeguard the public and protect the environmental resources on and around your facility.

Respectfully,

Priit R. Pals
Supervising Environmental Engineer
Field Verification Section

c: Anne Hernandez, Field Verification Section
Arthur Robinson, Field Verification Section
Mira Desai, Engineering Review Section

Appendix C
Facility Diagram



NOTES AND REFERENCES:

1. ELEVATIONS AND CONTOURS BASED UPON FIELD DATA OBTAINED NOVEMBER 2000 AND UPDATED JUNE 2005. ELEVATIONS IN NAVD 1929.
2. AS INDICATED BY THE ELEVATIONS AND CONTOURS THE EXISTING GRADIENT OF THE PROPERTY IS A GRADUAL SLOPE FROM A POINT NEAR JACOBUS AVENUE TO THE PASSAIC RIVER.
3. MHW LINE ELEVATION 3.4 (NVD29) ESTABLISHED FROM TIDAL DATUMS AT "POINT NO POINT, PASSAIC RIVER" AND TIDAL BENCH MARK C72 1965.

MAP REFERENCE:
NEW CONTAINMENT BLDG. & RAIL ACCESS, PREPARED FOR – CLEAN EATH OF NORTH JERSEY INC. DRAWING ENTITLED "SITE PLAN–SP1" BY LEANORD BUSCH ASSOCIATES. 3/01/05, REVISED 11/02/05.

LEGEND

EXISTING CONTOUR

⊕ HYDRANT

UTILITY POLE

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

CLEANEARTH
treating the planet right

DWG. NAME	SITE PLAN CEC
DRAWN	CLC
CHECKED	AR
SCALE	1"=100'
DATE	3/26/09

SITE PLAN

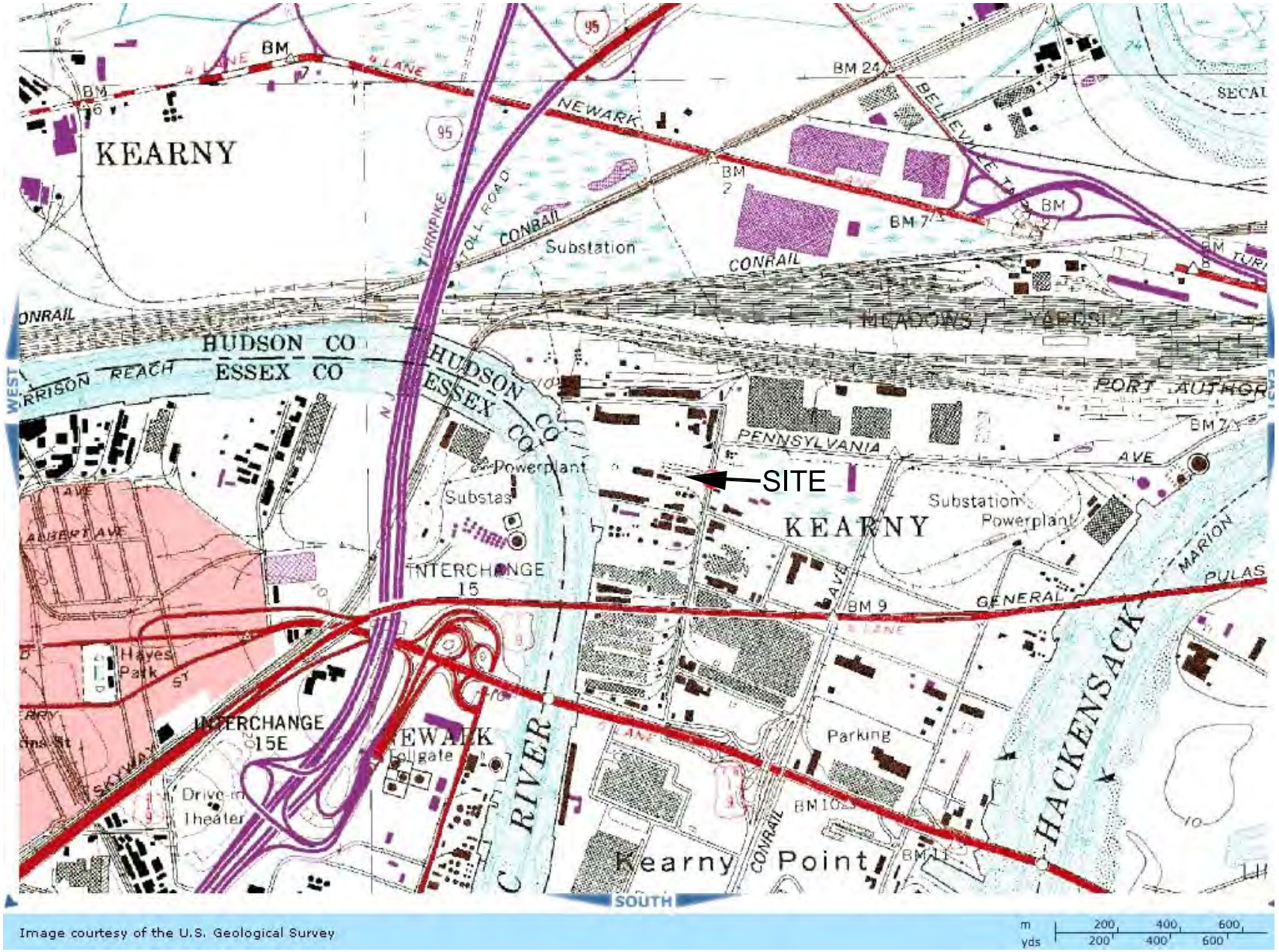
FOR

CLEAN EARTH OF NORTH JERSEY
105 JACOBUS AVENUE
SOUTH KEARNEY, NEW JERSEY

DRAWING NUMBER

1

Appendix D
Map of Surrounding Area



SOURCE: USGS TOPO MAP, NEW YORK QUAD, NEW YORK, NY. (TERRA SERVER)

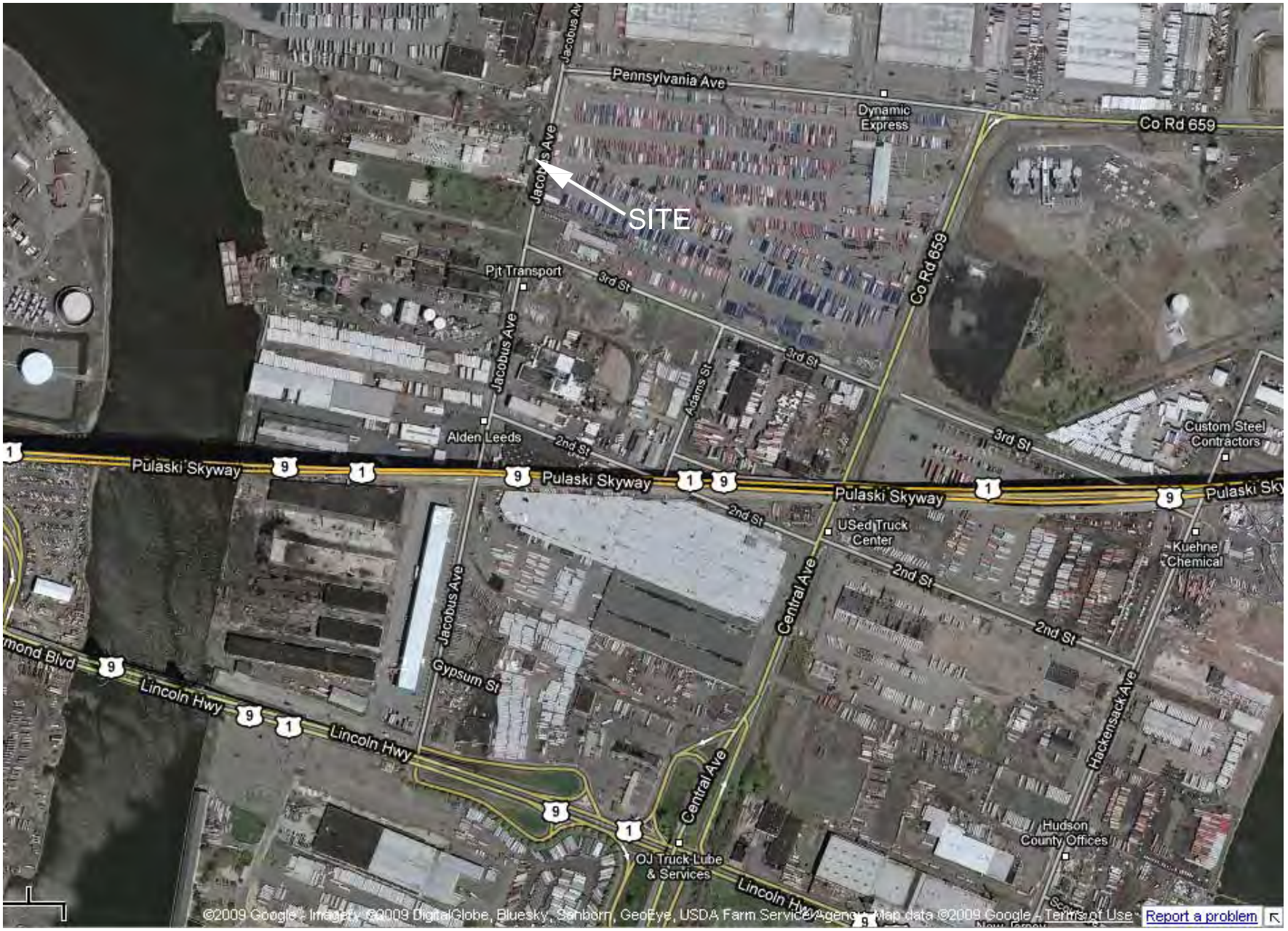
CLEANEARTH
Faster, smarter, greener solutions..

DWG. NAME	SITE LOCATION
DRAWN	CLC
CHECKED	CLC
SCALE	NTS
DATE	12/10/08

SITE LOCATION
CLEAN EARTH OF NORTH JERSEY

105 JACOBUS AVENUE
SOUTH KEARNY, HUDSON COUNTY, NEW JERSEY

FIGURE:
2



SOURCE: GOOGLE MAPS, 2010

CLEANEARTH
Faster, smarter, greener solutions...

DWG. NAME	SITE LOCATION
DRAWN	CLC
CHECKED	CLC
SCALE	NTS
DATE	10/29/09

AERIAL PHOTOGRAPH
CLEAN EARTH OF NORTH JERSEY

105 JACOBUS AVENUE
SOUTH KEARNY, HUDSON COUNTY, NEW JERSEY

FIGURE:
3

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0101D

FIRM

FLOOD INSURANCE RATE MAP

HUDSON COUNTY, NEW JERSEY
(ALL JURISDICTIONS)

PANEL 101 OF 118

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JERSEY CITY, CITY OF	340223	0101	D
KEARNY, TOWN OF	340224	0101	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
34017C0101D

EFFECTIVE DATE
AUGUST 16, 2006

Federal Emergency Management Agency

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000mN — 1000-meter Universal Transverse Mercator grid values, zone 18
- 600000 FT — 5000-foot grid ticks: New Jersey State Plane coordinate system, FIPSZONE 2900, Transverse Mercator projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

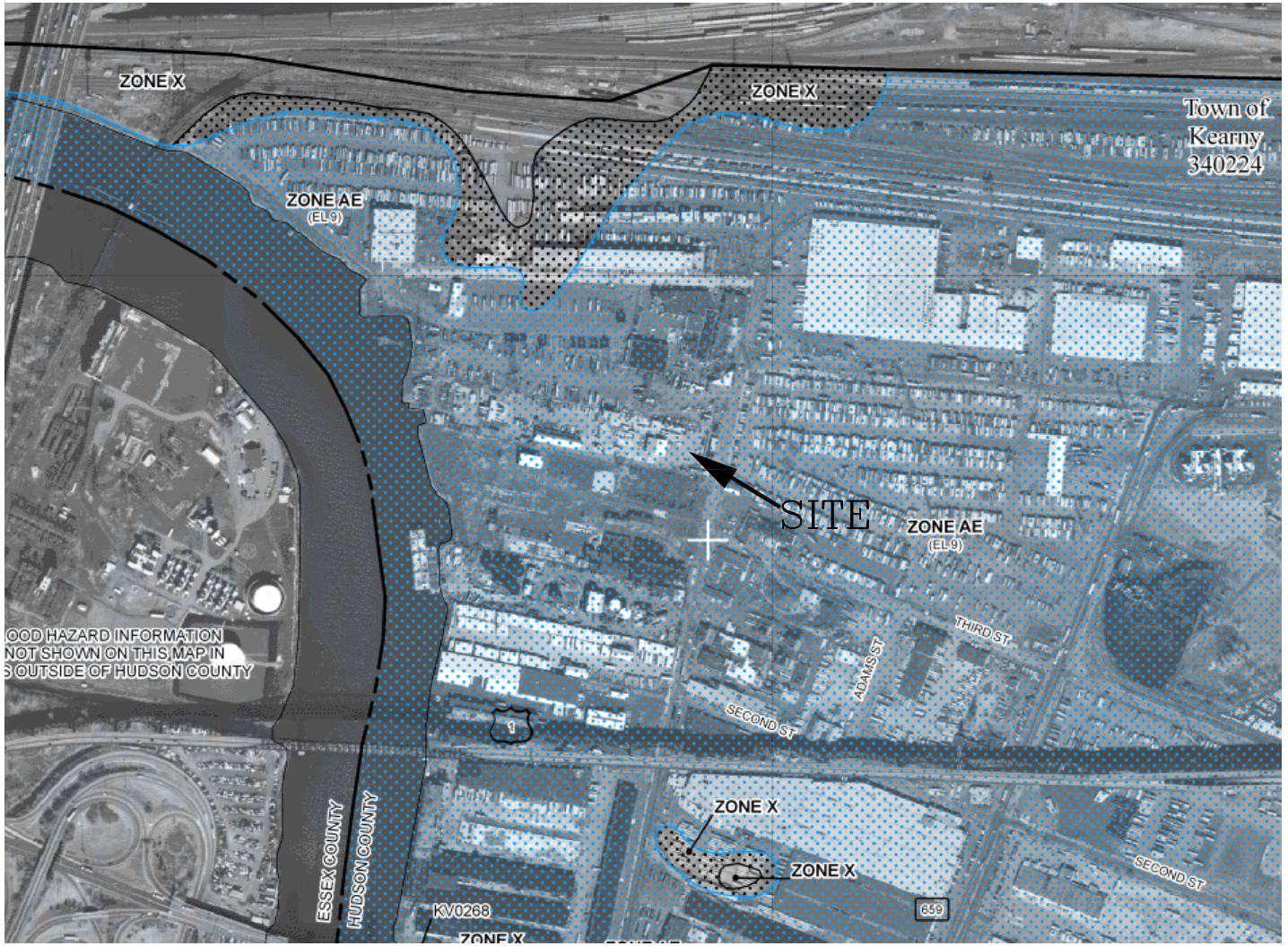
For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

200 0 500 1000 FEET

150 0 150 300 METERS



CLEANEARTH
Faster, smarter, greener solutions.™

DWG. NAME	SITE LOCATION
DRAWN	CLC
CHECKED	CLC
SCALE	NTS
DATE	1/25/10

FLOOD PLAIN MAP
CLEAN EARTH OF NORTH JERSEY

105 JACOBUS AVENUE
SOUTH KEARNY, HUDSON COUNTY, NEW JERSEY

FIGURE:
4

Appendix E
Waste Characterization Profile Sheet

Clean Earth of North Jersey, Inc.

115 Jacobus Avenue, Kearny, NJ 07032 (973) 344-4004

Approval Code D) _____ B) _____

Generic Code D) _____ B) _____

Customer # _____

LSR # _____

Master WPS ☐ Yes ☐ No

Technical Rep. Initials _____

Broker Name (if applicable) _____

Approval Date _____

A. GENERATOR INFORMATION

Generator's Name _____

Mailing Address _____

Waste Pickup Address _____

EPA ID No. _____ MSDS Attached ☐ Yes ☐ No

Tech Contact _____ Phone _____

Common Name of Waste _____

Process Generating Waste _____

Biennial Report Codes: SIC Code _____ Source Code A _____ Form Code B _____

Origin Code _____ System Type _____

Is this waste from a plant closure or plant clean up? ☐ Yes ☐ No

B. PHYSICAL/CHEMICAL CHARACTERISTIC

REACTIVITY (PPM)

Total Cyanides _____

Amenable Cyanides _____

Reactive Sulfides _____

Check if waste is:

- ☐ Water Reactive
- ☐ Air Reactive
- ☐ Shock Sensitive
- ☐ Generates Toxic Fumes When mixed with Acid, Base or H2O

ODOR

☐ None ☐ Mild ☐ Strong

Describe _____

COLOR _____

PHYSICAL STATE @ 70˚F

- ☐ Solid
- ☐ Liquid
- ☐ Powder
- ☐ Semi-Solid
- ☐ Single Phase
- ☐ Bi-Layered
- ☐ Multi-Layered
- ☐ Gas/AerosolSolid

CORROSIVITY (pH)

_____ ≤2.0
_____ 2.01 - 5.0
_____ 5.01 - 9.0
_____ 9.01 - 12.49
_____ ≥12.50

_____ Exact pH

PERCENT LIQUID/SOLID

Total Solids _____ %
Suspended Solids _____ %
Free Liquid _____ %
Water _____ %

IGNITABILITY

Liquids:
Flash Point ˚F

_____ <100˚
_____ ≥100˚ ≤140˚
_____ >140˚ ≤200˚
_____ >200˚
_____ Actual

Solids:

☐ Yes ☐ No

SPECIFIC GRAVITY

_____ <.8
_____ ≥.8 ≤1
_____ >1 ≤1.2
_____ >1.2

Exact: _____

C. CHEMICAL COMPOSITION

	Check if SARA Title III Sec 313	Check if SARA III EHS Sec 302	Range Min.-Max.
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
_____	☐	☐	_____ %
		TOTAL	_____ %

Please note the chemical composition total in the range (Max.) column must be greater than or equal to 100 percent.

D. TOXICITY CHARACTERISTICS

Contaminant	EPA Waste #	Regulatory Level (mg/L)	Actual Level
Arsenic	D004	5.0	
Barium	D005	100.0	
Cadmium	D006	1.0	
Chromium	D007	5.0	
Chromium CR+ 6	D007	5.0	
Lead	D008	5.0	
Mercury	D009	0.2	
Selenium	D010	1.0	
Silver	D011	5.0	
Benzene	D018	0.5	
Carbon Tetrachloride	D019	0.5	
Chlordane	D020	0.03	
Chlorobenzene	D021	100.0	
Chloroform	D022	6.0	
o-Cresol	D023	200.0 **	
m-Cresol	D024	200.0 **	
p-Cresol	D025	200.0 **	
Cresol	D026	200.0 **	
2,4-D	D016	10.0	
1,4-Dichlorobenzene	D027	7.5	
1,2-Dichloroethane	D028	0.5	
1,1-Dichloroethylene	D029	0.7	
2,4-Dinitrotoluene	D030	0.13 *	
Endrin	D012	0.02	
Heptachlor (and its episode)	D031	0.008	
Hexachlorobenzene	D032	0.13 *	
Hexachlorobutadiene	D033	0.5	
Hexachloroethane	D034	3.0	
Lindane	D013	0.4	
Methoxychlor	D014	10.0	
Methyl Ethyl Ketone	D035	200.0	
Nitrobenzene	D036	2.0	
Pentachlorophenol	D037	100.0	
Pyridine	D038	5.0 *	
Tetrachloroethylene	D039	0.7	
Toxaphene	D015	0.5	
Trichhloroethylene	D040	0.5	
2,4,5-Trichlorophenol	D041	400.0	
2,4,6-Trichlorophenol	D042	2.0	
2,4,5-TP (Silvex)	D017	1.0	
Vinyl chloride	D043	0.2	

* Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

** If o-,m- and p-Cresol concentrations cannot be differentiated, the total Cresol (D026) concentration is used. The regulatory level of total Cresol is 200mg/L.

E. *HAZARDOUS CHARACTERISTICS*

- ☐ Radioactive
- ☐ Infectious
- ☐ Toxic
- ☐ Explosive
- ☐ Pyrophoric
- ☐ Oxidizer
- ☐ Corrosive
- ☐ Other Describe _____
- ☐ Corrosive
- ☐ None of the above
- ☐ Compressed Gas
- ☐ Flammable Solid
- ☐ Organic Peroxide
- ☐ Shock Sensitive
- ☐ Reactive Metals (Specify in section C)

F. *IDENTIFY THE HEALTH HAZARD CHARACTERISTICS FROM THE TABLE BELOW*

Immediate (Acute) Health Hazard

- ☐ None
- ☐ Highly Toxic
- ☐ Toxic
- ☐ Irritant
- ☐ Sensitizer
- ☐ Corrosive
- ☐ Other Hazardous Chemicals with an adverse effect on a target organ that generally occurs as a result of short term exposure and with a short duration.

Delayed (Chronic) Health Hazard

- ☐ Carcinogens (if carcinogens are known to be in waste, specify the carcinogen in Section C)
- ☐ Other Hazardous Chemicals with an adverse effect on a target organ that generally occurs as a result of long term exposure and with a long duration.

G. *SHIPPING INFORMATION*

- ☐ Bulk Liquid
- ☐ Bulk Solid
- ☐ Bulk Sludge
- ☐ Other Describe _____
- ☐ Drums (Steel)
- ☐ Drums (Poly)

Shipping Frequency:

Quantity _____ Per _____

H. *MANIFEST INFORMATION*

Is this a DOT Hazardous Material? ☐ Yes ☐ No

Proper DOT shipping name (49CFR table 172.101) _____ Rq. Units (lb/kg) _____

DOT Hazard Class / Division: _____ UN/UA _____ Packing Group (select one) ☐ I ☐ II ☐ III

Additional descriptions requirements (49CFR 172.203) _____

Emergency response telephone number (49CFR 172.604) _____ Contact (print name) _____

I. *WASTE CHARACTERISTICS*

Is this a US EPA Hazardous Waste? ☐ Yes ☐ No US EPA Hazardous Waste Number(s) _____ Hazard Codes _____

If yes, if the waste is a characteristic hazardous waste, does it contain underlying hazardous constituents (as defined at 40CFT 268.2(I)) Above the Universal Treatment Standard.

☐ Yes ☐ No If yes, please complete the UHC Waste Profile Addendum.

State Non-Hazardous Waste Number(s) _____

Does this waste contain any PCBs? ☐ Yes ☐ No If yes, indicate level _____ Are PCBs TSCA Regulated? ☐ Yes ☐ No

Does this waste contain any herbicides, pesticides, dixon or residues thereof? ☐ Yes ☐ No If yes, list compound and concentration in Section C.

Is this waste prohibited from land disposal under 40CFR Part 268? ☐ Yes ☐ No

If yes, list waste subcategory description, if applicable _____ or check none ☐ None

Is this waste a (check one) ☐ Non-Wastewater ☐ Wastewater? (See 40CFR 268.2)

Benzene NESHAP applicability: Is waste subject to management under National Emission Standards for Benzene Waste Operations as provided in 40CFR Part 61 Subpart FF?

☐ Yes ☐ No If yes, give benzene concentration _____

Does this waste contain any N-Nitroso-N-Methylurea? ☐ Yes ☐ No If yes, give concentration _____

If this waste is a RCRA Hazardous Waste, does it contain VOCs in concentrations ≥500 PPM (40CFR Subpart CC)? ☐ Yes ☐ No

Are there any special handling instructions for the disposal of this waste? ☐ Yes ☐ No If yes, specify _____

J. *AUTHORIZATION TO CORRECT WMPS*

I AUTHORIZE CLEAN EARTH OF NORTH JERSEY TO MAKE CORRECTIONS TO THIS WMPS. CORRECTIONS MUST BE CONSISTENT WITH THE RESULTS OF SAMPLE ANALYSIS AND REGULATORY REQUIREMENTS. I UNDERSTAND THAT A CORRECTED COPY OF THE WMPS WILL BE SENT TO ME.

Signature _____

K. *SPECIAL HANDLING COMMENTS*

_____

_____

_____

_____

L. *OFFICIAL USE ONLY*

_____

_____

_____

_____

M. *APPROVAL*

Safety _____

Environ _____

N. *POLYCHLORINATED BIPHENYL (PCB), HERBICIDE, INSECTICIDE/ALUMINUM AND REACTIVE METAL WARRANTY*

I hereby warrant that the material transferred to Clean Earth of North Jersey (CENJ) for transportation, treatment, storage and/or disposal is not radioactive waste, does not contain >1% asbestos and is not contaminated by either Polychlorinated Biphenyl or Herbicide/Pesticide/Insecticide or Dioxins or Furans of any value unless it is listed in Section C and approved by CENJ, nor does it contain Elemental Aluminum or Reactive Metal Paste, Powder, or Pigment unless it is listed in Section C and approved by CENJ and hereby agree to indemnify and hold CENJ harmless from any costs, damages, or other liability resulting from breach of this warranty or any other terms and conditions of this Waste Material Profile Sheet, including the indemnification listed on the back page.

O. The inforamtion on this Waste Material Profile Sheet (WMPS) may have been prepared by other individuals. By signing Section O of this WMPS, I certify that all information, including any attached information, is complete and is an accurate representation of the waste and its known or suspected hazards.

Date	Printed Name	Title	Generator's Signature

Clean Earth of North Jersey has all of the appropriate permits for and will accept the waste that has been characterized/identified by this Approved Waste Material Profile Sheet.

WASTE MATERIAL PROFILE SHEET INSTRUCTIONS

The following information is required of all waste to be considered for transportation, storage, treatment or disposal. It is used to determine that the waste may be transported, stored, treated or disposed of in a legal, safe and environmentally sound manner. All questions must be answered and completed in ink. Response of "NONE" or "NOT APPLICABLE" should be made if appropriate. Most items required are self-explanatory. Other items need definition or instruction as follows:

PART A – GENERATOR INFORMATION

GENERATOR NAME AND ADDRESS- As notified to EPA.
MAILING ADDRESS- Should be the location that will manage the returned waste profile sheets and manifest.
US EPA ID- For the facility generating the waste.
TECHNICAL CONTACT- A person who could give additional information about the waste, if needed.
COMMON NAME OF WASTE- A name which will be generally descriptive of the waste; a generic classification (e.g., paint, oil and water).
PROCESS GENERATING WASTE- Specific descriptive process or source which generates the waste.

PART B – PHYSICAL/CHEMICAL CHARACTERISTICS OF WASTE

ODOR- If present, describe as well as possible (e.g., solvent, acrid, sweet).
COLOR- Self explanatory.
PHYSICAL STATE- Check as many as apply.
FLASH POINT/IGNITABILITY- A value attained using the appropriate testing method as set forth in 40CFR Part 261.21.
AIR REACTIVE- Will ignite spontaneously in air.
SHOCK SENSITIVE- Normally unstable and readily undergoes violent change without detonating.
GENERATES TOXIC FUMES- In sufficient quantity to endanger human health or the environment when mixed with water, acid or base.
PERCENT LIQUID/SOLID- List the % total solids, suspended solids, free liquids and water.
SPECIFIC GRAVITY- The weight of the water compared to the weight of an equal volume of the waste.

PART C – CHEMICAL COMPOSITION

List all organic and/or inorganic components of the waste using specific chemical names. If trade names are used, Material Safety Data Sheets or other documents which adequately describe the composition of the waste must be provided. For each component indicate expected percent or range in which the component is present. In case of extreme pH (less than 2 or greater than 12.5) indicate specific acid or caustic species. Any hazardous components present in "trace" amounts and not specifically mentioned in PARTS D, F and/or H should be included, even if specific concentrations are not known. Any components listed in PARTS D, F, and/or H which exceed 10,000 PPM (1%) must be included. Components must total to 100% including water, earth or other components. If a unit of measure other than percent must be used, indicate that unit. Indicate which, if any, of the constituents are listed in SARA, Title III, Section 313. This list can be found at 40CFR Part 372. Also, indicate which, if any, of the constituents are listed in SARA, Title III, EHS Section 302. This list can be found at 40 CFR Part 355; Appendices A and B.

PART D – TOXICITY CHARACTERISTIC

Use the appropriate line to indicate the actual level, specified ranges or if below regulated level for each toxicity characteristic as defined by 40CFR Part 261.24.

PART E – HAZARDOUS CHARACTERISTICS

Complete if the waste exhibits any of the hazardous characteristics as per OSHA 29CFR Part 1910.1200 Hazard Communications Standard.

PART F – SARA/OSHA

*See below for detailed directions.

PART G – SHIPPING INFORMATION

Indicate method of shipment and type of container. If drums, they must be as specified in 49CFR Part 173, 178 or 179. Indicate quantity to be shipped during specified time frame (e.g., 10 drums per month).

PART H – MANIFEST INFORMATION

Is the waste a US DOT hazardous material as defined in 49CFR Part 172.101? If yes, enter the **SHIPPING NAME, HAZARD CLASS/ DIVISION, DOT ID NUMBER, R.Q.** (Reportable Quantity) as defined in 49CFR and identify applicable **PACKAGING GROUP**. Enter the technical names of at least two most predominant components which contribute to the hazards of the mixture or solution for all proper shipping names found in 49CFR Part 172.203 (k)3. Enter the Emergency Response Telephone number and contact name as required by 49CFR Part 172.604.

PART I – WASTE CHARACTERISTICS

Use this section to properly list all applicable US EPA/STATE Hazardous Waste Numbers and identify any waste that may be prohibited from land disposal under 40CFR Part 268.

PART J – AUTHORIZATION TO CORRECT WMPS

Provide generator's signature in this section to allow CENJ to make corrections on the WMPS that are consistent with the results of sample analysis and regulatory requirements. Signing this section will help expedite the approval process in the event corrections need to be made.

PART K – SPECIAL HANDLING/ COMMENTS

Use this section to alert the handlers of the waste of any precautions that should be taken or if the waste requires special safety or personal protective equipment. Use this space to list any additional information that may help in managing this waste.

PARTS N/O – WARRANTIES/SIGNATURE

Please read these warranties carefully. If any of these warranties cannot be certified, state the reason in Section K, Comments. The generator of the waste must sign and date the Generator's Waste Material Profile Sheet.

***PART F – CONTINUED, Instructions on Health Hazard Characterization**

Identify by checking the box which most appropriately describes the hazardous characteristics as defined below:

NONE
Self-explanatory.

HIGHLY TOXIC
(a) A chemical that has a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
(b) A chemical that has a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
(c) A chemical that has a median lethal concentration (LC50) in the air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

TOXIC
(a) A chemical that has median lethal dose (LD50) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
(b) A chemical that has a median lethal dose (LD50) of more than 200 milligrams per kilogram but not more than 1000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.

(c) A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

IRRITANT
Irritant means a chemical substance or mixture, not a corrosive which on immediate, prolonged or repeated contact with normal living tissues induces a local inflammatory response in the skin, eyes or mucous membranes per 16CFR Part 1500.41.

SENSITIZER
Sensitizer means a chemical substance or mixture that causes a substantial number of persons to develop a hypersensitive reaction in normal tissue upon reapplication of the chemical substance or mixture through an allergic or photodynamic reaction.

CORROSIVE
Corrosive Material means a chemical liquid or solid that causes visible destruction or irreversible alteration in human skin tissue at the site of contact or in the case of leakage from its packaging, a liquid that has a severe corrosion rate on steel.
(1) A Material is considered to be destructive or to cause irreversible alteration in skin tissue if, when tested on the intact skin of the albino rabbit by the method described in Appendix A of 49CFR Part 173, the structure of the tissue at the site of contact is destroyed or changed irreversibly after an exposure period of 4 hours or less.
(2) A liquid is considered to have a severe corrosive rate if its corrosion rate exceeds 0.250 inch per year (IPY) on steel (SAE 1020) at a test temperature of 103°F.

OTHER HAZARDOUS CHEMICALS . . .
Short Term
Acute (short term) refers to the adverse effects that normally are evident immediately or shortly after the exposure. Appropriate information on the effects of inhalation and skin or eye exposure should be entered here. The information should be in the form of simple symptomatic statements such as "pale and nauseous," "dizzy feeling," "weak," "irritation," etc. Again, refer to supplier MSDSs, the NPCA Labeling Guide or any other appropriate source for hazard warning language.

CARCINOGENS
Carcinogen means a chemical which has been demonstrated to cause cancer in humans or to cause cancer in animals and, therefore, is considered capable of causing cancer in humans. A chemical is considered to be a carcinogen if:
(a) it has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen; or
(b) it is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
(c) it is regulated by OSHA as a carcinogen.

OTHER HAZARDUS CHEMICALS . . .
Long Term
Chronic (long term, cumulative) refers to the adverse effects that develop slowly over a long period of time or upon repeated prolonged exposure. Appropriate information on the effects of chronic overexposure should be reported here. Evidence of carcinogenicity, asbestosis, sensitization, etc., should be indicated here. Known or suspect mutagens or teratogens must also be identified here. Mutagen means those chemical or physical effects which can alter genetic material in an organism and results in physical or functional changes in all subsequent generations. Teratogen means a chemical which has been demonstrated to cause physical defects in the developing embryo.

SAMPLES
If the generator cannot properly characterize their waste, a representative sample must accompany each Waste Material Profile Sheet submitted to CENJ. The only exception would be for virgin material where a Material Safety Data Sheet (MSDS) has been submitted with the Profile Sheet.

All samples must be taken according to 40CFR Part 261 Appendix I or the New Jersey DEP Field Sampling Procedures Manual.

All samples must be packaged according to US DOT, US EPA and any other applicable regulations.

Each sample container must be properly labeled to comply with NJAC 7:26 - 8.2(A) 12ii and NJAC 8:59 - Subchapter 5 and any other applicable regulations.

A CENJ Chain of Custody Record must be completed and submitted with each sample. Samples which are not properly classified, described, packaged, marked, labeled and in the proper condition to transport according to the applicable regulations of the US DOT, OSHA, NJ DEP, New Jersey Worker and Community Right-to-Know Act and/or any other applicable regulations may be rejected and returned at the generator's expense.

INDEMNITY
Customer hereby agrees to indemnify and hold CENJ harmless from and against any and all loss, damage, suits, liability and expenses (including, but not limited to, reasonable investigation and legal expenses) arising out of any claim for loss of or damage to property, including CENJ's property, and injuries to or death of persons, including customer's or CENJ's employees, caused by or resulting from the negligence or willful misconduct or violation of any federal, state or local laws or regulations of customer, its employees or agents. CENJ hereby agrees to indemnify and hold customer harmless from and against all loss, damage, suits, liability and expenses (including, but not limited to, reasonable investigation and legal expenses) arising out of any claim for loss of or damage to property, including customer's property, and injuries to or death of persons, including CENJ's or customer's employees, to the extent caused by or resulting from the negligence or willful misconduct of CENJ, its employees or agents.

DISTRIBUTION OF COPIES
Retain a copy for your records. Send a copy of this Generator's Waste Material Profile Sheet and attachments within the sample shipping package, ensuring that if the sample leaks, the paperwork will remain intact. Send this package to the address below.

Clean Earth of North Jersey, Inc.
115 Jacobus Avenue
Kearny, NJ 07032
T 973-344-4004
F 973-344-8652

Clean Earth of North Jersey, Inc. Underlying Hazardous Constituent (UHC) LDR Form

GENERATOR NAME: **MANIFEST DOC. NO.:**

APPROVAL CODE #:

If D001through D043 requires treatment to 268.48 standards, then each underlying hazardous constituent present in the waste at the point of generation, and at a level above the UTS constituent specific treatment standard, must be listed. Write the letter (A,B1,B2,C or D) which corresponds to the letter found on Clean Earth of North Jersey, Inc. LDR Notification and Certification Form (page 2), beside each constituent present, to properly described how the constituent(s) must be managed under 40 CFR 268.7. If no underlying hazardous constituents are present, please check appropriate section on Page 2 of this form.

CONSTITUENT	HOW MUST CONSISTUENT BE MANAGED	WW (mg/l)	NWW (mg/kg)	CONSTITUENT	HOW MUST CONSISTUENT BE MANAGED	WW (mg/l)	NWW (mg/kg)
ORGANIC CONSTITUENTS				1,2-Dibromo-3-Chloropropane		0.11000	15.000
Acenaphthylene		0.05900	3.400	1,2-Dibromoethane (Ethylene dibromide)		0.02800	15.000
Acenaphthene		0.05900	3.400	Dibromomethane		0.11000	15.000
Acetone		0.28000	160.000	2,4-Dichlorophenoxyacetic acid (2,4-D)		0.72000	10.000
Acetonitrile		5.60000	38.000	o,p-DDD		0.02300	0.087
Acetophenone		0.01000	9.700	p,p-DDD		0.02300	0.087
2-Acetylaminofluorene		0.05900	140.000	o,p-DDE		0.03100	0.087
Acrolein		0.29000	NA	p,p-DDE		0.03100	0.087
Acrylamide		19.000	23.000	o,p-DDT		0.00390	0.087
Acrylonitrile		0.24000	84.000	p,p-DDT		0.00390	0.087
Aldicard sulfone		0.05600	0.280	Dibenzo(a,h) anthracene		0.05500	8.200
Aldrin		0.02100	0.066	Dibenzo(a,e)pyrene		0.06100	NA
4-Aminobiphenyl		0.13000	NA	m-Dichlorobenzene		0.03600	6.000
Aniline		0.81000	14.000	o-Dichlorobenzene		0.08800	6.000
Anthracene		0.05900	3.400	p-Dichlorobenzene		0.09000	6.000
Aramite		0.36000	NA	Dichlorodifluoromethane		0.23000	7.200
Barban		0.05600	1.400	1,1-Dichloroethane		0.05900	6.000
alpha-BHC		0.00014	0.066	1,2-Dichloroethane		0.21000	6.000
beta-BHC		0.00014	0.066	1,1-Dichloroethylene		0.02500	6.000
delta-BHC		0.02300	0.066	trans-1,2-Dichloroethylene		0.05400	30.000
gamma-BHC (Lindane)		0.00170	0.066	2,4-Dichlorophenol		0.04400	14.000
Bendiocarb		0.05600	1.400	2,6-Dichlorophenol		0.04400	14.000
Benomyl		0.05600	1.400	1,2-Dichloropropane		0.85000	18.000
Benzene		0.14000	10.000	cis-1,3-Dichloropropylene		0.03600	18.000
Benz (a) anthracene		0.05900	3.400	trans-1,3-Dichloropropylene		0.03600	18.000
Benzal chloride		0.05500	6.000	Dieldrin		0.01700	0.130
Benzo (b) fluoranthene		0.11000	6.800	Diethyl phthalate		0.20000	28.000
Benzo (k) fluorathene		0.11000	6.800	p-Dimethylaminoazobenzene		0.13000	NA
Benzo (g,h,i) perylene		0.00550	1.800	2,4-Dimethyl phenol		0.03600	14.000
Benzo (a) pyrene		0.06100	3.400	Dimethyl phthalate		0.04700	28.000
Bromodichloromethane		0.35000	15.000	Di-n-butyl phthalate		0.05700	28.000
Bromoform (Tribromomethane)		0.63000	15.000	1,4-Dinitrobenzene		0.32000	2.300
Bromomethane (methyl bromide)		0.11000	15.000	4,6-Dinitro-o-cresol		0.28000	160.000
4-Bromophenyl phenyl ether		0.05500	15.000	2,4-Dinitrophenol		0.12000	160.000
n-Butanol (n-Butyl alcohol)		5.60000	2.600	2,4-Dinitrotoluene		0.32000	140.000
Butylate		0.04200	1.400	2,6-Dinitrotoluene		0.55000	28.000
Butyl benzyl phthalate		0.01700	28.000	Di-n-octyl phthalate		0.01700	28.000
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)		0.06600	2.500	Di-n-propylnitrosoamine		0.40000	14.000
Carbaryl		0.00600	0.140	Dithiocarbamates (Total)			28.000
Carbendazim		0.05600	1.400	1,4-Dioxane		12.00000	170.000
Carbofuran		0.00600	0.140	Diphenyl amine		0.92000	13.000
Carbofuran phenol		0.05600	1.400	Diphenylnitrosamine		0.92000	13.000
Carbon disulfide		3.80000	4.800[1]	1,2-Diphenyl hydrazine		0.08700	NA
Carbon tetrachloride		0.05700	6.000	Disulfoton		0.01700	6.200
Carbosulfan		0.02800	1.400	Endosulfan I		0.02300	0.066
Chlordane (alpha & gamma)		0.00330	0.260	Endosulfan II		0.02900	0.130
p-Chloroaniline		0.46000	16	Endosulfan sulfate		0.02900	0.130
Chlorobenzene		0.05700	6.000	Endrin		0.00280	0.130
Chlorobenzilate		0.10000	NA	Endrin aldehyde		0.02500	0.130
2-chloro-1,3-butadiene		0.05700	0.280	EPTC		0.04200	1.400
Chlorodibromomethane		0.05700	15.000	Ethyl acetate		0.34000	33.000
Chloroethane		0.27000	6.000	Ethyl benzene		0.05700	10.000
bis-(2-Chloroethoxy) methane		0.03600	7.200	Ethyl cyanide (Propanenitrile)		0.24000	360.000
bis-(2-Chloroethyl) ether		0.03300	6	Ethyl ether		0.12000	160.000
Chloroform		0.04600	6	bis-(2-Ethylhexyl) phthalate		0.28000	28.000
bis-(2-Chloroisopropyl) ether		0.05500	7.2	Ethyl methacrylate		0.14000	160.000
p-Chloro-m-cresol		0.01800	14.000	Ethylene oxide		0.12000	NA
2-Chloroethyl Vinyl ether		0.06200	NA	Famphur		0.01700	15.000
Chloromethane (methyl chloride)		0.19000	30.000	Fluoranthene		0.06800	3.400
2-Chloronaphthalene		0.05500	5.600	Fluorene		0.05900	3.400
2-Chlorophenol		0.04400	5.700	Formetanate hydrochloride		0.05600	1.400
3-Chloropropylene		0.03600	30.000	Heptachlor		0.00120	0.066
Chrysene		0.05900	3.400	Heptachlor epoxide		0.01600	0.066
m-Cresol		0.77000	5.600	Hexachlorobenzene		0.05500	10.000
o-Cresol		0.11000	5.600	Hexachlorobutadiene		0.05500	5.600
p-Cresol		0.77000	5.600	Hexachlorocyclopentadiene		0.05700	2.400
m-Cumenyl methylcarbamate		0.05600	1.400	Hexachlorodibenzo-furans		0.000063	0.001
Cyclohexanone		0.36000	0.750[1]	Hexachlorodibenzo-p-dioxins		0.00006	0.001

Clean Earth of North Jersey, Inc. Underlying Hazardous Constituent (UHC) LDR Form

GENERATOR NAME: **MANIFEST DOC. NO.:**

APPROVAL CODE #:

CONSTITUENT	HOW MUST CONSISTUENT BE MANAGED	WW (mg/l)	NWW (mg/kg)	CONSTITUENT	HOW MUST CONSISTUENT BE MANAGED	WW (mg/l)	NWW (mg/kg)
Hexachloroethane		0.05500	30.000	Promecarb		0.05600	1.400
Hexachloropropylene		0.03500	30.000	Pronamide		0.09300	1.500
Indeno (1,2,3-c,d) pyrene		0.00550	3.400	Propham		0.05600	1.400
Iodomethane		0.19000	65.000	Propoxur		0.05600	1.400
Isobutanol (Isobutyl Alcohol)		5.60000	170.000	Prosulfocarb		0.04200	1.400
Isodrin		0.02100	0.066	Pyrene		0.06700	8.200
Isosafrole		0.08100	2.600	Pyridine		0.01400	16.000
Kepone		0.00110	0.130	Safrole		0.08100	22.000
Methacrylonitrile		0.24000	84.000	Silvex (2,4,5-TP)		0.72000	7.900
Methanol		5.60000	0.750[1]	1,2,4,5-Tetrachlorobenzene		0.05500	14.000
Methapyrilene		0.08100	1.500	Tetrachlorodibenzo-furans		0.000063	0.001
Methiocarb		0.05600	1.400	Tetrachlorodibenzo-p-dioxins		0.000063	0.001
Methomyl		0.02800	0.140	1,1,1,2-Tetrachloroethane		0.05700	6.000
Methoxychlor		0.25000	0.180	1,1,2,2-Tetrachloroethane		0.05700	6.000
3-Methylcholanthrene		0.00550	15.000	Tetrachloroethylene		0.05600	6.000
4,4-Methylene-Bis-(2-chloroaniline)		0.50000	30.000	2,3,4,6-Tetrachlorophenol		0.03000	7.400
Methylene Chloride		0.08900	30.000	Thiodicarb		0.01900	1.400
Methyl ethyl ketone		0.28000	36.000	Thiophanate-methyl		0.05600	1.400
Methyl isobutyl ketone		0.14000	33.000	Toluene		0.08000	10.000
Methyl methacrylate		0.14000	160.000	Toxaphene		0.00950	2.600
Methyl methanesulfonate		0.01800	NA	Triallate		0.04200	1.400
Methyl parathion		0.01400	4.600	Tribromomethane/Bromoform		0.06300	15.000
Metolcarb		0.05600	1.400	2,4,6-Tribromophenol		0.03500	7.400
Mexacarbate		0.05600	1.400	1,2,4-Trichlorobenzene		0.05500	19.000
Molinate		0.04200	1.400	1,1,1-Trichloroethane		0.05400	6.000
Naphthalene		0.05900	5.600	1,1,2-Trichloroethane		0.05400	6.000
2-Naphthylamine		0.52000	NA	Trichloroethylene		0.05400	6.000
o-Nitroaniline		0.27000	14.000	Trichloromonofluoromethane		0.02000	30.000
p-Nitroaniline		0.02800	28.000	2,4,5-Trichlorophenol		0.18000	7.400
Nitrobenzene		0.06800	14.000	2,4,6-Trichlorophenol		0.03500	7.400
5-Nitro-o-toluidine		0.32000	28.000	2,4,5-Trichlorophenoxyacetic acit/2,4,5-T		0.07200	7.900
o-Nitrophenol		0.02800	13.000	1,2,3-Trichloropropane		0.85000	30.000
p-Nitrophenol		0.12000	29.000	1,1,2-Trichloro-1,2,2-trifluoroethane		0.05700	30.000
N-Nitrosodiethylamine		0.40000	28.000	Triethylamine		0.08100	1.500
N-Nitrosodimethylamine		0.40000	2.300	Tris(2,3,-dibromopropyl) phosphate		0.11000	0.100
N-Nitroso-di-n-butylamine		0.40000	17.000	Vernolate		0.04200	1.400
N-Nitrosomethylethylamine		0.40000	2.300	Vinyl chloride		0.27000	6.000
N-Nitrosomorpholine		0.40000	2.300	Xylene (sum of o-,m-, and p- isomers)		0.32000	30.000
N-Nitrosopiperidine		0.01300	35.000	***Inorganic Constituents***			
N-Nitrosopyrrolidine		0.01300	35.000	Cyanides (Total)		1.20000	590.000
Oxamyl		0.05600	0.280	Cyanides (Amenable)		0.86000	30.000
Parathion		0.01400	4.600	Antimony		1.90000	1.150[1]
PCBs (total) all isomers or Aroclors		0.10000	10.000	Arsenic		1.40000	5.000[1]
Pebulate		0.04200	1.400	Barium		1.20000	21.000[1]
Pentachlorobenzene		0.05500	10.000	Beryllium		0.82000	1.220[1]
Pentachloroethane		0.05500	6.000	Cadmium		0.69000	0.110[1]
Pentachlorodibenzo-furans		0.000035	0.001	Chromium(Total)		2.77000	0.600[1]
Pentachlorodibenzo-p-dioxins		0.000063	0.001	Fluoride [2]		35.0000	NA
Pentachloronitrobenzene		0.05500	4.800	Lead		0.69000	0.750[1]
Pentachlorophenol		0.08900	7.400	Mercury (Non WW from retort)		NA	0.200[1]
Phenacetin		0.08100	16.000	Mercury (All others)		0.15000	0.025[1]
Phenanthrene		0.05900	5.600	Nickel		3.98000	11.000[1]
Phenol		0.03900	6.200	Selenium		0.82000	5.700[1]
Phorate		0.02100	4.600	Silver		0.43000	0.140[1]
Phthalic acid		0.05500	28.00	Sulfide [2]		14.00000	NA
Phthalic anhydride		0.05500	28.000	Thallium		1.40000	0.20[1]
Physostigmine		0.05600	1.400	Vanadium [2]		4.30000	1.600[1]
Physostigmine salicylate		0.05600	1.400	Zinc [2]		2.61000	4.300 [1]

[1]These concentrations are expressed in mg/l and are measured through an analysis of TCLP extract; all others measured through a total waste analysis.

[2]These constituents are not Underlying Hazardous Constituents in characteristic wastes, according to the definition at 268.2(i).

☐ This waste stream contains none of the Underlying Hazardous Constituents (UHC's) listed above or on Page 1, above the UHC's specific treatment standard (UTS) at the point of generation.

The information above was determined by:

☐ Generator's knowledge of the waste
☐ Laboratory analysis

Print Name

Signature Date Title

Form UHC-LD2-09/01

Clean Earth of North Jersey, Inc.

115 Jacobus Ave.
South Kearny, NJ 07032
(973) 344-4004

APPROVAL CODE D)_____ B)_____
GENERIC CODE D)_____ B)_____
CUSTOMER # _____
LSR # _____
MASTER WPS ____YES ____NO
TECHNICAL REP. INITIALS _____
BROKER NAME (If Applicable)_____
APPROVAL DATE _____

ASBESTOS WASTE MATERIAL PROFILE SHEET

A. OWNER/OPERATOR INFORMATION

GENERATOR'S NAME _____
MAILING ADDRESS _____
WASTE PICKUP ADDRESS_____
TECH CONTACT _____ PHONE _____
PROCESS GENERATING WASTE_____

B: WASTE DESCRIPTION

1) Is the asbestos containing material mixed with any hazardous waste?
   Yes____ No____ If yes explain:_____
2) Is the asbestos containing material mixed with any state regulated waste?
   Yes____ No____ If yes explain:_____
3) Is the asbestos containing material mixed with any Polychlorinated Biphenyls?
   Yes____ No____ If yes explain:_____
4) Is the asbestos containing material mixed with any radioactive or toxic substances?
   Yes____ No____ If yes explain:_____
5) Is the asbestos containing material friable_____ non-friable_____ both_____
6) If both friable and non-friable list % friable _____ %non-friable_____.
7) What is the total quantity of regulated asbestos containing material in yards _____
8) Is the regulated asbestos containing material packaged properly packaged for transport and disposal (i.e. double bagged with 6 mil poly bags and wetted?
   Yes____ No____ If no explain:_____

C: NOTIFICATIONS:

1) Has the owner or operator supplied the USEPA, NJDEP and other applicable regulatory agencies with the proper notifications? Yes____ No____
2) If no, is the regulated asbestos containing material from a renovation project where the amount is less than 260 linear feet or at least 160 square feet on other components, or less than 35 cubic feet of facility components where the length or area could not be measured previously? Yes____ No____

K. SPECIAL HANDLING COMMENTS	*L. OFFICIAL USE ONLY*	*M. APPROVAL*
_____	_____	SAFETY _____
_____	_____	ENVIRON _____
_____	_____	
_____	_____	

D: *WARRANTY*

I hereby warrant that the material transferred to Clean Earth of North Jersey, Inc. for consolidation and transfer is not contaminated with any hazardous waste or toxic substances and hereby agree to indemnify and hold Clean Earth of North Jersey, Inc. harmless from any costs, damages or other liabilities resulting from breach of this warranty or any other terms and conditions of this Asbestos Waste Material Profile Sheet. The information on this Asbestos Waste Material Profile Sheet may have been prepared by other individuals. By signing below I certify that all information, including any attached information is complete and is an accurate representation the waste and its known constituents

Date Print Name/Title Owner or Operator Signature

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF SOLID AND HAZARDOUS WASTE

WASTE ORIGIN AND DISPOSAL FORM

1. **A. TRANSPORTER'S DEP REGISTERED NAME:** _____ **B. PHONE NO.** _____

2. **TRANSPORTER'S DEP NUMBERS:**

	DEP#	DECAL #	VEHICLE PLATE NOS. & STATE INITIAL
VEHICLE:			
TRAILER:			
CONTAINER:			

3. **A. WASTE TYPE(S):** *(Please circle)*
10 13 13C* 23 25 27 27A** 27I***
Other: _____

*Construction/Demolition Debris
**Asbestos ***Incinerator Ash

B. SOURCE SEPERATED RECYCLABLES: *(Please circle)*
Paper, Corrugated, Glass, Metal, Plastics, Concrete Products, Asphalt, Wood, Yard Material,
Other: *(Specify)* _____

4. **WASTE ORIGIN STATE** *(Please Circle)* NJ PA NY DE MD Other: *(Specify)* _____

5.

MUNICIPALITY (IES)	COUNTY (IES)	% OF TOTAL LOAD

6. **WEIGHING FACILITY:** Clean Earth of North Jersey, Inc. **ID #: 01-000311-01**

(if applicable)	CUBIC YARDS	GROSS WEIGHT	NET WEIGHT
	(Completed by Transporter)	*(Completed by Weighmaster)*	*(Completed by Weighmaster for in-State Disposal Only)*

FINAL DISPOSAL FACILITY: _____ **STATE:** _____ **ID#:** _____

7. **TRANSPORTER'S CERTIFICATION:** I certify that the information provided on this form is true to the best of my knowledge

_____ _____ _____
Print Driver/Transporter's Name *Signature* *Date*

8 **WEIGHMASTER'S CERTIFICATION:** I certify that this form has been completed by the registered transporter identified above, and the gross weight figure is true and accurate for loads going out of state.

_____ _____
(Weighmaster's Signature (if applicable) *Date*

9 **FINAL DISPOSAL FACILITY OPERATOR CERTIFICATION** (In-State Disposal Only): I certify that this form has been completed by the registered transporter identified above, and that the waste as identified by the transporter is permitted to be disposed of at this facility

_____ _____ _____
Operator's Signature *Date* *Time*

Manifest/BL # _____ Revenue Ticket # _____

115 Jacobus Ave., So. Kearny, NJ 07032 201-344-4004

LABORATORY SERVICE REQUEST

Generator	Outside Laboratory ☐ Yes ☐ No
Location	Special Analytical Request/Comments
Customer	
Customer No.	
Tech Contact	
Address	
Charge Account #	
P.O. #	
Revenue Tkt #	
Typed Copy Required? ☐ Yes ☐ No	
Sample Location in Lab	
Date/Time Submitted to Lab	

SPECIFY ANALYSES	QTY	PRICE
☐ Approval Analysis		
☐ Metals (EP-TOX/TCLP/TOTAL)		
☐ Pesticides/Herbicides (EP-TOX/TCLP/TOTAL		
☐ PCB'S		
☐ BTU/Chlorides		
☐ Total Organic Carbon		
☐ T.P.H.C.		
☐ Cyanide (Quantitative)		
☐ Sulfide (Quantitative)		
☐ Priority Pollutants (GC/MS)		
☐ Other (Specify)		
TOTAL PRICE		

Certification Of Representative Sample

1. Sampling Method:
I have obtained a representative sample of the waste according to sampling methods specified in 40CFR261 Appendix 1 or by using a method equivalent to the sampling methods described in 40CFR261 Appendix 1.
2. Sample source (e.g. drum, tank, vat, pit, lagoon, roll-off)
_____
3. I certify that the sample container complies with all regulatory packaging requirements.

4. Print Sampler's Name:_____
5. Sampler's Signature:_____
6. Sampler's Employer:_____
(If S&W see below)
7. In cases where S&W Waste,Inc. obtains the sample, one of the generator's employees must be present to direct the particular source to be sampled and to witness the sampling.

7a. Witness's Signature:
_____
7b. Witness's Employer:
_____
Date of Sampling_____
Time of Sampling_____

Chain Of Custody Record

SAMPLE I.D.#	COMP	GRAB	SAMPLE DESCRIPTION & SIZE	SHIPPED VIA

RELINQUISHED BY (Signature)	DATE	AGENT OF:	REC'D BY SIGNATURE	DATE	AGENT OF:
PRINTED NAME	TIME		PRINTED NAME	TIME	
RELINQUISHED BY (Signature)	DATE	REC'D FOR LAB BY : (Signature)	DATE	REMARKS	
PRINTED NAME	TIME	PRINTED NAME	TIME	Sampling Cond: Temp_____ °F Weather: (in/outdoors)	

LABO***TORY ANALYSES

LSR NO.	ANALYSES
DATE/TIME	
GENERATOR	
CUSTOMER #	
CUSTOMER	
ADDRESS	
LOCATION	
TECH CONTACT	
TECH REP	
RETURN REPORT TO:	
Check One: Typed Copy Required? ❑ YES ❑ NO	

❑ S & W LAB ❑ CONTRACT LAB_____ SPECIAL ANALYTICAL REQUESTS _____

CLIENT SAMPLE IDENTIFICATION	SHIPPING NAME WASTE TYPE	SAMPLING VISUAL & COMMENTS	LAB VISUAL

PAINT FILTER TEST	FLASH POINT (°F)	IGN	BTU TOP/BOTTOM	%C / CI / SPOT/TOX	SPECIFIC GRAVITY	MISCIBILITY SOLVENT	MISCIBILITY WATER	pH	T.O.C. (ppm)	OXIDIZER TEST	DOT OXIDIZER TEST	CHEMICAL COMPATABILITY A-B-KD-S
LIQUID / SOLID			GAL / LB							POS LOW MED HIGH NEG	POS / NEG	

REACTIVITY WATER	REACTIVITY SULFIDE TEST	REACTIVITY CYANIDE TEST	TOTAL SULFIDES	KARL FISCHER WATER (%)	B S & W CENTRIFUGING	ORGANIC PEROXIDE SPOT TEST	LIQUEFACTION	LATEX TEST	ALUMINUM TEST	% ASH	PCB'S (ppm)
					TOP / MIDDLE / BOTTOM	POS NEG	POS NEG	PASS FAIL	POS NEG		

METALS ❑ RCRA ❑ TOTAL ❑ TCLP ❑ VOL WEIGHTED AVERAGE ❑ Mg/L ❑ Mg/Kg			LAB COMMENTS
ANTIMONY	CHROMIUM	SELENIUM	
ARSENIC	COPPER	SILVER	
BARIUM	LEAD	THALLIUM	
BERYLLIUM	MERCURY	ZINC	
CADMIUM	NICKEL		

DATE	TIME	COMPLETED	ANALYST	(PRINT)	(INITIAL)	APPROVED BY

Appendix F
Acceptable Waste Codes

CLEAN EARTH OF NORTH JERSEY

Section 5
EPA Waste Types Accepted at CENJ Facility

Fuel Blending, Liquids:

D001	D039	K028	U012	U048	U081	U119	U159	U201
D002	D040	K029	U014	U049	U082	U120	U161	U202
D004	D041	K030	U015	U050	U083	U121	U162	U203
D005	D042	K036	U016	U051	U084	U122	U163	U206
D006	D043	K048	U017	U052	U085	U123	U164	U207
D007	F001	K049	U018	U053	U086	U124	U165	U208
D008	F002	K050	U019	U055	U087	U125	U166	U209
D009	F003	K051	U020	U056	U088	U126	U168	U210
D010	F004	K052	U021	U057	U089	U127	U169	U211
D011	F005	K085	U022	U058	U090	U128	U170	U212
D018	F006	K086	U023	U059	U091	U129	U171	U213
D019	F007	K093	U024	U060	U092	U130	U172	U218
D020	F008	K095	U025	U061	U093	U131	U173	U219
D021	F009	K096	U026	U062	U094	U132	U174	U220
D022	F032	K104	U028	U063	U095	U133	U177	U221
D023	F034	K105	U029	U064	U097	U136	U179	U222
D024	F035	K169	U030	U066	U099	U137	U180	U223
D025	F037	K170	U031	U067	U105	U140	U181	U225
D026	F038	K171	U034	U068	U106	U141	U182	U226
D027	F039	K172	U035	U069	U107	U142	U183	U227
D028	K001	U001	U036	U070	U108	U143	U184	U228
D029	K015	U002	U037	U071	U109	U147	U185	U230
D030	K016	U003	U038	U072	U110	U148	U186	U231
D031	K017	U004	U039	U073	U111	U149	U188	U232
D032	K018	U005	U041	U074	U112	U150	U190	U233
D033	K019	U006	U042	U075	U113	U151	U191	U237
D034	K020	U007	U043	U076	U114	U152	U192	U239
D035	K022	U008	U044	U077	U115	U153	U193	U240
D036	K023	U009	U045	U078	U116	U154	U194	U242
D037	K024	U010	U046	U079	U117	U157	U197	U247
D038	K027	U011	U047	U080	U118	U158	U200	

NJDEP WASTE TYPES: ID72

Stabilization:

D002	D019	D029	D039	F009	K003	K019	K060	K101
D004	D020	D030	D040	F019	K004	K020	K061	K102
D005	D021	D031	D041	F032	K005	K024	K069	K106
D006	D022	D032	D042	F034	K006	K027	K071	K169
D007	D023	D033	D043	F035	K007	K028	K073	K170
D008	D024	D034	F001	F037	K008	K048	K084	K171
D009	D025	D035	F002	F038	K015	K049	K086	K172
D010	D026	D036	F006	F039	K016	K050	K087	U032
D011	D027	D037	F007	K001	K017	K051	K095	U204
D018	D028	D038	F008	K002	K018	K052	K096	

All F, K, U or P numbers above that do not exhibit the characteristic of ignitability.
NJDEP WASTE TYPES: ID27, ID72

Wastewater Blending:

D001	D009	D022	D029	D036	D043	F038	K105
D002	D010	D023	D030	D037	F006	F039	K169
D004	D011	D024	D031	D038	F019	K050	K170
D005	D018	D025	D032	D039	F032	K062	K171
D006	D019	D026	D033	D040	F034	K086	K172
D007	D020	D027	D034	D041	F035	K100	
D008	D021	D028	D035	D042	F037	K104	

Aqueous mixtures that qualify as F, K, P or U waste codes that the permittee is authorized to handle.
NJDEP WASTE TYPES: ID72

Lab Packs:

D001	F001	K063	P026	U006	U055	U101	U146	U200
D002	F002	K064	P027	U007	U056	U102	U147	U201
D003	F003	K065	P028	U008	U057	U103	U148	U202
D004	F004	K066	P029	U009	U058	U105	U149	U203
D005	F005	K067	P030	U010	U059	U106	U150	U204
D006	F006	K068	P034	U011	U060	U107	U151	U205
D007	F019	K069	P040	U012	U061	U108	U152	U206
D008	F032	K071	P041	U014	U062	U109	U153	U207
D009	F034	K073	P044	U015	U063	U110	U154	U208
D010	F035	K084	P054	U016	U064	U111	U157	U209
D011	F037	K085	P064	U017	U066	U112	U158	U210
D012	F038	K086	P066	U018	U067	U113	U159	U211
D013	F039	K087	P067	U019	U068	U114	U161	U212
D014	K001	K093	P068	U020	U069	U115	U162	U213
D015	K002	K095	P069	U021	U070	U116	U163	U214
D016	K003	K096	P070	U022	U071	U117	U164	U215
D017	K004	K100	P077	U023	U072	U118	U165	U216
D018	K005	K101	P081	U024	U073	U119	U166	U217
D019	K006	K102	P087	U025	U074	U120	U168	U218
D020	K007	K104	P089	U026	U075	U121	U169	U219
D021	K008	K105	P092	U028	U076	U122	U170	U220
D022	K015	K106	P093	U029	U077	U123	U171	U221
D023	K016	K169	P097	U030	U078	U124	U172	U222
D024	K017	K170	P102	U031	U079	U125	U173	U223
D025	K018	K171	P103	U032	U080	U126	U174	U225
D026	K019	K172	P104	U034	U081	U127	U176	U226
D027	K020	P002	P105	U035	U082	U128	U177	U227
D028	K022	P003	P106	U036	U083	U129	U178	U228
D029	K023	P007	P107	U037	U084	U130	U179	U230
D030	K024	P008	P108	U038	U085	U131	U180	U231
D031	K027	P010	P110	U039	U086	U132	U181	U232
D032	K028	P011	P111	U041	U087	U133	U182	U233
D033	K029	P012	P113	U042	U088	U134	U183	U235
D034	K030	P013	P114	U043	U089	U136	U184	U237
D035	K035	P014	P115	U044	U090	U137	U185	U238
D036	K048	P015	P118	U045	U091	U138	U188	U239
D037	K049	P016	P119	U046	U092	U139	U189	U240
D038	K050	P017	P123	U047	U093	U140	U190	U242
D039	K051	P018	U001	U048	U094	U141	U191	U243
D040	K052	P021	U002	U049	U095	U142	U192	U244
D041	K060	P022	U003	U051	U097	U143	U193	U247
D042	K061	P023	U004	U052	U098	U144	U194	
D043	K062	P024	U005	U053	U099	U145	U197	

NJDEP WASTE TYPES: ID27, ID72

Fuel Blending, Solids:

D001	K004	K071	P013	P076	U023	U078	U133	U189
D002	K005	K073	P014	P077	U024	U079	U134	U190
D004	K006	K083	P015	P078	U025	U080	U135	U191
D005	K007	K084	P016	P081	U026	U081	U136	U192
D006	K008	K085	P017	P082	U027	U082	U137	U193
D007	K009	K086	P018	P084	U028	U083	U138	U194
D008	K010	K087	P020	P085	U029	U084	U140	U196
D009	K011	K088	P021	P087	U030	U085	U141	U197
D010	K013	K090	P022	P088	U031	U086	U142	U200
D011	K014	K093	P023	P089	U032	U087	U143	U201
D018	K015	K094	P024	P092	U033	U088	U144	U202
D019	K016	K095	P026	P093	U034	U089	U145	U203
D020	K017	K096	P027	P094	U035	U090	U146	U204
D021	K018	K097	P028	P095	U036	U091	U147	U205
D022	K019	K098	P029	P096	U037	U092	U148	U206
D023	K020	K099	P030	P097	U038	U093	U149	U207
D024	K021	K100	P031	P098	U039	U094	U150	U208
D025	K022	K101	P033	P099	U040	U095	U151	U209
D026	K023	K102	P034	P101	U041	U096	U152	U210
D027	K024	K103	P036	P102	U042	U097	U153	U211
D028	K025	K104	P037	P103	U043	U098	U154	U213
D029	K026	K105	P038	P104	U044	U099	U155	U214
D030	K027	K106	P039	P105	U045	U101	U156	U215
D031	K028	K111	P040	P106	U046	U102	U157	U216
D032	K029	K112	P041	P107	U047	U103	U158	U217
D033	K030	K113	P042	P108	U048	U104	U159	U218
D034	K031	K114	P043	P109	U049	U105	U160	U219
D035	K032	K115	P044	P110	U050	U106	U161	U220
D036	K033	K116	P045	P111	U051	U107	U162	U221
D037	K034	K117	P046	P112	U052	U108	U163	U222
D038	K035	K118	P047	P113	U053	U109	U164	U223
D039	K036	K123	P048	P114	U055	U110	U165	U225
D040	K037	K124	P049	P115	U056	U111	U166	U226
D041	K038	K125	P050	P116	U057	U112	U167	U227
D042	K039	K126	P051	P118	U058	U113	U168	U228
D043	K040	K131	P054	P119	U059	U114	U169	U234
F001	K041	K132	P057	P120	U060	U115	U170	U235
F002	K042	K136	P058	P121	U061	U116	U171	U236
F003	K043	K169	P059	P122	U062	U117	U172	U237
F004	K044	K170	P060	P123	U063	U118	U173	U238
F005	K045	K171	P062	U001	U064	U119	U174	U239
F019	K046	K172	P063	U002	U065	U120	U176	U240
F024	K047	P001	P064	U010	U066	U121	U177	U243
F025	K048	P002	P065	U011	U067	U122	U178	U244
F028	K049	P003	P066	U012	U068	U123	U179	U246
F032	K050	P004	P067	U014	U069	U124	U180	U247
F034	K051	P005	P068	U015	U070	U125	U181	U248
F035	K052	P006	P069	U016	U071	U126	U182	U249
F037	K060	P007	P070	U017	U072	U127	U183	U328
F038	K061	P008	P071	U018	U073	U128	U184	U353
F039	K602	P009	P072	U019	U074	U129	U185	U359
K001	K064	P010	P073	U020	U075	U130	U186	
K002	K065	P011	P074	U021	U076	U131	U187	
K003	K066	P012	P075	U022	U077	U132	U188	

NJDEP WASTE TYPES: ID27, ID72

Partial listing for major activities. For complete list refer to Facility Permit.

Appendix G
Corporate Health and Safety Plan

CLEANEARTH™

RECYCLING & DISPOSAL SOLUTIONS

HEALTH & SAFETY MANUAL

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Appendix H
Primary Contacts and Key Personnel

Primary Contacts and Key Personnel

Entity	Title	Name	Phone Number
NJDEP	NJDEP Division of Hazardous and Solid Waste	Jennifer Meyer	609-292-9880
NJDEP	NJDEP Division of Water Quality	John Ashton	609-633-7021
NJDEP	NJDEP Division of Quality Assurance	Joseph Aiello	609-292-3250
Clean Earth of North Jersey	General Manager	Robert Fixter	973-344-4004
Clean Earth of North Jersey	Operations Manager	Joe Barone	973-344-4004
Clean Earth of North Jersey	EHS Manager	Tom Turpin	973-344-4004
Clean Earth, LLC	Director of Environmental & Compliance	Cheryl Coffee	215-734-1400 ext. 1204

Stericycle®
Environmental Solutions

We protect
what matters.

FACILITY AUDIT PACKAGE

Hatfield, Pennsylvania TSDF

LEGAL/PERMITTED NAME: Republic Environmental Systems, LLC

2869 Sandstone Dr.
Hatfield, PA 19440
215-822-8995
StericycleEnvironmental.com

Last Updated 5/9/2019

Stericycle®
Environmental Solutions

Facility Audit Package

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INSURANCE

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About Stericycle

We protect what matters

Around the world and in most organizations, increasingly strict regulatory guidelines and stringent quality controls are putting new demands on businesses. And for many, staying up to date with the requirements that govern their respective industries is a challenge. That's where we come in.

Stericycle is a world-leading business-to-business services company providing organizations, large or small, with a wide array of essential and highly specialized compliance-based solutions. We have the scale, expertise, and experience to handle the many complicated and often behind-the-scenes services that allow our more than 1,000,000 customers to focus on their business.

To our customers and the communities that we serve, Stericycle is a company that protects people, brands and business. We protect what matters.

Overview of Stericycle's Key Services

M&I Hazardous Waste

Proper packaging, transportation and treatment of "less than a truckload" RCRA regulated materials

Retail/Healthcare Hazardous Waste

Turn-key services to manage disposal of hazardous wastes in the healthcare setting and from unusable products from retail outlets

Pharmaceutical Waste

Proper packaging, transportation and treatment for all types of unused pharmaceuticals to protect the environment and communities

Compliance

Tools and resources to promote safety, compliance, data privacy, and other best practices for small healthcare offices

Medical Waste

Compliant management of regulated medical waste to protect workers, reduce contamination risk, and improve sustainability

Information Destruction

Protects businesses and their customers with secure collection and destruction of confidential information

Recalls

Comprehensive brand protection solutions including notifications, returns management, replacement, and reporting of product recalls

Communication Solutions

Live voice and automated systems to manage customer and patient contact, appointments, and other communications

Stericycle Environmental Solutions

Stericycle Environmental Solutions provides customers with an unparalleled portfolio of services designed to successfully comply with all environmental and waste regulations. Our deep bench of highly trained technicians, expertise in compliant packaging for containment and segregation, and fleet of specially equipped trucks address our customers' needs and ensure full compliance with various OSHA, DOT, EPA and state regulations.

A total of thirteen RCRA Part B permitted Treatment, Storage and Disposal Facilities (TSDFs) and approximately fifty permitted Service Centers deliver the most appropriate hazardous waste disposal method for any given client, while meeting all regulatory and sustainability goals.

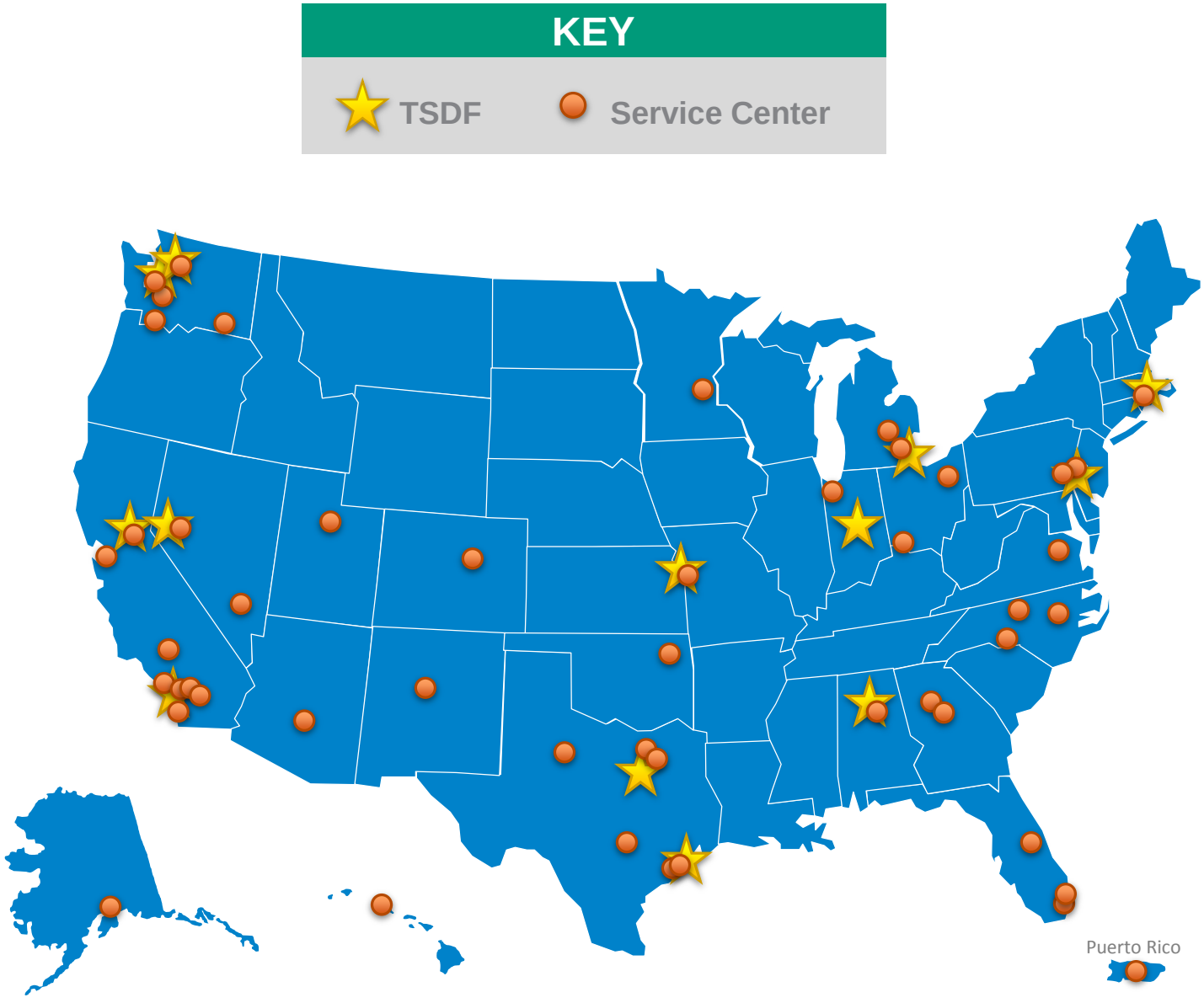
Beyond compliance, we work closely with our customers to uncover innovative reuse, recycling and alternative-use options that control costs, minimize liability, and support sustainability goals and environmental responsibility.

Stericycle®
Environmental Solutions

Facility Audit Package

Environmental Solutions Facilities & Contacts

U.S. ENVIRONMENTAL SOLUTIONS FACILITIES



Treatment, Storage and Disposal Facilities

500 Medco Road Birmingham, AL 35217 205-841-1707	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Allworth, LLC	RCRA Part B Facility, Storage capacity of over 67,000 gallons and 1,040 drums; Solvent recovery/distillation; Fuel blending. Transportation and Disposal of Hazardous, Non-hazardous, and Universal wastes.
	EPA ID #	ALD 094 476 793	
FACILITY MANAGER	**LEGAL DOT NAME**	Stericycle Specialty Waste Solutions, Inc	
Todd Williamson	**DOT #**	337503	

425 Isis Avenue Inglewood, CA 90301 323-776-6233	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Rho Chem, LLC	RCRA Part B Facility, Transportation services; storage capacity of 183,400 gallons and 1,080 drums; Fuel blending; Solvent recycling/distribution; Transportation and Disposal of Hazardous, Non-hazardous, and Universal wastes. Battery recycling; Fluorescent bulb recovery; Chlorinated solvent recovery.
	EPA ID #	CAD 008 364 432	
FACILITY MANAGER	**LEGAL DOT NAME**	Rho-Chem LLC	
Dorothy Harley	**DOT #**	195711	

11855 White Rock Rancho Cordova, CA 95742 916-351-0980	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	General Environmental Management of Rancho Cordova, LLC dba PSC Environmental Services of Rancho Cordova	RCRA Part B Facility, Repacking;Consolidation; Lab packing; Transportation & Disposal of Hazardous, Non-hazardous, and Universal wastes. Bulk liquid capacity of 360,000 gallons. Containerized waste capacity of 3,140,000. On-site laboratory for testing received waste. 10-day Truck-to-Truck Transfer;
	EPA ID #	CAD 980 884 183	
FACILITY MANAGER	**LEGAL DOT NAME**	21ST Century Environmental Management of California LP	
Modesto Granados	**DOT #**	2059497	

Treatment, Storage and Disposal Facilities (continued)

2770 Fortune Circle East Indianapolis, IN 46241 317-860-1192	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Stericycle Specialty Waste, Inc.	RCRA Part B Facility, Transportation, Storage, Disposal of Hazardous and Non-Hazardous waste, Universal waste, Waste to Energy, Recycling
	EPA ID #	INR000110197	
FACILITY MANAGER	**LEGAL DOT NAME**	Stericycle Specialty Waste Solutions, Inc	
Keith Birdwell	**DOT #**	1348411	

515 Lycaste St. Detroit, MI 48214 313-824-5840	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Petro-Chem Processing Group of Nortru, LLC	RCRA Part B Facility; Storage capacity 1.1 million gallons and 7,195 drums; Solvent distillation; Metal/solids shredding; Metal drum recycling; Transportation and Disposal of Hazardous, Non-hazardous, and Universal wastes and Waste-to- Energy Recycling.
	EPA ID #	MID 980 615 298	
FACILITY MANAGER	**LEGAL DOT NAME**	Petro-Chem Processing Group of Nortru, LLC	
Allen Jones	**DOT #**	337503	

700 Mulberry St. Kansas City, MO 64101 816-474-1391	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Solvent Recovery, LLC	RCRA Part B, CERCLA approved Facility; Storage capacity 85,650 gallons and 2,891 drums; Fuel blending; Lab pack/de-pack;
	EPA ID #	MOD 000 610 766	
FACILITY MANAGER	**LEGAL DOT NAME**	Stericycle Specialty Waste Solutions, Inc	
Matt Langston	**DOT #**	1348411	

2095 Newlands Dr. E Fernley, NV 89408 775-575-2760	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	21st Century Environmental Management of Nevada, LLC	RCRA Part B Facility; storage capacity of 182,303 gallons and 2,942 drums (liquid); 3,211 cubic yards (solid); Inorganic waste treatment; Metal- bearing resource recovery; Photographic silver recovery; Battery recycling, Transportation and Disposal of Hazardous, Non-hazardous, and Universal wastes.
	EPA ID #	NVD 980 895 338	
FACILITY MANAGER	**LEGAL DOT NAME**	21st Century Environmental Management of Nevada LLC	
Tracy Buono	**DOT #**	615443	

Treatment, Storage and Disposal Facilities (continued)

2869 Sandstone Dr. Hatfield, PA 19440 215-822-8995	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Republic Environmental Systems, LLC	RCRA Part B Facility; Approved to accept 440 waste codes; Storage capacity of 160,000 gallons, 569 drums, and 750 tons of bulk solids; Corrosive, Inorganic Wastewater Treatment; Heavy metal stabilization; Transportation & Disposal of Hazardous, Non-hazardous, and Universal wastes.
	EPA ID #	PAD 085 690 592	
FACILITY MANAGER	**LEGAL DOT NAME**	Republic Environmental Systems Transportation Group LLC	
Richard Scheule	**DOT #**	267146	

275 Allens Avenue Providence, RI 02905 401-781-6340	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Northland Environmental, LLC	RCRA Part B Facility; Storage capacity of 130,000 gallons and over 5,000 drums; Transportation & Disposal of Hazardous, Non-hazardous, and Universal wastes. Lab pack; Oil recycling, Fuel blending; Silver reclamation.
	EPA ID #	RID 040 098 352	
FACILITY MANAGER	**LEGAL DOT NAME**	Republic Environmental Systems Transportation Group LLC	
Kevin Fitzgerald	**DOT #**	618090	

405 Powell St. Avalon, TX 76623 972-627-3224	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Chemical Reclamation Services, LLC	RCRA Part B, CERCLA approved; storage capacity of 180,000 gallons; 3,500 drums; and 60 cubic yard of solids. Solvent recovery; Fuel blending.
	EPA ID #	TXD 046 844 700	
FACILITY MANAGER	**LEGAL DOT NAME**	Philip Reclamation Services Houston LLC	
Johnny Busby	**DOT #**	166862	

Treatment, Storage and Disposal Facilities (continued)

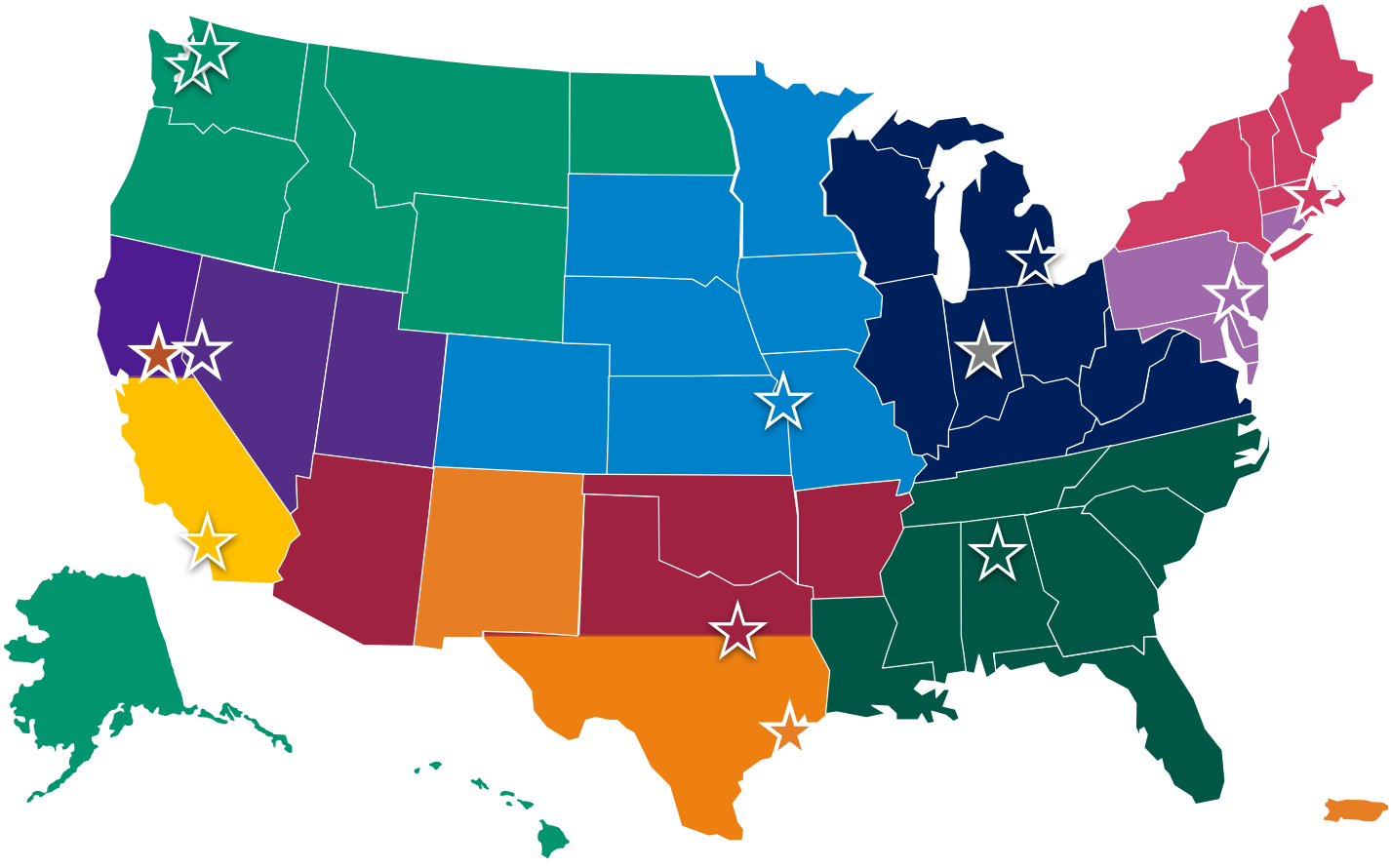
2131 Progressive Dr. Dallas, TX 75212 214-637-5575	**LOCATION TYPE**	Plant	**CAPABILITIES**
	LEGAL/PERMITTED NAME	PSC Recovery Systems, LLC	Water/Wastewater Treatment Facility; sewer & line cleaning; sand & grease trap cleaning/treatment; vacuum trucks;
	EPA ID #	TXD 102 599 339	
FACILITY MANAGER	**LEGAL DOT NAME**	PSC Recovery Systems LLC	
Chuck Trombold	**DOT #**	993643	

4050 Homestead Road Houston, TX 77028 713-679-2300	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Philip Reclamation Services, Houston, LLC	RCRA Part B Facility, CERCLA approved; Storage capacity of 50,000 gallons and 1,100 drums; Wastewater Treatment; Fuel blending; Solidification; Stabilization; Lab Pack, Solvent recovery. Bulking for Incineration;
	EPA ID #	TXD0474196338	
FACILITY MANAGER	**LEGAL DOT NAME**	Philip Reclamation Services Houston LLC	
Terry Ramey	**DOT #**	166862	

20245 77th Ave. South Kent, WA 98032 253-872-8030	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Burlington Environmental, LLC	RCRA Part B, CERCLA approved Facility; Storage capacity of 500,000 gallons and 6,000 drums; Carbon adsorption; Chemical oxidation/ precipitation/stabilization; Wastewater and sludge Treatment; PCB waste storage.
	EPA ID #	WAD 991 281 767	
FACILITY MANAGER	**LEGAL DOT NAME**	Burlington Environmental LLC	
Megan Swick	**DOT #**	262568	

1701 E. Alexander Ave Tacoma, WA 98421 253-627-7568	**LOCATION TYPE**	TSDF	**CAPABILITIES**
	LEGAL/PERMITTED NAME	Burlington Environmental, LLC	RCRA Part B, CERCLA approved; Bulk storage capacity 754,860 Gallons; Container storage capacity 284,130 Gallons; Treatment- Fuel Blending, Neutralization, Carbon Absorption, Chemical Oxidation, Chemical Precipitation, Chemical Reduction, Cyanide Destruction, Cylinder Depressurization, Decanting/Clarification, Demulsification, Dewatering, Emulsification, Filtration, Flocculation, Heat Treatment, Lab-Packing, Sedimentation, Solidification, Stabilization
	EPA ID #	WAD 020 257 945	
FACILITY MANAGER	**LEGAL DOT NAME**	Burlington Environmental LLC	
Denard Ward	**DOT #**	262568	

Flow of Waste



Kansas City	Kent & Tacoma	Detroit
Hatfield	Providence	Rancho Cordova
Fernley	Inglewood	Avalon
Houston	Birmingham	Indianapolis

This map is a generalization and exceptions do exist.

Stericycle®
Environmental Solutions

Facility Audit Package

Insurance

356429-ENSOL

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 5/31/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Risk Management Department
Commercial Lines - (305) 443-4886 USI Insurance Services National, Inc. 2601 South Bayshore Drive, Suite 1600 Coconut Grove, FL 33133	PHONE (A/C, No, Ext): (305)443-4886 FAX (A/C, No): (610)537-2273 E-MAIL ADDRESS: StericycleCerts@usi.com

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Stericycle Environmental Solutions, Inc. A subsidiary of Stericycle, Inc. 28161 N Keith Drive Lake Forest, IL 60045	INSURER A: Lexington Insurance Company	19437
	INSURER B: Greenwich Insurance Company	22322
	INSURER C: Allied World National Assurance Co.	10690
	INSURER D: XL Insurance America, Inc.	24554
	INSURER E: XL Specialty Insurance Company	37885
	INSURER F: Allied World Assurance Co (US)	19489

COVERAGES **CERTIFICATE NUMBER:** 13088266 **REVISION NUMBER:** See below

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY X PRO-JECT X LOC OTHER:			EG 1932356	06/01/2018	06/01/2019	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 300,000 $ 25,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY HIRED AUTOS ONLY SCHEDULED AUTOS NON-OWNED AUTOS ONLY			RAD943783301 (AOS) Physical Damage-Self Insured	06/01/2018	06/01/2019	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 5,000,000 $ $ $
C	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $			0305-0836	06/01/2018	06/01/2019	EACH OCCURRENCE AGGREGATE	$ 5,000,000 $ 5,000,000
D E	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		RWD943548901 (AOS) RWR943549001 (AK & WI)	06/01/2018 06/01/2018	06/01/2019 06/01/2019	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000
F	Pollution Legal Liability			0310-7450	06/01/2017	06/01/2020	Per Incident/Agg $10,000,000 Each Occur/Agg $10,000,000	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Evidence of Coverage

CERTIFICATE HOLDER

Stericycle Environmental Solutions, Inc.
28161 N Keith Drive
Lake Forest, IL 60045

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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ACORD 25 (2016/03)

Additional supplemental insurance available upon request

CID: 356429-ENSOL SID: 13088266

Certificate of Insurance (Con't)

OTHER Coverage

INSR LTR	TYPE OF INSURANCE	ADDL INSR	WVD SUBR	POLICY NUMBER	EFFECTIVE DATE (MM/DD/YY)	EXPIRATION DATE (MM/DD/YY)	LIMIT
F	Contractor's Pollution/E&O			0310-1636	06/01/2018	06/01/2019	Per Incident $10,000,000 Occur/Aggregate $10,000,000

Certificate of Insurance-Con't

Additional supplemental insurance available upon request

CID: 356429-ENSOL SID: 13088266

Additional Remarks Schedule (Continued from Page 1)

Named Insured Includes:

21st Century Environmental Management of Nevada, LLC, a Nevada limited liability company
21st Century Environmental Management, Inc., a Delaware corporation
21st Century Environmental Management, LLC of Rhode Island, a Rhode Island limited liability company
21st Century Environmental Management of California, LP, a California limited partnership
Allworth, LLC, an Alabama limited liability company
Burlington Environmental, LLC, a Washington limited liability company
Chemical Pollution Control of Florida, LLC, a Florida limited liability company
Chemical Pollution Control, LLC of New York, a New York limited liability company
Chemical Reclamation Services, LLC, a Texas limited liability company
Disposal Consultant Services, Inc.
General Environmental Management of Rancho Cordova, LLC, a California limited liability company
Luntz Acquisition (Delaware), LLC, a Delaware limited liability company
Northland Environmental, LLC, a Delaware limited liability company
Nortru, LLC, a Michigan limited liability company
Philip Holdings, LLC, a Delaware limited liability company
Philip Reclamation Services, Houston, LLC, a Texas limited liability company
PSC Environmental Management, Inc., a Delaware corporation
PSC Environmental Services of Pomona, LP, a Delaware limited partnership
PSC Environmental Services, LLC, a Delaware limited liability company
PSC Holdings, Inc. Subsidiaries
PSC Holdings, Inc., a Delaware Corporation
PSC Recovery Systems, LLC, a Georgia limited liability company
PSC, LLC, a Delaware limited liability company
Republic Environmental Recycling (New Jersey), Inc., a New Jersey corporation
Republic Environmental Systems (Pennsylvania), LLC, a Pennsylvania limited liability company Republic Environmental Systems (Transportation Group), LLC, a Pennsylvania limited liability company
Rho-Chem, LLC, a California limited liability company
Solvent Recovery, LLC, a Missouri limited liability company
Stericycle Environmental Solutions, Inc.

Additional Remarks Schedule-Con't

Additional supplemental insurance available upon request

Stericycle®
Environmental Solutions

Facility Audit Package | Hatfield, Pennsylvania TSDF

Permits & Accepted Waste Codes

Permits & Accepted Waste Codes

Accepted Waste Codes

D	F	K			P			U				
D001	F001	K001	K052	K136	P001	P058	P118	U001	U053	U107	U158	U214
D002	F002	K002	K060		P002	P059	P119	U002	U055	U108	U159	U215
D003	F003	K003	K061		P003	P060	P120	U003	U056	U109	U160	U216
D004	F004	K004	K062		P004	P062	P121	U004	U057	U110	U161	U217
D005	F005	K005	K064		P005	P063	P122	U005	U058	U111	U162	U218
D006	F006	K006	K065		P006	P064	P123	U006	U059	U112	U163	U219
D007	F007	K007	K066		P007	P065	P127	U007	U060	U113	U164	U220
D008	F008	K008	K069		P008	P066	P128	U008	U061	U114	U165	U221
D009	F009	K009	K071		P009	P067	P185	U009	U062	U115	U166	U222
D010	F010	K010	K073		P010	P068	P188	U010	U063	U116	U167	U223
D011	F011	K011	K083		P011	P069	P189	U011	U064	U117	U168	U225
D012	F012	K013	K084	K156	P012	P070	P190	U012	U066	U118	U169	U226
D013	F019	K014	K085	K157	P013	P071	P191	U014	U067	U119	U170	U227
D014	F020	K015	K086	K158	P014	P072	P192	U015	U068	U120	U171	U228
D015	F021	K016	K087	K159	P015	P073	P194	U016	U069	U121	U172	U234
D016	F022	K017	K088	K161	P016	P074	P196	U017	U070	U122	U173	U235
D017	F023	K018	K090	K169	P017	P075	P197	U018	U071	U123	U174	U236
D018	F024	K019	K091	K170	P018	P076	P198	U019	U072	U124	U176	U237
D019	F025	K020	K093	K171	P020	P077	P199	U020	U073	U125	U177	U238
D020	F026	K021	K094	K172	P021	P078	P201	U021	U074	U126	U178	U239
D021	F027	K022	K095		P022	P081	P202	U022	U075	U127	U179	U240
D022	F028	K023	K096		P023	P082	P203	U023	U076	U128	U180	U243
D023	F032	K024	K097		P024	P084	P204	U024	U077	U129	U181	U244
D024	F034	K025	K098		P026	P085	P205	U025	U078	U130	U182	U246
D025	F035	K026			P027	P087		U026	U079	U131	U183	U247
D026	F037	K027	K100		P028	P088		U027	U080	U132	U184	U248
D027	F038	K028	K101		P029	P089		U028	U081	U133	U185	U249
D028	F039	K029	K102		P030	P092		U029	U082	U134	U186	U271
D029		K030	K103		P031	P093		U030	U083	U135	U187	U278
D030		K031	K104		P033	P094		U031	U084	U136	U188	U279
D031		K032	K105		P034	P095		U032	U085	U137	U189	U280
D032		K033	K106		P036	P096		U033	U086	U138	U190	U328
D033		K034			P037	P097		U034	U087	U140	U191	U353
D034		K035			P038	P098		U035	U088	U141	U192	U359
D035		K036			P039	P099		U036	U089	U142	U193	U364
D036		K037			P040	P101		U037	U090	U143	U194	U367
D037		K038	K111		P041	P102		U038	U091	U144	U196	U372
D038		K039	K112		P042	P103		U039	U092	U145	U197	U373
D039		K040	K113		P043	P104		U041	U093	U146	U200	U387
D040		K041	K114		P044	P105		U042	U094	U147	U201	U389
D041		K042	K115		P045	P106		U043	U095	U148	U203	U394
D042		K043	K116		P046	P108		U044	U096	U149	U204	U395
D043		K044	K117		P047	P109		U045	U097	U150	U205	U404
		K045	K118		P048	P110		U046	U098	U151	U206	U409
		K046	K123		P049	P111		U047	U099	U152	U207	U410
		K047	K124		P050	P112		U048	U101	U153	U208	U411
		K048	K125		P051	P113		U049	U102	U154	U209	
		K049	K126		P054	P114		U050	U103	U155	U210	
		K050			P056	P115		U051	U105	U156	U211	
		K051			P057	P116		U052	U106	U157	U213	

Part B Permit

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
PERMIT
FOR HAZARDOUS WASTE STORAGE, TREATMENT, AND DISPOSAL

Permittee: Republic Environmental Systems (Pennsylvania), LLC Permit Number: PAD 085 690 592

Facility: Republic Environmental Systems (Pennsylvania), LLC

2869 Sandstone Drive, Hatfield, PA 19440

This permit is issued by the Commonwealth of Pennsylvania Department of Environmental Protection (DEP) under authority of the Pennsylvania Solid Waste Management Act, the Act of July 7, 1980, Act 97, 35 P.S. Section 6018.101 et seq. (the Act), DEP's hazardous waste regulations, and Federal hazardous waste regulations, to Republic Environmental Systems (Pennsylvania), LLC (hereafter called the Permittee), to continue operations at a hazardous waste management facility located at 2869 Sandstone Drive, Hatfield, PA, in Hatfield Township, Montgomery County, at latitude 40 ° 17 ' 30 " North and longitude -75 ° 17 ' 09 " West.

The Permittee must comply with all terms and conditions of this permit. This permit consists of the conditions contained herein (Parts I–VI and Attachments 1 through 11, consisting of pages 1 through 46) and the applicable regulations contained in 25 Pa. Code Chapters 260a–270a and 40 CFR 260–270 as specified in the permit.

This permit is based on the assumption that the information submitted in the permit renewal application attached to the Permittee's letter dated November 22, 2011; as modified by subsequent amendments dated December 19, 2011; November 2, 2012; June 20, 2013; September 4, 2013; November 8, 2013; May 2, 2014, and October 2, 2014 (hereafter referred to as the application); are accurate and that the facility will be constructed and/or operated as specified in the application. Any inaccuracies found in this information may be grounds for the revocation or modification of this permit and potential enforcement action. The Permittee must inform DEP of any deviation from or changes in the information in the application which would affect the Permittee's ability to comply with the applicable regulations or permit conditions.

This permit is conditioned upon full compliance with all applicable provisions of the Act; DEP's regulations contained in 25 Pa. Code Chapters 260a–270a; Federal regulations contained in 40 CFR Chapters 260–270; the Clean Streams Law, 35 P.S. 691.1 et seq.; the Air Pollution Control Act, 35 P.S. 4001 et seq.; the Dam Safety and Encroachments Act, 32 P.S. 693.1 et seq.; the Surface Mining Conservation and Reclamation Act, 52 P.S. 1396.1 et seq.; the Coal Refuse Disposal Control Act, 52 P.S. 30.51 et seq.; all other Pennsylvania statutes related to the protection of the environment; and all Pennsylvania statutes related to the protection of public health, safety, and welfare.

This permit is effective as of December 10, 2014, and shall remain in effect until December 10, 2024, unless revoked and reissued, or terminated in accordance with 25 Pa. Codes 270a.41, 270a.42, and 270a.43 and 40 CFR 270.41, 270.42, and 270.43, or continued.

Page 1

Permits & Accepted Waste Codes

Air Quality Permit

46-00146 REPUBLIC ENV SYS PA LLC/HATFIELD

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY PROGRAM

STATE ONLY OPERATING PERMIT

Issue Date: July 8, 2016 Effective Date: July 8, 2016
Expiration Date: July 8, 2021

In accordance with the provisions of the Air Pollution Control Act, the Act of January 8, 1960, P.L. 2119, as amended, and 25 Pa. Code Chapter 127, the Owner, [and Operator if noted] (hereinafter referred to as permittee) identified below is authorized by the Department of Environmental Protection (Department) to operate the air emission source(s) more fully described in this permit. This Facility is subject to all terms and conditions specified in this permit. Nothing in this permit relieves the permittee from its obligations to comply with all applicable Federal, State and Local laws and regulations.

The regulatory or statutory authority for each permit condition is set forth in brackets. All terms and conditions in this permit are federally enforceable unless otherwise designated.

State Only Permit No: 46-00146
Synthetic Minor
Federal Tax Id - Plant Code: 26-2277300-1

Owner Information
Name: REPUBLIC ENV SYS PA LLC
Mailing Address: 2869 SANDSTONE DR
HATFIELD, PA 19440-1912

Plant Information
Plant: REPUBLIC ENV SYS PA LLC/HATFIELD
Location: 46 Montgomery County 46930 Hatfield Township
SIC Code: 4953 Trans. & Utilities - Refuse Systems

Responsible Official
Name: RICHARD SCHEULE
Title: OPERATIONS MANAGER
Phone (215) 822 - 8995 Ext.101

Permit Contact Person
Name: JUSTIN N PICKENS
Title: COMPLIANCE MANAGER
Phone: (215) 822 - 8995 Ext.111

[Signature] James D. Rebarchak
JAMES D. REBARCHAK, SOUTHEAST REGION AIR PROGRAM MANAGER

DEP Auth ID: 1092196 Page 1

Stormwater Permit

3850-PM-BCW0083d 9/2016
Permit

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

PAG-03

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT FOR DISCHARGES OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY

NPDES PERMIT NO: PAR900009

In compliance with the provisions of the Clean Water Act, 33 U.S.C. Section 1251 *et seq.*, and Pennsylvania's Clean Streams Law, as amended, 35 P.S. Section 691.1 *et seq.*,

Republic Environmental Systems (Pennsylvania), LLC
2869 Sandstone Drive
Hatfield, PA 19440

(permittee) is authorized to discharge from a facility known as **Republic Environmental Systems (Pennsylvania), LLC** (facility), located in **Hatfield Township, Montgomery County**, to **Unnamed Tributary to West Branch Neshaminy Creek** in Watershed(s) **2-F** in accordance with the effluent limitations, monitoring and reporting requirements, best management practices (BMPs) and other conditions set forth in Parts A, B and C and Appendix(ces) **A** herein.

APPROVAL OF COVERAGE TO DISCHARGE UNDER THIS GENERAL NPDES PERMIT IS AUTHORIZED BEGINNING ON JANUARY 1, 2017. WHEN THE GENERAL PERMIT IS RENEWED, REISSUED OR MODIFIED, THE FACILITY OR ACTIVITY COVERED BY THE APPROVAL FOR COVERAGE MUST COMPLY WITH THE FINAL RENEWED, REISSUED OR MODIFIED GENERAL PERMIT.

The authority granted by coverage under the PAG-03 NPDES General Permit ("General Permit") is subject to the following further qualifications:

1. The permittee shall comply with the terms and conditions of the PAG-03 NPDES General Permit, including the monitoring and reporting requirements contained in Part A, the standard conditions in Part B, the special conditions in Part C, and the applicable appendix or appendices for all discharges of stormwater from the facility.

2. Submission of a Notice of Intent (NOI) is not required for renewal of coverage under this General Permit and coverage is automatically extended for the duration of the final renewed, reissued or amended General Permit, unless DEP notifies the permittee in writing that submission of an NOI is required. The permittee shall be responsible for complying with the final renewed, reissued or amended General Permit. If the permittee is unable to comply with the renewed, reissued or amended General Permit, the permittee shall submit an application for an individual NPDES permit within 90 days of the final General Permit publication.

3. If the permittee believes a conflict exists between the requirements in the NOI or its supporting documents and the terms and conditions of the PAG-03 NPDES General Permit, the permittee shall comply with the terms and conditions of the General Permit.

4. The Permittee's failure to comply with the terms, conditions, or effluent limitations of the PAG-03 NPDES General Permit is grounds for DEP to take an enforcement action, or to terminate or revoke coverage under this General Permit.

5. This PAG-03 NPDES General Permit does not authorize construction or modification of treatment facilities necessary to meet the terms and conditions of this General Permit.

The aforementioned approval is authorized by:

Jenifer L. Fields, P.E.
Clean Water Program Manager
Southeast Regional Office

- 1 -

Wastewater Permit

RALPH HARVEY, Chairman
DONALD ATKISS, Vice Chairman
GEORGE LANDES, Asst. Secretary
BARRY WERT, Secretary/Asst. Treasurer
CHARLES SIBEL, Treasurer

PETER R. DORNEY, Executive Director

HATFIELD TOWNSHIP MUNICIPAL AUTHORITY
CLEAN WATER

GHD INC
Engineer
717-541-0622

HAMBURG, RUBIN, MULLIN,
MAXWELL & LUPIN
Solicitor
215-661-0400

PERMIT NO. 9035

In accordance with the provisions of Hatfield Township Ordinance No. 600 – (amending Ord. 420, Ch. 18.), and all Hatfield Township Municipal Authority (HTMA) rules and resolutions relating to the discharge of wastewater to the Hatfield Township Municipal Authority's Wastewater Treatment System,

REPUBLIC ENVIRONMENTAL SYSTEMS (PA) LLC, (RESPA) Permittee
aka - Stericycle Environmental Services
2869 Sandstone Drive
Hatfield, PA 19440,

A Significant Industrial User as defined by this permit, is hereby authorized to discharge process wastewater from the above identified facility and through the outfall identified herein, into the Hatfield Township Municipal Authority wastewater treatment system in accordance with the conditions set forth in this permit.

Compliance with this permit does not relieve the permittee of its obligations to comply with any and all applicable pretreatment regulations, standards or requirements under local, state, and federal laws, including any such regulations, standards, requirements, or laws that may become effective during the term of this permit.

Noncompliance with any term or condition of this permit shall constitute a violation of the Hatfield Township Sewer Use Ordinance.

This permit shall become effective on July 1, 2018 and shall expire at midnight on June 30, 2021.

If the permittee wishes to continue to discharge after the expiration date of this permit, an application must be filed for renewal in accordance with Ordinance requirements, a minimum of 90 days prior to the expiration date, or as otherwise specified by this permit.

Issued this 14th day of June, 2018.

Issued by: Joseph C. Stammers, Plant Manager

Joseph E. Stammers

3200 ADVANCE LANE, COLMAR, PA 18915 FAX (215) 822-1869 (215) 822-9300 & 997-2768

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

Certifies That

46-01135

Republic Environmental Systems Pennsylvania LLC

2869 Sandstone Dr, Hatfield, PA, 19440-1912

Having duly met the requirement of

Chapter 252 Regulations

issued under the act of June 29, 2002

(P.L. 596, No. 90) dealing with Environmental Laboratory Accreditation (27 Pa. C.S. 4104-4113)

is hereby approved as an

Accredited Laboratory

to conduct analysis within the fields of accreditations more fully described in the attached Scope of Accreditation

Expiration Date: **04/30/2020**

Certificate Number: **012**

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Aaren S. Alger, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Laboratory Accreditation Permit

Permits & Accepted Waste Codes

Laboratory Accreditation Permit (page 2)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 011-001 expiration date April 30, 2019. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 46-01135 **EPA Lab Code: PA01576** **(215) 822-8995**

Republic Environmental Systems Pennsylvania LLC
2869 Sandstone Dr
Hatfield, PA 19440-1912

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1010		Ignitability	State	PA	4/16/2008
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	State	PA	4/16/2008
EPA 200.7	4.4	Aluminum	State	PA	4/16/2008
EPA 200.7	4.4	Antimony	State	PA	4/16/2008
EPA 200.7	4.4	Arsenic	State	PA	4/16/2008
EPA 200.7	4.4	Barium	State	PA	11/23/2009
EPA 200.7	4.4	Beryllium	State	PA	4/16/2008
EPA 200.7	4.4	Cadmium	State	PA	8/3/2017
EPA 200.7	4.4	Chromium	State	PA	4/16/2008
EPA 200.7	4.4	Cobalt	State	PA	4/16/2008
EPA 200.7	4.4	Copper	State	PA	9/20/2011
EPA 200.7	4.4	Iron	State	PA	4/16/2008
EPA 200.7	4.4	Lead	State	PA	4/16/2008
EPA 200.7	4.4	Manganese	State	PA	6/25/2014
EPA 200.7	4.4	Molybdenum	State	PA	10/7/2013
EPA 200.7	4.4	Nickel	State	PA	4/16/2008
EPA 200.7	4.4	Selenium	State	PA	10/7/2013
EPA 200.7	4.4	Silver	State	PA	10/7/2013
EPA 200.7	4.4	Thallium	State	PA	4/16/2008
EPA 200.7	4.4	Tin	State	PA	10/7/2013
EPA 200.7	4.4	Vanadium	State	PA	4/16/2008
EPA 200.7	4.4	Zinc	State	PA	8/3/2017
EPA 3010	A	Hot plate acid digestion (HNO_3 + HCl)	State	PA	4/16/2008
EPA 420.1		Total phenolics	State	PA	4/16/2008
EPA 5030	B	Aqueous-phase purge-and-trap	State	PA	4/16/2008
EPA 601		1,1,1-Trichloroethane	State	PA	6/25/2014
EPA 601		1,1,2,2-Tetrachloroethane	State	PA	6/25/2014
EPA 601		1,1,2-Trichloroethane	State	PA	8/3/2017
EPA 601		1,1-Dichloroethane	State	PA	6/25/2014
EPA 601		1,1-Dichloroethene (1,1-Dichloroethylene)	State	PA	8/3/2017
EPA 601		1,2-Dichlorobenzene (o-Dichlorobenzene)	State	PA	10/7/2013
EPA 601		1,2-Dichloroethane	State	PA	6/25/2014
EPA 601		1,2-Dichloropropane	State	PA	6/25/2014
EPA 601		1,3-Dichlorobenzene (m-Dichlorobenzene)	State	PA	6/25/2014
EPA 601		1,4-Dichlorobenzene (p-Dichlorobenzene)	State	PA	8/3/2017
EPA 601		2-Butanone (Methyl ethyl ketone, MEK)	State	PA	6/25/2014
EPA 601		Bromodichloromethane	State	PA	6/25/2014
EPA 601		Bromoform	State	PA	6/25/2014
EPA 601		Bromomethane (Methyl bromide)	State	PA	6/25/2014
EPA 601		Carbon tetrachloride	State	PA	6/25/2014

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

Page 1 of 4 **www.dep.state.pa.us** **Issue Date: 04/19/2018**

Permits & Accepted Waste Codes

Laboratory Accreditation Permit (page 3)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 011-001 expiration date April 30, 2019. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 46-01135 **EPA Lab Code: PA01576** **(215) 822-8995**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 601		Chlorobenzene	State	PA	6/25/2014
EPA 601		Chloroethane	State	PA	6/25/2014
EPA 601		Chloroform	State	PA	8/3/2017
EPA 601		Chloromethane (Methyl chloride)	State	PA	7/9/2015
EPA 601		Dibromochloromethane	State	PA	8/3/2017
EPA 601		Dichlorodifluoromethane (Freon 12)	State	PA	6/25/2014
EPA 601		Methylene chloride (Dichloromethane)	State	PA	6/25/2014
EPA 601		Tetrachloroethene (PCE, Perchloroethylene)	State	PA	6/25/2014
EPA 601		Trichloroethene (TCE, Trichloroethylene)	State	PA	6/25/2014
EPA 601		Trichlorofluoromethane (Freon 11)	State	PA	6/25/2014
EPA 601		Vinyl chloride (Chloroethene)	State	PA	7/9/2015
EPA 601		cis-1,3-Dichloropropene	State	PA	8/3/2017
EPA 601		trans-1,2-Dichloroethene	State	PA	6/25/2014
EPA 601		trans-1,3-Dichloropropene	State	PA	6/25/2014
EPA 602		Benzene	State	PA	8/3/2017
EPA 602		Ethylbenzene	State	PA	8/3/2017
EPA 602		Toluene	State	PA	7/9/2010
EPA 602		Xylenes, total	State	PA	9/20/2011
SM 2540 B		Residue, total	State	PA	4/16/2008
SM 2540 D		Residue, nonfilterable (TSS)	State	PA	4/16/2008
SM 4500-CN- B		Preliminary treatment of cyanide samples	State	PA	4/16/2008
SM 4500-CN- C/E		Cyanide	State	PA	4/16/2008
SM 4500-Cl G		Total residual chlorine	State	PA	9/17/2013
SM 4500-Cl- B		Chloride	State	PA	10/27/2009
SM 4500-H+ B		pH	State	PA	4/16/2008
SM 4500-NH3 B		Ammonia distillation	State	PA	4/16/2008
SM 4500-NH3 C		Ammonia as N	State	PA	4/16/2008
SM 4500-NO3- B		Nitrate as N	State	PA	4/16/2008
SM 4500-P E		Orthophosphate as P	State	PA	4/16/2008
SM 5310 C		Total organic carbon (TOC)	State	PA	8/3/2017
SM 5530 B		Cleanup procedure for phenols	State	PA	4/16/2008

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1010		Ignitability	State	PA	4/16/2008
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	State	PA	4/16/2008
EPA 3050	B	Acid digestion of solids	State	PA	4/16/2008
EPA 5035		Closed-system purge-and-trap (methanol option)	State	PA	4/16/2008
EPA 6010		Aluminum	State	PA	4/16/2008
EPA 6010		Antimony	State	PA	4/16/2008
EPA 6010		Arsenic	State	PA	4/16/2008
EPA 6010		Barium	State	PA	4/16/2008
EPA 6010		Beryllium	State	PA	4/16/2008
EPA 6010		Cadmium	State	PA	4/16/2008

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Permits & Accepted Waste Codes

Laboratory Accreditation Permit (page 4)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 011-001 expiration date April 30, 2019. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 46-01135 **EPA Lab Code: PA01576** **(215) 822-8995**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 6010		Chromium	State	PA	4/16/2008
EPA 6010		Cobalt	State	PA	4/16/2008
EPA 6010		Copper	State	PA	4/16/2008
EPA 6010		Iron	State	PA	4/16/2008
EPA 6010		Lead	State	PA	4/16/2008
EPA 6010		Magnesium	State	PA	8/3/2017
EPA 6010		Manganese	State	PA	4/16/2008
EPA 6010		Mercury	State	PA	4/16/2008
EPA 6010		Molybdenum	State	PA	4/16/2008
EPA 6010		Nickel	State	PA	4/16/2008
EPA 6010		Selenium	State	PA	4/16/2008
EPA 6010		Silver	State	PA	4/16/2008
EPA 6010		Thallium	State	PA	4/16/2008
EPA 6010		Tin	State	PA	7/9/2015
EPA 6010		Titanium	State	PA	4/16/2008
EPA 6010		Vanadium	State	PA	9/13/2012
EPA 6010		Zinc	State	PA	4/16/2008
EPA 8021		1,1,1-Trichloroethane	State	PA	4/30/2008
EPA 8021		1,1,2,2-Tetrachloroethane	State	PA	4/30/2008
EPA 8021		1,1,2-Trichloroethane	State	PA	4/30/2008
EPA 8021		1,1-Dichloroethane	State	PA	4/30/2008
EPA 8021		1,1-Dichloroethene (1,1-Dichloroethylene)	State	PA	4/30/2008
EPA 8021		1,2-Dichloroethane	State	PA	4/30/2008
EPA 8021		1,2-Dichloropropane	State	PA	9/13/2012
EPA 8021		1,3-Dichlorobenzene (m-Dichlorobenzene)	State	PA	4/30/2008
EPA 8021		1,4-Dichlorobenzene (p-Dichlorobenzene)	State	PA	4/30/2008
EPA 8021		2-Butanone (Methyl ethyl ketone, MEK)	State	PA	4/30/2008
EPA 8021		Benzene	State	PA	4/30/2008
EPA 8021		Bromodichloromethane	State	PA	7/9/2015
EPA 8021		Bromoform	State	PA	4/30/2008
EPA 8021		Bromomethane (Methyl bromide)	State	PA	4/30/2008
EPA 8021		Carbon tetrachloride	State	PA	4/30/2008
EPA 8021		Chlorobenzene	State	PA	9/18/2012
EPA 8021		Chloroethane	State	PA	4/30/2008
EPA 8021		Chloroform	State	PA	4/30/2008
EPA 8021		Chloromethane (Methyl chloride)	State	PA	4/30/2008
EPA 8021		Dibromochloromethane	State	PA	4/30/2008
EPA 8021		Dichlorodifluoromethane (Freon 12)	State	PA	4/30/2008
EPA 8021		Ethylbenzene	State	PA	4/30/2008
EPA 8021		Methylene chloride (Dichloromethane)	State	PA	4/30/2008
EPA 8021		Tetrachloroethene (PCE, Perchloroethylene)	State	PA	4/30/2008
EPA 8021		Toluene	State	PA	4/30/2008
EPA 8021		Trichloroethene (TCE, Trichloroethylene)	State	PA	4/30/2008
EPA 8021		Trichlorofluoromethane (Freon 11)	State	PA	4/30/2008
EPA 8021		Vinyl chloride (Chloroethene)	State	PA	4/30/2008
EPA 8021		Xylenes, total	State	PA	4/8/2013
EPA 8021		cis-1,3-Dichloropropene	State	PA	4/30/2008

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

Page 3 of 4 **www.dep.state.pa.us** Issue Date: 04/19/2018

Permits & Accepted Waste Codes

Laboratory Accreditation Permit (page 5)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 011-001 expiration date April 30, 2019. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 46-01135 **EPA Lab Code: PA01576** **(215) 822-8995**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8021		trans-1,2-Dichloroethene	State	PA	4/30/2008
EPA 8021		trans-1,3-Dichloropropene	State	PA	4/30/2008
EPA 9045		pH	State	PA	4/16/2008
EPA 9095	A	Paint filter liquids test	State	PA	4/16/2008

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

Page 4 of 4 www.dep.state.pa.us Issue Date: 04/19/2018

CERCLA Waste Permit

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

BY TELE FAX AND CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JUL 13 2005

Mr. Averill Rance
Republic Environmental Systems, Inc.
2869 Sandstone Drive
Hatfield, Pennsylvania 19440

RE: CERCLA Off-Site Acceptability Determination - Republic Environmental Systems, Inc., 2869 Sandstone Drive, Hatfield, Pennsylvania 19440

Dear Mr. Rance:

The Environmental Protection Agency, Region III (Region III), has made an acceptability determination for the Republic Environmental Systems, Inc., 2869 Sandstone Drive, Hatfield, Pennsylvania 19440 (Facility) to receive CERCLA Waste, as that term is defined at 40 C.F.R. Section 300.440(a) of the Off-Site Rule.[1]

On December 14, 2004 the United States Environmental Protection (EPA) amended the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, by adding Section 300.440, now known as the Off-Site Rule. The Off-Site Rule codifies the requirements contained in CERCLA Section 121(d)(3). The Off-Site Rule establishes the criteria and procedures for determining if facilities are acceptable for the receipt of CERCLA Waste.

The Off-Site Rule requires that prior to a facility's initial receipt of CERCLA Waste, EPA must determine that there are no relevant releases or relevant violations at the facility. EPA believes that an affirmative determination of "compliance" and "control of release" is necessary before a facility may be deemed acceptable for the receipt of CERCLA Waste.

Region III has contacted the Pennsylvania Department of Environmental Protection (PADEP). PADEP has indicated that the Facility is in compliance with all of its regulatory requirements and is operating without any relevant releases. EPA Region III has also been provided with a copy of his latest inspection of your facility. Based upon that information, this letter serves to inform you of Region III's determination that the Facility is currently acceptable to receive CERCLA Waste.

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[1] As used herein, the term "Off-Site Rule" refers to the "procedures for Planning and Implementing Off-Site Response Action," 40 C.F.R. Section 300.40. As used herein, the term "CERCLA" refers to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Sections 9601-9675, otherwise known as the federal Superfund law.

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Customer Service Hotline: 1-800-438-2474

Permits & Accepted Waste Codes

PCB Commercial Storage Permit

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

SEP 13 1990

9/19/90
cc: Greg Breidinger
Tony Grasso
Karl Kriger
Re: PCB Storage Application
FYI/FYE
(FYI)

Mr. Randy R. Royer
Waste Conversion, Inc.
2869 Sandstone Drive
Hatfield, PA 19440

Dear Mr. Royer:

This letter serves as an acknowledgement that the U.S. Environmental Protection Agency (EPA), Region III has received on August 2, 1990 your application for a PCB Commercial Storage Approval. A preliminary review of the application indicates that the application is complete, and that the following information was provided as required:

- Facility name and address;
- Identification of owner(s) and/or operator(s);
- Identification of the person responsible for operating the facility (i.e., point of contact at the site) and supervisor employees responsible for the facility's operations;
- Technical qualifications and experience of the persons responsible for the overall operations of the facility and employees responsible for handling waste;
- Listing of State and/or Federal environmental violations (past five years);
- Listing of companies in which the owner, operator, or key employees have/had an interest (past five years);
- Estimate of the maximum amount of PCBs to be stored at the facility;
- Certification that facility complies with requirements of 40 CFR 761.65;
- Closure Cost Estimate;
- Financial Assurance Demonstration;
- Signature.

Therefore, the interim status granted on August 2, 1990, to continue operations at the Waste Conversion, Inc. Facility in

PCB Commercial Storage Permit (page 2)

Hatfield, PA remains in force pending EPA's final action on your application. A more thorough technical review of the application will now be conducted. During that review, you may be required to submit supplemental information necessary to demonstrate that your facility should receive final approval. The submission of any supplemental data should be made in a timely manner, as the availability of this information may have an impact on your request for an approval.

If you need further clarifications, please do not hesitate to contact me at 215-597-7668.

Sincerely,

Edward H. Cohen

Edward H. Cohen
Regional PCB Permit Coordinator

cc: Tony Baney
Chemical Regulation Branch, EPA

FACILITY AUDIT PACKAGE

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CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 07/29/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER AssuredPartners of Indiana, LLC 10401 N. Meridian #300 Indianapolis, IN 46290	1-317-844-7759
CONTACT NAME:	Lyndsay Myers
PHONE (A/C, No, Ext):	317-595-7392
FAX (A/C, No):	
E-MAIL ADDRESS:	Lyndsay.Myers@assuredpartners.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : GREENWICH INS CO	22322
INSURER B : XL INS AMER INC	24554
INSURER C : XL SPECIALTY INS CO	37885
INSURER D : ZURICH AMER INS CO	16535
INSURER E : IRONSHORE SPECIALTY INS CO	25445
INSURER F : TOKIO MARINE PACIFIC INS LTD	11216

INSURED
Heritage Waste Solutions, LLC

6510 Telecom Drive Suite 400

Indianapolis, IN 46278

COVERAGES **CERTIFICATE NUMBER:** 59885097 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT LOC OTHER:			GEC000304120	08/01/20	08/01/21	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG 	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000 $
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY HIRED AUTOS ONLY SCHEDULED AUTOS NON-OWNED AUTOS ONLY			AEC000304320	08/01/20	08/01/21	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) 	$ 1,000,000 $ $ $ $
C	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED X RETENTION $ 10,000			UEC00183618	08/01/20	08/01/21	EACH OCCURRENCE AGGREGATE 	$ 10,000,000 $ 10,000,000 $
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC929886320	08/01/20	08/01/21	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
E	POLLUTION LEGAL LIABILITY			002855804	08/01/20	08/01/21	EACH 15,000,000 AG	30,000,000
F	CPL/ PROFESSIONAL			PPK2163828	08/01/20	08/01/21	EACH 15,000,000 AG	30,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

HERITAGE WASTE SOLUTIONS, LLC

7903 NW PLEASANT FORD ROAD

WEATHERBY LAKE, MO 64152

USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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AssuredPartners of Indiana

AssuredPartners of Indiana, LLC
10401 N. Meridian Street | Suite 300
Indianapolis, IN 46290
Phone: 317-844-7759 | Fax: 317-815-6036

ADDITIONAL NAMED INSUREDS: (Applies to all locations of the named insured)

Heritage Environmental Services, LLC
6510 Telecom Drive Suite 400
Indianapolis, IN 46278

Heritage Environmental Services, LLC
7901 West Morris Street
Indianapolis, IN 46231

Heritage Interactive Services, LLC
6510 Telecom Drive Suite 400
Indianapolis, IN 46278

Heritage Transport, LLC
7901 West Morris Street
Indianapolis, IN 46231

Heritage Environmental Services PR, LLC
Carr 682 Km 13.5 Bo Cercadillo
Arecibo, PR 00613

Rineco Chemical Industries, LLC
P.O. Box 729
Benton, AR 72015

Rineco Environmental Services, LLC
P.O. Box 729
Benton, AR 72015

Rineco Transportation, LLC
P.O. Box 729
Benton, AR 72015

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location(s) Of Covered Operations
Any person or organization where required by written contract provided that such contract was executed prior to the date of loss.	All Locations as required per written contract.
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or

2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and

2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or

2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

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C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location And Description Of Completed Operations
Any person or organization where required by written contract provided that such contract was executed prior to the date of loss.	All Locations as required per written contract.,
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the Schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and

2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

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WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Person Or Organization:
Any person or organization where required by written contract provided that such contract was executed prior to the date of loss (as permissable by law).
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

The following is added to Paragraph **8. Transfer Of Rights Of Recovery Against Others To Us** of **Section IV – Conditions:**

We waive any right of recovery we may have against the person or organization shown in the Schedule above because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard". This waiver applies only to the person or organization shown in the Schedule above.

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ENDORSEMENT #10

This endorsement, effective 12:01 a.m., 08-01-2020, forms a part of

Policy No. GEC0003041-20 issued to Heritage Environmental Services, LLC

by Greenwich Insurance Company.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

PRIMARY INSURANCE CLAUSE ENDORSEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS COVERAGE PART

It is agreed that to the extent that insurance is afforded to any Additional Insured under this policy, this insurance shall apply as primary and not contributing with any insurance carried by such Additional Insured, as required by written contract.

All other terms and conditions of this policy remain unchanged.

©, 2005, XL America, Inc.

ENDORSEMENT #007

This endorsement, effective 12:01 a.m., August 1, 2020 forms a part of Policy No. AEC000304320 issued to HERITAGE ENVIRONMENTAL SERVICES, LLC by XL Insurance America, Inc..

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

AUTOMATIC ADDITIONAL INSURED

This endorsement modifies insurance provided under the following:

BUSINESS AUTO COVERAGE FORM
MOTOR CARRIER COVERAGE FORM
AUTO DEALERS COVERAGE FORM

A. **COVERED AUTOS LIABILITY COVERAGE, Who Is An Insured,** is amended to include as an "insured" any person or organization you are required in a written contract to name as an additional insured, but only for "bodily injury" or "property damage" otherwise covered under this policy caused, in whole or in part, by the negligent acts or omissions of:

1. You, while using a covered "auto"; or

2. Any other person, except the additional insured or any employee or agent of the additional insured, operating a covered "auto" with your permission;

Provided that:

a. The written contract is in effect during the policy period of this policy;

b. The written contract was signed by you and executed prior to the "accident" causing "bodily injury" or "property damage" for which liability coverage is sought; and

c. Such person or organization is an "insured" solely to the extent required by the contract, but in no event if such person or organization is solely negligent.

B. The Limits of Insurance provided for the Additional Insured shall not be greater than those required by contract and, in no event shall the Limits of Insurance set forth in this policy be increased by the contract.

C. **General Conditions, Other Insurance** is amended as follows:

Any coverage provided hereunder shall be excess over any other valid and collectible insurance available to the additional insured whether such insurance is primary, excess, contingent or on any other basis unless the contract specifically requires that this policy be primary.

All terms, conditions, exclusions and limitations of this policy shall apply to the liability coverage provided to any additional insured, and in no event shall such coverage be enlarged or expanded by reason of the contract.

All other terms and conditions of this policy remain unchanged.

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SRIS 09/11/2019

COMMERCIAL AUTO
CA 04 49 11 16

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

PRIMARY AND NONCONTRIBUTORY – OTHER INSURANCE CONDITION

This endorsement modifies insurance provided under the following:

AUTO DEALERS COVERAGE FORM
BUSINESS AUTO COVERAGE FORM
MOTOR CARRIER COVERAGE FORM

With respect to coverage provided by this endorsement, the provisions of the Coverage Form apply unless modified by the endorsement.

A. The following is added to the **Other Insurance** Condition in the Business Auto Coverage Form and the **Other Insurance – Primary And Excess Insurance Provisions** in the Motor Carrier Coverage Form and supersedes any provision to the contrary:

This Coverage Form's Covered Autos Liability Coverage is primary to and will not seek contribution from any other insurance available to an "insured" under your policy provided that:

1. Such "insured" is a Named Insured under such other insurance; and

2. You have agreed in writing in a contract or agreement that this insurance would be primary and would not seek contribution from any other insurance available to such "insured".

B. The following is added to the **Other Insurance** Condition in the Auto Dealers Coverage Form and supersedes any provision to the contrary:

This Coverage Form's Covered Autos Liability Coverage and General Liability Coverages are primary to and will not seek contribution from any other insurance available to an "insured" under your policy provided that:

1. Such "insured" is a Named Insured under such other insurance; and

2. You have agreed in writing in a contract or agreement that this insurance would be primary and would not seek contribution from any other insurance available to such "insured".

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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US (WAIVER OF SUBROGATION)

This endorsement modifies insurance provided under the following:

AUTO DEALERS COVERAGE FORM
BUSINESS AUTO COVERAGE FORM
MOTOR CARRIER COVERAGE FORM

With respect to coverage provided by this endorsement, the provisions of the Coverage Form apply unless modified by the endorsement.

This endorsement changes the policy effective on the inception date of the policy unless another date is indicated below.

Named Insured: HERITAGE ENVIRONMENTAL SERVICES, LLC

Endorsement Effective Date: August 1, 2020

SCHEDULE

Name(s) Of Person(s) Or Organization(s):
WHERE REQUIRED BY WRITTEN CONTRACT OR AGREEMENT EXECUTED PRIOR TO LOSS (EXCEPT WHERE NOT PERMITTED BY LAW).
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

The **Transfer Of Rights Of Recovery Against Others To Us** condition does not apply to the person(s) or organization(s) shown in the Schedule, but only to the extent that subrogation is waived prior to the "accident" or the "loss" under a contract with that person or organization.

 © Insurance Services Office, Inc., 2011

WORKERS COMPENSATION AND EMPLOYERS LIABILITY INSURANCE POLICY **WC 00 03 13**

(Ed. 4-84)

WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS ENDORSEMENT

We have the right to recover our payments from anyone liable for an injury covered by this policy. We will not enforce our right against the person or organization named in the Schedule. (This agreement applies only to the extent that you perform work under a written contract that requires you to obtain this agreement from us.)

This agreement shall not operate directly or indirectly to benefit anyone not named in the Schedule.

Schedule

ALL PERSONS AND/OR ORGANIZATIONS THAT ARE REQUIRED BY WRITTEN CONTRACT, OR AGREEMENT WITH THE INSURED, EXECUTED PRIOR TO THE ACCIDENT OR LOSS, THAT WAIVER OF SUBROGATION BE PROVIDED UNDER THIS POLICY FOR WORK PERFORMED BY YOU FOR THAT PERSON AND/OR ORGANIZATION

© 1983 National Council on Compensation Insurance.

SUPPLEMENT TO CERTIFICATE OF INSURANCE

DATE
07/29/2020

NAME OF INSURED: Heritage Waste Solutions, LLC

SUPP (10/00)

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR(S) 2018-2021

Registrant: HERITAGE WASTE SOLUTIONS LLC
ATTN: ALEXANDER BENSLEY
7903 NW PLEASANT FORD ROAD
WEATHERBY LAKE, MO 64152

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 062918550682AC Effective: July 1, 2018 Expires: June 30, 2021

HM Company ID: 161371

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with PHMSA; and

(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, PHH-52, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590, telephone (202) 366-4109.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

Heritage Waste Solutions Limited Liability Company
7903 NW Pleasant Ford Road
Weatherby Lake, MO 64152

NOV 08 2012

RE: **Hazardous Waste Transporter License**

Dear Applicants:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. had been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department issued a Solid Waste Transporter and Broker License on March 22, 2012 and is hereby issuing a **Hazardous Waste Transporter License** to:

HERITAGE WASTE SOLUTIONS LIMITED LIABILITY COMPANY

Please be advised that the license hereby issued is a **"conditional"** license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Any transportation equipment must be registered prior to commencing operations; and in accordance with the hazardous waste regulations, your company must undertake provisions for a training program in the safe management of hazardous waste for all employees who will handle such waste. Questions regarding equipment registration of the above license should be directed to (609) 292-7081.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosure
c: Raghu Murthy, DAG
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
004802

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

MAR 22 2012

John Dillow
Heritage Waste Solutions Limited Liability Company
7903 NW Pleasant Ford Road
Weatherby Lake, MO 64152

RE: **Solid Waste Transporter License**

Dear Mr. Dillow:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. has been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department is hereby issuing this **Solid Waste Transporter License to:**

HERITAGE WASTE SOLUTIONS LIMITED LIABILITY COMPANY

Please be advised that the license hereby issued is a "**conditional**" license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Please be aware that you are required to obtain a Certificate of Public Convenience and Necessity prior to commencing solid waste business operations. An application is enclosed. Questions regarding this certificate should be directed to (609) 984-2080. As you know, any transportation equipment must be registered prior to commencing operations. Questions regarding registration should be directed to (609) 292-7081.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosure

c: Gwen Farley, DAG
Raghu Murthy, DAG
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
#004802

Heritage Waste Solutions Limited Liability Company

Condition of Solid Waste License:
Prohibition of Sale of License
pursuant to N.J.S.A. 13:1E-126 et seq.
N.J.A.C. 7:26-16.6 and N.J.A.C. 7:26H-1.9

Regardless of whether a license obtains or has obtained a certificate of public convenience and necessity, should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting solid waste from a generator, transfer station, or other source of waste to a solid waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50% of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 13:1E-126 et seq., N.J.A.C. 7:26-16.6, N.J.S.A. 48:13A-1 et seq., and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with fingerprints, of all proposed new owners, directors, partners, officers or key employees, to the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

This Certificate is Non-Transferable

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

Department of Environmental Protection
Solid & Hazardous Waste Management
Bureau of Transfer Stations & Recycling Facilities
401 East State Street
Mail Code 401-02C
Trenton, New Jersey 08625

BOB MARTIN
Commissioner

CERTIFICATE
Of
PUBLIC CONVENIENCE AND NECESSITY

HEREBY ISSUED TO: HERITAGE WASTE SOLUTIONS, LLC

STREET ADDRESS
7903 NW PLEASANT FORD ROAD
WEATHERBY LAKE, MISSOURI 64152

MAILING ADDRESS
7903 NW PLEASANT FORD ROAD
WEATHERBY LAKE, MISSOURI 64152

SW NUMBER: SW3033

FOR AUTHORITY TO ENGAGE IN THE BUSINESS OF SOLID WASTE COLLECTION AS DEFINED IN N.J.S.A. 13:1E-1 ET SEQ. IN AND ABOUT THE STATE OF NEW JERSEY

The authority granted shall not exceed that requested in Docket No. **CF2012-082**

IT IS MADE A CONDITION OF THIS CERTIFICATE THAT THE HOLDER SHALL OPERATE IN COMPLIANCE WITH THE AUTHORITY HEREIN GRANTED UNDER THE PROVISIONS OF N.J.S.A. 48:13A-1ET SEQ. AND N.J.S.A. 13:1E-1 ET SEQ. FAILURE TO DO SO SHALL CONSTITUTE SUFFICIENT GROUNDS FOR SUSPENSION OR REVOCATION PURSUANT TO N.J.S.A. 48:13A-9 ET SEQ.

Date of Issue: 11/7/2012

Anthony Fontana, Bureau Chief
Solid & Hazardous Waste Management

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

State of New Jersey
Department of Environmental Protection
Solid & Hazardous Waste Management
Bureau of Transfer Stations & Recycling Facilities
401 East State Street
Mail Code 401-02C
Trenton, New Jersey 08625

BOB MARTIN
Commissioner

IN THE MATTER OF THE APPLICATION OF HERITAGE WASTE SOLUTIONS, LLC FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE COLLECTION OF SOLID WASTE	))))	SOLID WASTE ORDER DOCKET NO. CF2012-082 SW NUMBER SW3033

(SERVICE LIST ATTACHED)

On September 28, 2012 Heritage Waste Solutions, LLC a limited liability company formed under the laws of the State of Missouri, with a street address of 7903 NW Pleasant Ford Road, Weatherby Lake, Missouri, 64152 filed a petition with the Department of Environmental Protection (Department) pursuant to N.J.S.A. 48:13A-6, for a Certificate of Public Convenience and Necessity (Certificate) to engage in the business of solid waste collection.

Pursuant to the provisions of N.J.S.A. 48:13A-6, persons are not permitted to engage in the solid waste collection or solid waste disposal business unless they hold a Certificate, are qualified by experience, training or education, are able to furnish proof of financial responsibility and the proposed collection or disposal system is registered with, and approved by the Department.

The Applicant proposes to engage in New Jersey's Solid Waste Industry, providing the collection, transportation, and disposal, of hazardous and non-hazardous environmental remediation waste (solid waste), as well as providing broker management services (managing, administrating, arranging), through a contract or other means, the solid and/or hazardous waste (solid waste) needs of clients, utilizing other licensed collectors, in all counties of New Jersey. The solid waste will be disposed of in accordance with each county's Solid Waste Management Plan.

A copy of the Applicant's notice of A-901 Approval, dated March 22, 2012 meeting the requirements of N.J.S A. 13:1E-126 et.seq. has been submitted to the Department. The Applicant has submitted tariff sheets for these services.

After review of the application as filed, the Department **FINDS** that the Applicant has met the necessary requirements as to financial responsibility, experience and training to be granted a Certificate. Therefore, the Department **HEREBY AUTHORIZES** the issuance of a Certificate identified as **SW No. 3033** to engage in the solid waste collection business in New Jersey as specified herein above. Operations authorized herein are subject to the rights and duties of public utilities as set forth in Title 48, New Jersey Statutes Annotated and Title 7, New Jersey Administrative Code.

Should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting solid waste from a generator, transfer station, or other source of waste to a solid waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50 percent of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 48:13A-1 et. seq. and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

This Order shall not limit, prevent, or in any manner affect the authority of the Department or State to institute any proceeding, civil, criminal, regulatory or administrative, in any federal or state court or agency with respect to anti-trust, monopoly or restraint of trade issues, "fitness to serve" the existence of effective competition or other activities of the parties to this proceeding. Nor shall this Order limit, prevent, or in any manner affect the authority of the Department, or any federal or state court or agency.

Should the fitness to serve of the applicant be successfully challenged in any legal and/or administrative proceeding, or should the applicant or its owners, officers or employees be found to have violated any statutory or regulatory provision, the Department hereby reserves its right to amend, change and/or rescind such provisions of this Order, as in its judgment the public good may demand.

Further, this Order grants approval to operate only to the extent consistent with the application and supporting documents incorporated and requested herein by reference. Should **Heritage Waste Solutions, LLC** expand the scope of its solid waste operations without providing the Department with the appropriate notice, the Applicant shall be subject to penalties and fines pursuant to N.J.A.C. 7:26H-1.1 et. seq.

DATED: 11/7/2012

DEPARTMENT OF ENVIRONMENTAL PROTECTION
BY:

Anthony Fontana

Anthony Fontana, Bureau Chief
Solid & Hazardous Waste Management

HORWTRU-01 ELHUDLER

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 11/29/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Erica L. Hudler	
EHD (Engle-Hambright & Davies, Inc.) 350 Eagleview Blvd Suite 110 Exton, PA 19341	PHONE (A/C, No, Ext): (610) 280-0410	FAX (A/C, No): (610) 280-0703
	E-MAIL ADDRESS: elhudler@ehd-ins.com	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Burlington Insurance Company	23620
INSURER B : Greenwich Insurance Company	22322
INSURER C : Gemini Insurance Company	10833
INSURER D : Arch Insurance Company	11150
INSURER E : Endurance American Specialty Insurance Co.	
INSURER F :	

INSURED
Horwith Trucks, Inc.
LV Company Inc.
1449 Nor Bath Blvd
Northampton, PA 18067-9700

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT LOC OTHER:			549BW54948	12/1/2019	12/1/2020	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY			AEC005100702	12/1/2019	12/1/2020	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
C	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED X RETENTION $ 10,000			GVE100141105	12/1/2019	12/1/2020	EACH OCCURRENCE AGGREGATE	$ 4,000,000 $ 4,000,000
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N N If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		ZAWC15804100	1/1/2020	8/1/2020	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000
E	Excess Liability			EXT30001382800	12/1/2019	12/1/2020	Occurrence	2,000,000
E	Excess Liability			EXT30001382800	12/1/2019	12/1/2020	Aggregate	2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
CARGO AND LOGISTICS LEGAL LIABILITY
Limit at Any Other Locations $250,000
Deductible: $5,000
Carrier: The Travelers Indemnity Company of America
Policy Number: QT-660-3P623151
Effective Dates: 12/01/19-12/01/20

SEE ATTACHED ACORD 101

CERTIFICATE HOLDER

Evidence of Coverage

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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AGENCY CUSTOMER ID: HORWTRU-01 ELHUDLER

LOC #: 1

ACORD

ADDITIONAL REMARKS SCHEDULE

AGENCY		NAMED INSURED
EHD (Engle-Hambright & Davies, Inc.)		Horwith Trucks, Inc. LV Company Inc. 1449 Nor Bath Blvd Northampton, PA 18067-9700
POLICY NUMBER SEE PAGE 1		
CARRIER SEE PAGE 1	NAIC CODE SEE P 1	EFFECTIVE DATE: SEE PAGE 1

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: ACORD 25 FORM TITLE: Certificate of Liability Insurance

Description of Operations/Locations/Vehicles:
Pollution Legal Liability
Carrier: Aspen Specialty Insurance Company
Policy ER00A0U18
Effective Dates: 12/01/2018-12/01/21
Limits: $5,000,000
Deductible $25,000

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L V COMPANY, INC. FID 23-1728849

PM-31
(Rev. 10/84)

INTERSTATE COMMERCE COMMISSION

PERMIT

No. MC 150163 (Sub 14-P)

SERVICE DATE
MAR 31 1987

LV COMPANY, INC.
NORTHAMPTON, PA

This Permit is evidence of the carrier's authority to engage in transportation as a contract carrier by motor vehicle.

This authority will be effective as long as the carrier maintains compliance with the requirements pertaining to insurance coverage for the protection of the public (49 CFR 1043); the designation of agents upon whom process may be served (49 CFR 1044); the execution of contracts (49 CFR 1053)*; and for passenger carriers, tariffs or schedules (49 CFR 1312).

This authority is subject to any terms, conditions, and limitations as are now, or may later be, attached to this privilege.

The transportation service to be performed is described on the reverse side of this document.

By the Commission.

(SEAL)

NORETA R. McGEE,
Secretary.

*While the execution of contracts must be accomplished, it is unnecessary to file them with the Commmission.

NOTE: If there are discrepancies regarding this Permit, please notify the Commission within 30 days.

Form **W-9**
(Rev. November 2017)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ Go to *www.irs.gov/FormW9* for instructions and the latest information.

Give Form to the requester. Do not send to the IRS.

Print or type. See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
LV COMPANY INC.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☑ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.
1149 NORBATH BLVD

Requester's name and address (optional)

6 City, state, and ZIP code
NORTHAMPTON, PA 18067

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number
[ ][ ][ ] - [ ][ ] - [ ][ ][ ][ ]

or

Employer identification number
23 - 1728849

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here Signature of U.S. person ▶ [signature] Date ▶ 3-26-18

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

HAZARDOUS MATERIALS CERTIFICATE OF REGISTRATION FOR REGISTRATION YEAR(S) 2018-2021

Registrant: L V COMPANY
ATTN: Regina Grim
PO BOX 7 RTE 329
NORTHAMPTON, PA 18067

This certifies that the registrant is registered with the U.S. Department of Transportation as required by 49 CFR Part 107, Subpart G.

This certificate is issued under the authority of 49 U.S.C. 5108. It is unlawful to alter or falsify this document.

Reg. No: 060918550020AC Effective: July 1, 2018 Expires: June 30, 2021

HM Company ID: 44704

Record Keeping Requirements for the Registration Program

The following must be maintained at the principal place of business for a period of three years from the date of issuance of this Certificate of Registration:

(1) A copy of the registration statement filed with PHMSA; and

(2) This Certificate of Registration

Each person subject to the registration requirement must furnish that person's Certificate of Registration (or a copy) and all other records and information pertaining to the information contained in the registration statement to an authorized representative or special agent of the U. S. Department of Transportation upon request.

Each motor carrier (private or for-hire) and each vessel operator subject to the registration requirement must keep a copy of the current Certificate of Registration or another document bearing the registration number identified as the "U.S. DOT Hazmat Reg. No." in each truck and truck tractor or vessel (trailers and semi-trailers not included) used to transport hazardous materials subject to the registration requirement. The Certificate of Registration or document bearing the registration number must be made available, upon request, to enforcement personnel.

For information, contact the Hazardous Materials Registration Manager, PHH-52, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590, telephone (202) 366-4109.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

DUPLICATE

SEP 04 2013

Horwith Trucks, Inc.
PO Box 7, Route 329
Northampton, PA 18067

RE: **Solid Waste Transporter License**

Dear Applicants:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. had been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department issued a **Solid Waste Transporter License** on December 22, 1994 to:

HORWITH TRUCKS, INC.

This letter will serve as documentation that a solid waste transporter license had been previously issued and this serves as a duplicate of the original license.

Please be advised that the license hereby issued is a **"conditional"** license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosure
c: Raghu Murthy, DAG
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
000426

Horwith Trucks, Inc.

Condition of Solid Waste License:
Prohibition of Sale of License
pursuant to N.J.S.A. 13:1E-126 et seq.
N.J.A.C. 7:26-16.6 and N.J.A.C. 7:26H-1.9

Regardless of whether a licensee obtains or has obtained a certificate of public convenience and necessity, should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting solid waste from a generator, transfer station, or other source of waste to a solid waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50% of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 13:1E-126 et seq., N.J.A.C. 7:26-16.6, N.J.S.A. 48:13A-1 et seq., and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with fingerprints, of all proposed new owners, directors, partners, officers or key employees, to the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

Conditions of Solid Waste License:
Official Company Name

The State of New Jersey, Division of Commercial Recordings database indicates that this company is registered as Horwith Trucks, Inc. (commercial record number: 0100521726), which is the official company name licensed as a solid waste transporter in New Jersey. Therefore, you are required to conduct all solid waste business activities and operations under the registered and licensed name of: Horwith Trucks, Inc., including, but not limited to, billing and invoices, insurance, and all state and federal identification numbers and registrations.

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

DUPLICATE

SEP 04 2013

Horwith Trucks, Inc.
PO Box 7, Route 329
Northampton, PA 18067

RE: **Hazardous Waste Transporter License**

Dear Applicants:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. had been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department issued a **Hazardous Waste Transporter License** on December 22, 1994 to:

HORWITH TRUCKS, INC.

This letter will serve as documentation that a solid waste transporter license had been previously issued and this serves as a duplicate of the original license.

Please be advised that the license hereby issued is a **"conditional"** license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosures
c: Raghu Murthy, DAG
Lt. Joseph McNally, NJSP
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
#000426

Horwith Trucks, Inc.

Conditions of Hazardous Waste License:
Official Company Name

The State of New Jersey, Division of Commercial Recordings database indicates that this company is registered as Horwith Trucks, Inc. (commercial record number: 0100521726), which is the official company name licensed as a solid waste transporter in New Jersey. Therefore, you are required to conduct all solid waste business activities and operations under the registered and licensed name of: Horwith Trucks, Inc., including, but not limited to, billing and invoices, insurance, and all state and federal identification numbers and registrations.

Condition of Hazardous Waste License:
Prohibition of Sale of License
pursuant to N.J.S.A. 13:1E-126 et seq.
N.J.A.C. 7:26-16.6 and N.J.A.C. 7:26H-1.9

Regardless of whether a licensee obtains or has obtained a certificate of public convenience and necessity, should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting hazardous waste from a generator, transfer station, or other source of waste to a hazardous waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50% of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 13:1E-126 et seq., N.J.A.C. 7:26-16.6, N.J.S.A. 48:13A-1 et seq., and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with fingerprints, of all proposed new owners, directors, partners, officers or key employees, to the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

Condition of Hazardous Waste License:
Comply with all Federal and State
Transporting Regulation

Hazardous Waste is specifically identified and regulated by the United States Environmental Protection Agency (USEPA) by 40CFR, Part 262 and incorporated by reference into the regulations of NJDEP. Therefore, the licensee must comply with all governing State and Federal laws applicable to hazardous waste transportation in New Jersey prior to the transportation of hazardous waste and provide proof to the Department at the time of filing your registration statement with NJDEP's Licensing and Registration Unit to obtain decals. Specifically, but not limited to:

1. Obtain a USEPA Transporter Registration Number.
2. Proof of compliance with the minimum financial responsibility requirements covering public liabilities, property damage and environmental restoration set out at 49 C.F.R. Part 387 in a form approved by the Department; MCS-90
3. Proof of Hazmat Training conforming to 49 CFR 172.700 to 172.704
4. Proper registration with the U.S. Department of Transportation (USDOT) for any applicable transportation activities
5. Proof of current registration with the Pipeline Hazardous Material Safety Administration to transport hazardous material
6. If applicable, satisfactorily completion of NJ State Police - New Entrant Program, or are in good standing with NJ State Police Motor Vehicle Enforcement

Failure to comply with these conditions may result in formal enforcement actions or denial of NJDEP Transporter registration statement and decals.

This Certificate is Non-Transferable.

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

Division of Solid and Hazardous Waste
Bureau of solid Waste Regulation
CN 414, Trenton, NJ 08625

CERTIFICATE
of
PUBLIC CONVENIENCE AND NECESSITY

HEREBY ISSUED TO: **HORWITH TRUCKS, INC.**
P.O. BOX 7, ROUTE 329
NORTHAMPTON, PA. 18067

SW NUMBER: SW1998

FOR AUTHORITY TO ENGAGE IN THE BUSINESS OF SOLID WASTE COLLECTION AS DEFINED IN N.J.S.A. 48:13A-1 ET SEQ. AND N.J.S.A. 13:1E-1 ET SEQ IN AND ABOUT THE STATE OF NEW JERSEY.

The authority granted herein shall not exceed that requested in the contract, Docket No. SE92070745.

IT IS MADE A CONDITION OF THIS CERTIFICATE THAT THE HOLDER SHALL OPERATE IN COMPLIANCE WITH THE AUTHORITY HEREIN GRANTED UNDER THE PROVISIONS OF N.J.S.A. 48:13A-1 ET SEQ. AND N.J.S.A. 13:1E-1 ET SEQ. FAILURE TO DO SO SHALL CONSTITUTE SUFFICIENT GROUNDS FOR SUSPENSION OR REVOCATION PURSUANT TO N.J.S.A. 48:13A-9 ET SEQ.

Date of Issue: DEC 11 1996

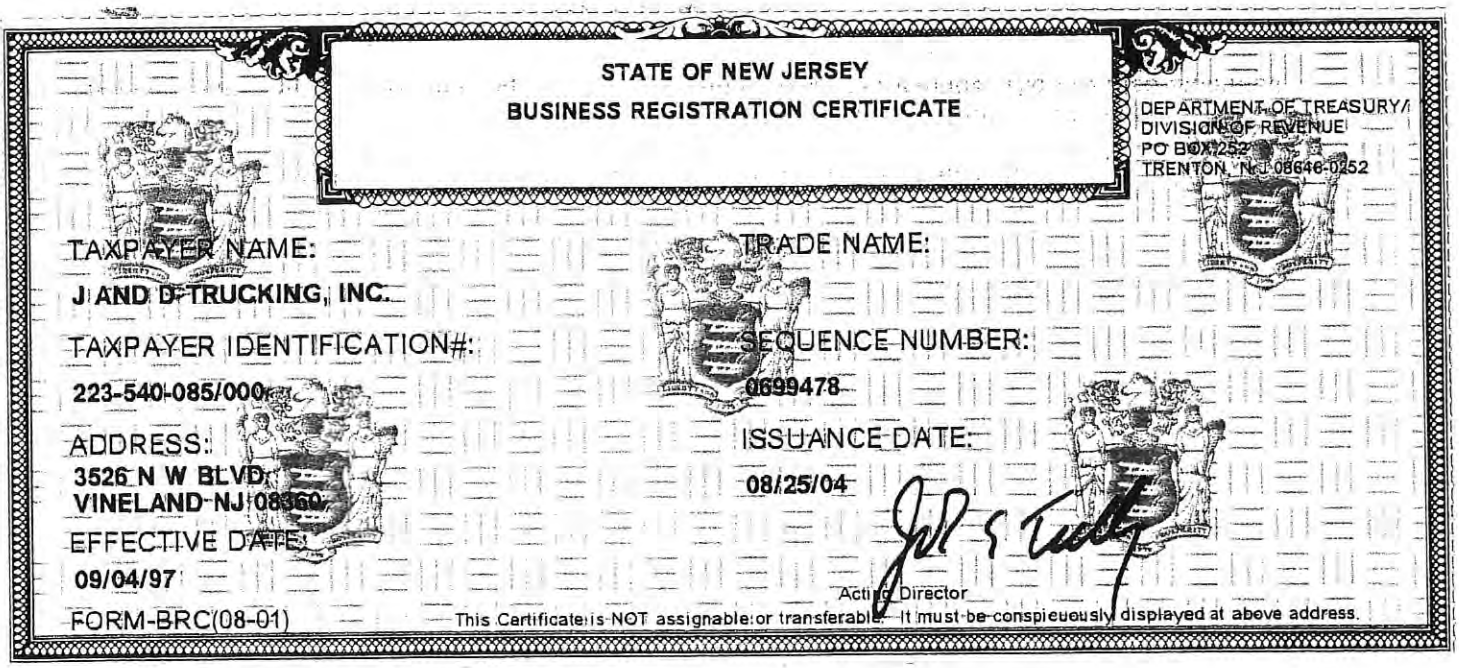
Frank Coolick, Assistant Director
Division of Solid & Hazardous Waste

STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE

Taxpayer Name:	J AND D TRUCKING, INC.
Trade Name:	
Address:	3526 N W BLVD VINELAND, NJ 08360
Certificate Number:	0699478
Effective Date:	December 04, 1997
Date of Issuance:	March 27, 2007

For Office Use Only:

20070327130232927



STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE

DEPARTMENT OF TREASURY
DIVISION OF REVENUE
PO BOX 252
TRENTON, NJ 08646-0252

TAXPAYER NAME:
J AND D TRUCKING, INC.

TRADE NAME:

TAXPAYER IDENTIFICATION#:
223-540-085/000

SEQUENCE NUMBER:
0699478

ADDRESS:
3526 N W BLVD
VINELAND NJ 08360

ISSUANCE DATE:
08/25/04

EFFECTIVE DATE:
09/04/97

Acting Director

FORM-BRC(08-01)

This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.

1

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401707**
Vin ID#: **1NKZXPTX5KJ281051 NJ**
License Plate #: **AU219V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

2

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401708**
Vin ID#: **1NKZXPTX9KJ281053 NJ**
License Plate #: **AU221V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

3

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401691**
Vin ID#: **1NKZXPTX2HJ133285 NJ**
License Plate #: **AT901H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

4

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401719**
Vin ID#: **1NKDX4TX9FJ472616** **NJ**
License Plate #: **AT907H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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Leased equipment can only be used to transport waste by the listed registrant.

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New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401692**
Vin ID#: **1NKZXPTX4HJ133286** **NJ**
License Plate #: **AT902H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401686**
Vin ID#: **1NKZXPTX1GJ115648** **NJ**
License Plate #: **AS337X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401709**
Vin ID#: **1NKZX4TX7KJ281096 NJ**
License Plate #: **AU222V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401693**
Vin ID#: **1NKZXPTX8HJ133288 NJ**
License Plate #: **AT903H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401710**
Vin ID#: **1NKZXPTXXKJ281059 NJ**
License Plate #: **AU220V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401701**
Vin ID#: **1NKZXPTXXJJ180389 NJ**
License Plate #: **AT904H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401694**
Vin ID#: **1NKZXPTX6HJ133290 NJ**
License Plate #: **AT896H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401695**
Vin ID#: **1NKZXPTXXHJ133289 NJ**
License Plate #: **AT897H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401703**
Vin ID#: **1NKZX4TX1JJ212774** **NJ**
License Plate #: **AU753D**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401704**
Vin ID#: **1NKZX4TX5JJ212776** **NJ**
License Plate #: **AU754D**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401696**
Vin ID#: **1NKZXPTX6HJ133287** **NJ**
License Plate #: **AT898H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401697**
Vin ID#: **1NKZXPTX8HJ133291 NJ**
License Plate #: **AT899H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401711**
Vin ID#: **1NKZX4TX8KJ281088 NJ**
License Plate #: **AU223V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401698**
Vin ID#: **1NKZXPTXXHJ133292 NJ**
License Plate #: **AT900H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401682**
Vin ID#: **1NKZXPTX8FJ423446 NJ**
License Plate #: **AT906H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401683**
Vin ID#: **1NKDX4TX4GJ474789 NJ**
License Plate #: **AS677M**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401684**
Vin ID#: **1NKDX4TX0GJ474790 NJ**
License Plate #: **AS678M**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401716**
Vin ID#: **1NPWX4EX7DD178790 NJ**
License Plate #: **AP736X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401714**
Vin ID#: **1NKDXBEX27J144747 NJ**
License Plate #: **AK807E**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401713**
Vin ID#: **1NKZX4TX3KJ281063 NJ**
License Plate #: **AU356V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MERT TRUCKING INC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401712**
Vin ID#: **1NKZX4TX5KJ281064 NJ**
License Plate #: **AU357V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MERT TRUCKING INC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401702**
Vin ID#: **1NKZX4TX7JJ202248 NJ**
License Plate #: **AU659A**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401699**
Vin ID#: **1NKZX4TX6HJ154316 NJ**
License Plate #: **AT122K**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401688**
Vin ID#: **1NKZX4TX7GJ109660 NJ**
License Plate #: **AS755W**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401687**
Vin ID#: **1NKZX4TX0GJ109659 NJ**
License Plate #: **AS754W**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

This card must be carried in the cab of the vehicle at all times.
This registration card & decal are valid for use only by the listed registrant.
Leased equipment can only be used to transport waste by the listed registrant.

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401706**
Vin ID#: **1NKZXPTX7KJ281052 NJ**
License Plate #: **AU449T**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401705**
Vin ID#: **1NKZX4TX4HJ147817 NJ**
License Plate #: **AT960G**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401689**
Vin ID#: **1NKZXPTX0HJ133317 NJ**
License Plate #: **AT940F**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401718**
Vin ID#: **1NPXX4EX8FD274922 PA**
License Plate #: **AG34717**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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(609) 292-7081 LRU@dep.nj.gov

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401717**
Vin ID#: **3ALMGNDV6EDFZ2638 PA**
License Plate #: **AG44228**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401700**
Vin ID#: **1NKZX4TX5HJ167830 PA**
License Plate #: **AG57388**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401690**
Vin ID#: **1NKZX4TX7HJ148086 PA**
License Plate #: **AG50188**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

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Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **HWL-21-401685**
Vin ID#: **1NPXX4EXXFD274923 PA**
License Plate #: **AG36041**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **50181**

LICENSED HAZARDOUS WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

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ADEM
Alabama Department of Environmental Management

HAZARDOUS WASTE FACILITY PERMIT

PERMITTEE:	**Chemical Waste Management, Inc.**
ADDRESS:	**36964 Alabama Highway 17 North Mile Marker 163 Emelle, Alabama 35459**
EPA ID/PERMIT NUMBER:	**ALD 000 622 464**
UNITS PERMITTED:	**Storage in containers Storage in tanks Storage in containment buildings Treatment in containers Treatment in tanks Treatment in containment buildings Treatment in miscellaneous units Disposal in landfills Post-Closure Care**
ISSUANCE DATE:	**October 21, 2016 May 4, 2018 - Modification 1 - Major**
EXPIRATION DATE:	**October 20, 2021**

This Permit is issued pursuant with the Code of Alabama 1975, §§ 22-30-1-et. seq., as amended, and regulations adopted thereunder and the Hazardous Wastes Management and Minimization Act and in accordance with the plans and specifications and applications filed with the Department subject to the conditions appended hereto, all of which are considered a part of this Permit. This Permit shall be subject to all applicable laws of the State of Alabama, rules and regulations and orders of the Department of Environmental Management and shall be effective from the date of issuance.

Alabama Department of Environmental Management

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

DUPLICATE

SEP 04 2013

Horwith Trucks, Inc.
PO Box 7, Route 329
Northampton, PA 18067

RE: **Hazardous Waste Transporter License**

Dear Applicants:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. had been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department issued a **Hazardous Waste Transporter License** on December 22, 1994 to:

HORWITH TRUCKS, INC.

This letter will serve as documentation that a solid waste transporter license had been previously issued and this serves as a duplicate of the original license.

Please be advised that the license hereby issued is a **"conditional"** license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosures
c: Raghu Murthy, DAG
Lt. Joseph McNally, NJSP
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
#000426

Horwith Trucks, Inc.

Conditions of Hazardous Waste License:
Official Company Name

The State of New Jersey, Division of Commercial Recordings database indicates that this company is registered as Horwith Trucks, Inc. (commercial record number: 0100521726), which is the official company name licensed as a solid waste transporter in New Jersey. Therefore, you are required to conduct all solid waste business activities and operations under the registered and licensed name of: Horwith Trucks, Inc., including, but not limited to, billing and invoices, insurance, and all state and federal identification numbers and registrations.

Condition of Hazardous Waste License:
Prohibition of Sale of License
pursuant to N.J.S.A. 13:1E-126 et seq.
N.J.A.C. 7:26-16.6 and N.J.A.C. 7:26H-1.9

Regardless of whether a licensee obtains or has obtained a certificate of public convenience and necessity, should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting hazardous waste from a generator, transfer station, or other source of waste to a hazardous waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50% of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 13:1E-126 et seq., N.J.A.C. 7:26-16.6, N.J.S.A. 48:13A-1 et seq., and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with fingerprints, of all proposed new owners, directors, partners, officers or key employees, to the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

Condition of Hazardous Waste License:
Comply with all Federal and State
Transporting Regulation

Hazardous Waste is specifically identified and regulated by the United States Environmental Protection Agency (USEPA) by 40CFR, Part 262 and incorporated by reference into the regulations of NJDEP. Therefore, the licensee must comply with all governing State and Federal laws applicable to hazardous waste transportation in New Jersey prior to the transportation of hazardous waste and provide proof to the Department at the time of filing your registration statement with NJDEP's Licensing and Registration Unit to obtain decals. Specifically, but not limited to:

1. Obtain a USEPA Transporter Registration Number.
2. Proof of compliance with the minimum financial responsibility requirements covering public liabilities, property damage and environmental restoration set out at 49 C.F.R. Part 387 in a form approved by the Department; MCS-90
3. Proof of Hazmat Training conforming to 49 CFR 172.700 to 172.704
4. Proper registration with the U.S. Department of Transportation (USDOT) for any applicable transportation activities
5. Proof of current registration with the Pipeline Hazardous Material Safety Administration to transport hazardous material
6. If applicable, satisfactorily completion of NJ State Police - New Entrant Program, or are in good standing with NJ State Police Motor Vehicle Enforcement

Failure to comply with these conditions may result in formal enforcement actions or denial of NJDEP Transporter registration statement and decals.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL MANAGEMENT
401 E. STATE STREET
2ND FLOOR, WEST WING
MAIL CODE 401-02C
TRENTON, NJ 08625-0420

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

BOB MARTIN
COMMISSIONER

DUPLICATE

SEP 04 2013

Horwith Trucks, Inc.
PO Box 7, Route 329
Northampton, PA 18067

RE: **Solid Waste Transporter License**

Dear Applicants:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. had been received by the Department of Environmental Protection. Based on our review of the aforementioned investigative report, the Department issued a **Solid Waste Transporter License** on December 22, 1994 to:

HORWITH TRUCKS, INC.

This letter will serve as documentation that a solid waste transporter license had been previously issued and this serves as a duplicate of the original license.

Please be advised that the license hereby issued is a **"conditional"** license and is modified by the terms and conditions as specified on the attached document as they have been put forth by the Attorney General's Office. Failure to meet the specified conditions will result in the revocation of this license.

This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

Sincerely,

Deborah Pinto

Deborah Pinto, Chief
Economic Regulation & Licensing

Enclosure
c: Raghu Murthy, DAG
Suzanne Conway, NJDEP, SWUCA
Robert Gomez , NJDEP, TOU
000426

Horwith Trucks, Inc.

Condition of Solid Waste License:
Prohibition of Sale of License
pursuant to N.J.S.A. 13:1E-126 et seq.
N.J.A.C. 7:26-16.6 and N.J.A.C. 7:26H-1.9

Regardless of whether a licensee obtains or has obtained a certificate of public convenience and necessity, should the licensee fail to own or lease any solid waste vehicle registered with the Department capable of collecting and transporting solid waste from a generator, transfer station, or other source of waste to a solid waste facility; or have no customers, or only a nominal customer list, or reasonable substitute therefore, sale of more than 50% of the equity of the licensee shall not be consummated, and no such sale will be approved by the Department pursuant to the provisions of N.J.S.A. 13:1E-126 et seq., N.J.A.C. 7:26-16.6, N.J.S.A. 48:13A-1 et seq., and N.J.A.C. 7:26H-1.1 et seq., without the submission of administratively complete disclosure forms, with fingerprints, of all proposed new owners, directors, partners, officers or key employees, to the Attorney General, and A-901 approval of all proposed new owners, directors, partners, officers or key employees.

Conditions of Solid Waste License:
Official Company Name

The State of New Jersey, Division of Commercial Recordings database indicates that this company is registered as Horwith Trucks, Inc. (commercial record number: 0100521726), which is the official company name licensed as a solid waste transporter in New Jersey. Therefore, you are required to conduct all solid waste business activities and operations under the registered and licensed name of: Horwith Trucks, Inc., including, but not limited to, billing and invoices, insurance, and all state and federal identification numbers and registrations.

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Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005254**
Vin ID#: **1NKDXBEX27J144747** **NJ**
License Plate #: **AK807E**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005255**
Vin ID#: **1NP5LBTX97N634639** **NJ**
License Plate #: **AL487L**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Registered Transporter:

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005256**
Vin ID#: **1NKWXBTX6VJ833444** **NJ**
License Plate #: **AF960R**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
DAVID CUCINOTTA INC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005257**
Vin ID#: **1NKWX4EX68J228401 NJ**
License Plate #: **AT904H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005258**
Vin ID#: **1NPWX4E7DD178790 NJ**
License Plate #: **AP736X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005259**
Vin ID#: **3ALMGNDV6EDFZ2638 NJ**
License Plate #: **AG44228**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005260**
Vin ID#: **1NPXX4EX6FD268780** **NJ**
License Plate #: **AS864B**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
COSTA HAULERS LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005261**
Vin ID#: **1NPXX4EX8FD254198** **NJ**
License Plate #: **AR938F**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005262**
Vin ID#: **1NPXX4EX8FD274922** **PA**
License Plate #: **AG34717**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005263**
Vin ID#: **1NKDX4TX9FJ472616 NJ**
License Plate #: **AT907H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005264**
Vin ID#: **1NKZXPT8FJ423446 NJ**
License Plate #: **AT906H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005265**
Vin ID#: **1NKDX4TX4GJ474789 NJ**
License Plate #: **AS677M**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005266**
Vin ID#: **1NKDX4TX0GJ474790 NJ**
License Plate #: **AS678M**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005267**
Vin ID#: **1NPXX4EXXFD274923 PA**
License Plate #: **AG36041**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005268**
Vin ID#: **1NKWXBEX07J166755 NJ**
License Plate #: **AS697C**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
FIRTINA LANDSCAPING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005269**
Vin ID#: **1NKZX4TX5GJ102061 NJ**
License Plate #: **AS314S**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
COSTA HAULERS LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005270**
Vin ID#: **1NPCX4TX1FD297363 NJ**
License Plate #: **AS370S**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005271**
Vin ID#: **1NKWXBEX76J133377 NJ**
License Plate #: **AS741S**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
FIRTINA LANDSCAPING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005272**
Vin ID#: **1NKZXPTX1GJ115648 NJ**
License Plate #: **AS337X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005273**
Vin ID#: **1NKZX4TX0GJ109659 NJ**
License Plate #: **AS754W**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005274**
Vin ID#: **1NKZX4TX7GJ109660 NJ**
License Plate #: **AS755W**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005275**
Vin ID#: **1NKZX4TXXGJ116473 NJ**
License Plate #: **AS789X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
COSTA HAULERS LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005276**
Vin ID#: **1NKZX4TX8HJ133306 NJ**
License Plate #: **AT272E**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
COSTA HAULERS LLC
NJDEP Registered Transporter:
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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005277**
Vin ID#: **1NPXX4EX7GD358330 NJ**
License Plate #: **AT899F**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005278**
Vin ID#: **1NKZXPTX0HJ133317** **NJ**
License Plate #: **AT940F**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005279**
Vin ID#: **1NKZX4TX7HJ148086** **PA**
License Plate #: **AG50188**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005280**
Vin ID#: **1NKZXPTX2HJ133285** **NJ**
License Plate #: **AT901H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005281**
Vin ID#: **1NKZXPTX4HJ133286 NJ**
License Plate #: **AT902H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005282**
Vin ID#: **1NKZXPTX8HJ133288 NJ**
License Plate #: **AT903H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005283**
Vin ID#: **1NKKZXPTX6HJ13329 NJ**
License Plate #: **AT896H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005284**
Vin ID#: **1NKZXPTXXHJ133289 NJ**
License Plate #: **AT897H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005285**
Vin ID#: **1NKZXPTX6HJ133287 NJ**
License Plate #: **AT898H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005286**
Vin ID#: **1WKZXPTX8HJ133291 NJ**
License Plate #: **AT899H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

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NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005287**
Vin ID#: **1NKZXPTXXHJ133292 NJ**
License Plate #: **AT900H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
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NJDEP #: **20936**

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New Jersey Department of Environmental Protection
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Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005288**
Vin ID#: **1NKZX4TX6HJ154316 NJ**
License Plate #: **AT122K**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005289**
Vin ID#: **1NKZX4TX5HJ167830 PA**
License Plate #: **AG57388**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005290**
Vin ID#: **1NKZXPTXXJJ180389** **NJ**
License Plate #: **AT904H**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005291**
Vin ID#: **1NKZX4TX8JJ193754** **NJ**
License Plate #: **AT629X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005292**
Vin ID#: **1KNZX4TXXJJ193755** **NJ**
License Plate #: **AT630X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005293**
Vin ID#: **1NKZX4TX7HJ161467** **NJ**
License Plate #: **AT222N**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
COSTA HAULERS LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005294**
Vin ID#: **1NKZX4TX8JJ191812** **PA**
License Plate #: **AG63034**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
AIT EXPRESS LLCL
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005295**
Vin ID#: **1NKZX4TX7JJ202248** **NJ**
License Plate #: **AU659A**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MEET TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005296**
Vin ID#: **1NKZXATX9JJ202249 NJ**
License Plate #: **AU803A**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
FIRTINA LANDSCAPING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005297**
Vin ID#: **1NKZX4TX1JJ212774 NJ**
License Plate #: **AU753D**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005298**
Vin ID#: **1NKZX4TX5JJ212776 NJ**
License Plate #: **AU754D**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005299**
Vin ID#: **1NKZX4TX3GJ137911** **NJ**
License Plate #: **AT967K**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005300**
Vin ID#: **1NKZX4TX4JJ191810** **NJ**
License Plate #: **AT532W**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005301**
Vin ID#: **1NKZX4TX4HJ133304** **NJ**
License Plate #: **AT576E**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005302**
Vin ID#: **1NKZX4TX6JJ191811 NJ**
License Plate #: **AT221X**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005303**
Vin ID#: **1NKZX4TX5KJ247366 NJ**
License Plate #: **AU354L**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005304**
Vin ID#: **1NKZX4TX3KJ247365 NJ**
License Plate #: **AR752B**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005305**
Vin ID#: **1NPXX4EX2JD460738 NJ**
License Plate #: **AU602R**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
YIGITER LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005306**
Vin ID#: **1NKZX4TX4HJ147817 NJ**
License Plate #: **AT960G**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005307**
Vin ID#: **1NKZXPTX7KJ281052 NJ**
License Plate #: **AU449T**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MDM CONTRACTING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005308**
Vin ID#: **1NKZXPTX5KJ281051 NJ**
License Plate #: **AU219V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005309**
Vin ID#: **1NKZXPTX9KJ281053 NJ**
License Plate #: **AU221V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005310**
Vin ID#: **1NKZX4TX7KJ281096 NJ**
License Plate #: **AU222V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
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NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005311**
Vin ID#: **1NKZXPTXXKJ281059 NJ**
License Plate #: **AU220V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
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NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005312**
Vin ID#: **1NKZX4TX8KJ281088 NJ**
License Plate #: **AU223V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **N**
If Yes, lessor's name:

NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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Leased equipment can only be used to transport waste by the listed registrant.

New Jersey Department of Environmental Protection
Division of Compliance Operations and Coordination
Bureau of Licensing and Registrations
Vehicle Registration Unit
9 Ewing Street, Mail Code 09-01, P.O. Box 420
Trenton, NJ 08625-0420
(609) 292-7081 LRU@dep.nj.gov

LICENSED SOLID WASTE
NJDEP Registered Transporter:

J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005313**
Vin ID#: **1NKZX4TX5KJ281078 NJ**
License Plate #: **AU386U**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
HIS TRUCKING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005314**
Vin ID#: **1NKZX4TX5KJ281064 NJ**
License Plate #: **AU357V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MERT TRUCKING INC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005315**
Vin ID#: **1NKZX4TX3KJ281063 NJ**
License Plate #: **AU356V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
MERT TRUCKING INC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005316**
Vin ID#: **1NKZX4TX7KJ281065 NJ**
License Plate #: **AU188V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
FIRTINA LANDSCAPING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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J&D TRUCKING INC
3526 NW BLVD,
VINELAND, NJ 08360

NJDEP Transporter Vehicle Registration Card

Expiration Date: **06/30/2021**
Decal Number: **SWL-21-005317**
Vin ID#: **1NKZX4TX9KJ281066 NJ**
License Plate #: **AS868V**
Vehicle Type: **Single Unit Vehicle**
Vehicle leased?: **Y**
If Yes, lessor's name:
FIRTINA LANDSCAPING LLC
NJDEP Registered Transporter:
J&D TRUCKING INC
NJDEP #: **20936**

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

March 30, 2016

Mr. Brian P. Bolvin, P.E.
Waste Management of Fairless, LLC
1000 New Ford Mill Road
Morrisville, PA 19067

Re: Fairless Landfill
Falls Township
Bucks County
Application No. 101699
APS No. 688905, AUTH No. 785826

Dear Mr. Bolvin:

The Department of Environmental Protection (DEP) has reviewed your application for the Fairless Landfill, a new municipal waste landfill, to be constructed on a brownfield site at the Keystone Industrial Port Complex (KIPC) – the former U.S. Steel Fairless Works, located in Falls Township, Bucks County. The Fairless Landfill consists of 330.5 acres of permit area, of which 197 acres will be for waste disposal with an estimated disposal capacity of 47,300,000 bank cubic yards. DEP has determined that you have satisfied all applicable requirements necessary to perform these activities. Therefore, we have issued the enclosed permit in accordance with Article V of the Solid Waste Management Act, 35 P.S. Sections 6018.101 et seq.

Compliance with the terms and conditions set forth in the permit is mandatory. You have the right to file an appeal as to these terms and conditions.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, 717.787.3483. TDD users may contact the Board through the Pennsylvania Relay Service, 800.654.5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at 717.787.3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717.787.3483) FOR MORE INFORMATION.

If you have any questions about the enclosed permit or requirements of the Solid Waste Management Act, please contact Dr. Mohamad Mazid, Chief, Technical Services, at 484.250.5768.

Thank you for your cooperation.

Sincerely,

James Wentzel, P.E.
Regional Manager
Waste Management

Enclosure: Fairless Landfill Permit

cc w/enc: Mr. Gray - Falls Township
Ms. Kostick - Bucks County Health Department
Mr. Adams - Golder Associates, Inc.
Re 30 (eh16wm)070

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Permit
For
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Date Expired March 30, 2026

Under the provisions of the Pennsylvania Solid Waste Management Act of July 7, 1980, Act 97, a permit for a solid waste disposal and/or processing facility at (municipality) Falls Township in the County of Bucks is granted to (applicant) Waste Management of Fairless, LLC

(address) 1000 New Ford Mill Road

Morrisville, PA 19067

This permit is applicable to the facility named as Fairless Landfill and described as:

Latitude - 40°, 09', 11"

Longitude - 74°, 45', 33"

This permit is subject to modification, amendment, and supplement by the Department of Environmental Protection (DEP) and is further subject to revocation or suspension by DEP for any violation of the applicable laws or the rules and regulations adopted thereunder, for failure to comply in whole or in part with the conditions of this permit and the provisions set forth in the application No. 101699 which is made a part hereof, or for causing any condition inimical to the public health, safety, or welfare.

See Attachment for waste limitations and/or special conditions.

FOR THE DEPARTMENT OF
ENVIRONMENTAL PROTECTION

THIS PERMIT IS NON - TRANSFERABLE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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AUTHORIZATION

1. This solid waste management permit is issued based upon Phase I/Phase II application No. 101699 (APS No. 688905, AUTH No. 785826) that was received in the Southeast Regional Office of the Pennsylvania Department of Environmental Protection (DEP). The initial Phase I submission was received on March 23, 2009, and the initial Phase II submission was received on February 5, 2014. This permit is for the Fairless Landfill, a new municipal waste landfill, to be constructed on a brownfield site at the Keystone Industrial Port Complex (KIPC) – the former U.S. Steel Fairless Works, located in Falls Township, Bucks County. Any and all approvals granted under this permit are limited to Fairless Landfill, unless otherwise noted.

   The Fairless Landfill is a new municipal waste landfill, consisting of 330.5 acres of permit area of which 197 acres is waste disposal area. The landfill consists of 14 cells, with a total disposal capacity of 47,300,000 bank cubic yards (bcy). Based on a permitted average daily volume (ADV) of 18,333 tons per day and 306 operating days per year, the landfill will have an operational life ranging from 6.9 to 8.6 years. The construction of the landfill is divided into five Phases. Phase 1 consists of cells 1 to 6 construction without a Mechanically Stabilized Earth (MSE) Wall. Phases 2 through 5 consist of the construction of cells 7 through 14 with a MSE Wall and the expansion of the MSE wall to cells 1 to 6. The maximum height of the landfill will be at elevation 294.00 feet above sea level.

   The approved application consists of the following documents (unless otherwise noted, received and revised refer to the dates documents were received by DEP and not necessarily the dates of the documents themselves):

   Phase I

   General Information Form (GIF) received on December 22, 2008, and revised on May 17, 2011
   Form A received on December 22, 2008, revised on May 19, 2014, and September 1, 2015
   Form B received on December 22, 2008, revised on May 17, 2011, and May 7, 2012
   Form B1 received December 22, 2008, revised on May 17, 2011, and May 7, 2012
   Form HW-C received on December 22, 2008, and revised on May 17, 2011
   Form D received on December 22, 2008, and revised on May 17, 2011
   Form E received on December 22, 2008, revised on May 17, 2011, May 19, 2014 and September 1, 2015
   Form F received on December 22, 2008, and revised on May 17, 2011
   Form I received on December 22, 2008, and revised on May 17, 2011

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Form 2 received on December 22, 2008, revised on May 17, 2011 and May 7, 2012
Form 6 received on December 22, 2008
Form 7 received on December 22, 2008, revised on May 17, 2011, May 7, 2012, and October 1, 2012
Form 8 received on December 22, 2008, and revised on May 17, 2011
Form 11 received on December 22, 2008
Form 12 received on December 22, 2008
Figure D.B-1 to Figure D.B-3, and Figure J.D-1 received on December 22, 2008, and Figure D.B-2 and Figure J.D-1 revised on May 17, 2011, Figure D.B-2 revised on May 7, 2012, and Figure D.B-1 and D.B-2 revised on May 19, 2014
Figure 1.B-1 to Figure 1.B-2 received on December 22, 2008, revised on May 17, 2011, and May 19, 2014
Figure 2.B-1 to Figure 2.B-4 received on December 22, 2008, revised on May 17, 2011, and May 7, 2012, Figure 2.B-4 revised on May 19, 2014
Figure 6.B-1 to Figure 6.B-11 received on December 22, 2008
Figure 7.B-1 to Figure 6.B-13 received on December 22, 2008, and Figure 7.B-10 and Figure 7.B-12 revised on May 17, 2011, Figure 7.B-12 and Figure 7.B-13 revised on May 7, 2012
Figure 11.B-1 received on December 22, 2008
Figure 12.B-1 received on December 22, 2008, and revised on May 19, 2014
Figure E-1 and E-2 received on September 1, 2015

The Phase I application includes the May 17, 2011, May 7, 2012, October 1, 2012, and May 22, 2014, responses to DEP's comments sent on December 23, 2010 (via e-mail), February 13, 2012, June 22, 2012 (via e-mail), and November 28, 2012, respectively.

Phase II

General Information Form (GIF) received on February 5, 2014
Form B received on February 5, 2014
Form B1 received on February 5, 2014
Form G (A) received on February 5, 2014
Form G (B) received on February 5, 2014
Form H received on February 5, 2014
Form I received on February 5, 2014, and revised on March 12, 2015
From J received on February 5, 2014, revised on June 22, 2015, September 1, 2015, and February 17, 2016

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Form K received on February 5, 2014
Form L received on February 5, 2014
Form Q (Form Q1 to Q5) received on February 5, 2014, revised on March 12, 2015, and September 1, 2015
Form R received on February 5, 2014, revised on March 12, 2015, September 1, 2015, February 17, 2016, and February 25, 2016
Form X received on February 5, 2014, and revised on March 12, 2015
Form 3 received on February 5, 2014
Form 14 received on February 5, 2014, revised on March 12, 2015, June 22, 2015, September 1, 2015, and February 17, 2016
Form 18 received on February 5, 2014, and revised on March 12, 2015
Form 24 received on February 5, 2014, revised on March 12, 2015, June 22, 2015, and September 1, 2015
Form 25 received on February 5, 2014, revised on March 12, 2015, and September 1, 2015
Form 28 received on February 5, 2014
Bonding worksheets received on February 5, 2014, revised on March 12, 2015, and September 1, 2015
Form 45 received on February 5, 2014, and revised on March 12, 2015
Form 46 received on February 5, 2014
Drawing Numbers 86086B-00 to 86086B-49 received February 5, 2014
Drawing Numbers 86086B-22, 23, 24, 25, 26 and 46 revised on June 22, 2015
Figure 14-1 to 14-7 received on February 5, 2014, and Figures 14-1, 14-2, and 14-3 revised on September 1, 2015
Table 14-1, Airspace and Life Expectancy Estimate, received on February 5, 2014
Figure I-1 and I-2 received on February 5, 2014
Figure 18-1 and 18-2 received on February 5, 2014
Figure X-1 received on February 5, 2014, revised on March 12, 2015, and February 25, 2016
Final Drawings 86086B-00 to 86086B-49 and 86086B-10A, 14A, 14B, and 14C. Drawing 86086B-15 is deleted from the application. Total of 53 drawings received on September 1, 2015
Drawing 86086B-01, Rev. dated August 27, 2015, indicating the property area and permitted area.

The Phase II application includes the March 11, 2015, and September 1, 2015, responses to DEP's comments sent on January 27, 2015 (via e-mail), and comments discussed in meetings on June 24, 2015, and July 22, 2015. Also included are the March 11, 2015, September 1, 2015, February 17,

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2016, and February 25, 2016, responses received on DEP's Form R comments sent on January 27, 2015, June 15, 2015, February 2, 2016, and February 23, 2016.

The contents of all the above listed documents are hereby incorporated in the permit as conditions with which the permittee must comply. Where the terms or conditions of this permit differ from the documents incorporated by reference, the terms or conditions of this permit shall govern.

2. Nothing in this permit shall be construed to supersede, amend, or authorize violation of, the provisions of any valid and applicable local law, ordinance, or regulation, provided that said local law, ordinance, or regulation is not preempted by the Pennsylvania Solid Waste Management Act, the Act of July 7, 1980, Act 97, 35 P.S. 6018.101 et seq. and Act 101, the Municipal Waste Planning, Recycling, and Waste Reduction Act.

3. As a condition of this permit, and of the permittee's authority to conduct the activities authorized by this permit, the permittee hereby authorizes and consents to allow authorized employees or agents of DEP, without advanced notice or a search warrant, upon presentation of appropriate credentials, and without delay, to have access to and to inspect all areas on which solid waste management activities are being or will be conducted. The authorization and consent shall include consent to collect samples of waste, water or gases, to take photographs, to perform measurements, surveys and other tests, to inspect any monitoring equipment, to inspect the methods of operation, and to inspect and/or copy documents, books, or papers required by DEP to be maintained. This permit condition is referenced in accordance with Section 608 and 610(7) of the Solid Waste Management Act, 35 P.S. Sections 6018.608 and 6018.610(7). This condition in no way limits any other powers granted under the Solid Waste Management Act.

4. Form 37, Certification of Facility Construction Activity, is to be submitted to the Regional Solid Waste Manager in DEP's Southeast Regional Office for review after each cell of the landfill is constructed, including the subbase preparation (includes MSE wall construction and structural fill placement to establish grades in advance of construction of the subbase itself), preparation of the witness zone, installation of the primary liner, installation of the leachate collection pipes, and the preparation of the protective layer for the primary liner prior to the start of landfilling operations. Waste disposal operations may not commence in a cell until DEP has accepted, in writing, the certification report(s) for all of that cell's components. All certification reports shall identity and explain deviations from the design approved in this permit.

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5. Form 37, Certification of Facility Construction Activity, including as-built reports for all construction and closure activities related to the landfill, is to be submitted to the Regional Solid Waste Manager in DEP's Southeast Regional Office for review after the construction of the following major construction activities as these activities are completed in part or in total, including the installation of the groundwater monitoring systems, landfill liner systems, leachate management systems, landfill final cover, landfill gas management systems, major access roads, stormwater management structures, and closure and final closure activities. All certification reports shall identity and explain deviations from the design approved in this permit. Systems and structures that are the subject of the certification submittal shall not be utilized until DEP has accepted, in writing, the certification submittal.

OPERATIONS AND REPORTING

6. A daily operational record is to be maintained in accordance with Section 273.311 of the Municipal Waste Rules and Regulations.

7. A quarterly operations report is to be submitted on or before the 20th day of April, July, October, and January for the three-month period ending the last day of March, June, September, and December in accordance with Section 273.312 of the Municipal Waste Rules and Regulations.

8. An Annual Operations Report is to be submitted to DEP's Southeast Regional Office on or before June 30 of each year in accordance with the format indicated in Chapter 273.312 of the Municipal Waste Rules and Regulations. The annual report submitted to DEP is to be accompanied by the annual permit administrative fee.

9. An annual topographic survey is to be conducted and is to be submitted to the Southeast Regional Office concerning the elevation and total volume of area that has been filled. This is due as part of the Annual Operations Report due on June 30 of each year.

10. After both the GROWS North and the Tullytown Resource Recovery Facility Landfills have permanently ceased waste acceptance, no more than 20,000 tons of solid waste may be received at the Fairless Landfill for disposal on any single operating day. This figure represents the maximum daily volume (MDV) of the facility, set pursuant to Section 1112 of the Municipal Waste Planning, Recycling, and Waste Reduction Act, 53 P.S. Section 1112 (Act 101 of 1988) and the regulation of DEP. The permittee is advised that this section also provides that a mandatory civil penalty of $100 per ton applies

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to any excess volume received for disposal at this facility for any reason. When the Fairless Landfill, the GROWS North Landfill, and/or the Tullytown Resource Recovery Facility Landfill, or any combination thereof, accept waste on a given day, the 20,000 tons per day MDV shall be shared amongst the operating landfills and the MDV of each individual landfill, when totaled together for that day, shall not exceed 20,000 tons in total for that day.

11. After both the GROWS North and the Tullytown Resource Recovery Facility Landfills have permanently ceased waste acceptance, no more than an average of 18,333 tons of solid waste may be received at the Fairless Landfill for disposal per operating day during the standard calendar year quarter. This figure represents the ADV of the facility, set pursuant to Section 1112 of the Municipal Waste Planning, Recycling, and Waste Reduction Act, 53 P.S. Section 1112 (Act 101 of 1988) and the regulation of DEP. The permittee is advised that this section also provides that a mandatory civil penalty of $100 per ton applies to any excess volume received for disposal at this facility for any reason. When the Fairless Landfill, the GROWS North Landfill, and/or the Tullytown Resource Recovery Facility Landfill, or any combination thereof, accept waste during a calendar quarter, the 18,333 tons per day ADV shall be shared amongst the operating landfills for that quarter and the ADV of each individual landfill, when totaled together for that quarter, shall not exceed 18,333 tons in total for that quarter.

12. After both the GROWS North and the Tullytown Resource Recovery Facility Landfills have permanently ceased waste acceptance, compliance with Condition 11, above, shall be calculated by taking the total tons of solid waste received for disposal at the Fairless Landfill during a standard calendar year quarter, divided by the number of days during the quarter that the facility was permitted to operate, including partial days. In the event Condition 11 is modified, compliance during the quarter, when the permit condition is modified, shall be calculated by dividing the total tons of solid waste received during the partial quarter by the number of permitted operating days within that partial quarter. When the Fairless Landfill, the GROWS North Landfill, and/or the Tullytown Resource Recovery Facility Landfill, or any combination thereof, accept waste during a calendar quarter, compliance with Condition 11, above, shall be calculated by taking the total tons of solid waste received for disposal at each of the landfills that accepted waste during the standard calendar year quarter, divided by the largest number of days during the quarter that any of the facilities were permitted to operate, including partial days.

13. The Fairless Landfill is permitted to accept waste for disposal Monday through Saturday from 2 a.m. to 8 p.m. (scale gate hours). Operations other than waste acceptance, construction operations in particular, shall be conducted and/or scheduled to minimize nuisances to the greatest extent possible.

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Operations may be extended due to extreme weather conditions in accordance with the following procedure. Prior to extending operations, justification for such an extension must be mailed or faxed to the Waste Management Program Manager or his designee. Written concurrence that the extension is justifiable needs to be received by the permittee from the manager or his designee before extended operations may be implemented. All other requests to extend operating hours must be requested in advance of need and be approved, in writing, in advance by DEP. Records documenting the compliance with the above-approved hours shall be provided in the facility's daily, quarterly, and annual reports.

14. Except to the extent this permit provides otherwise, the permittee shall conduct solid waste management activities as described in the approved application. The permittee shall file an application for a permit modification with DEP and shall receive approval from DEP prior to receiving any waste volumes in excess of the maximum or average daily volume stated in the permit.

15A. This facility may not operate to receive waste unless the operator has established at least one drop-off center for the collection or sale of at least three recyclable materials chosen from the following: clear glass, colored glass, aluminum, steel and bimetallic cans, high-grade office paper, newsprint, corrugated paper, and plastics. The drop-off center must be located at the facility or at a location that is easily accessible to substantial numbers of persons generating municipal waste that is processed or disposed of at the facility. The drop-off center shall be operated in compliance with Section 1502(b) of the Municipal Waste Planning, Recycling, and Waste Reduction Act, 53 P.S. Section 4000.1502(b).

15B. The drop-off center shall be located at the facility or in a place that is easily accessible to persons generating municipal waste that is processed or disposed at the facility.

15C. The drop-off center shall contain bins or containers where recyclable materials may be placed and temporarily stored. If the operation of the drop-off center requires attendants, the center shall be open at least eight hours per week, including four hours during evenings or weekends.

15D. Once every six months, the operator shall provide public notice of the availability of the drop-off center. The operator shall place an advertisement in a newspaper circulating in the municipality or provide notice in another manner approved by DEP in writing.

15E. On or before February 15 of each year, the operator shall inform the host municipality, in writing, of the weight and type of materials that were recycled in the previous calendar year, so that the host

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municipality may comply with the requirements of Section 304(f) of the Municipal Waste Planning, Recycling, and Waste Reduction Act.

16. The permittee shall not act in a manner contrary to any Municipal Waste Management Plan approval by DEP pursuant to the Municipal Waste Planning, Recycling, and Waste Reduction Act, nor shall the permittee fail to act in a manner that is consistent with any Municipal Waste Plan approved by DEP pursuant to that Act.

17. The permittee shall not violate, or cause or assist in the violation of any provision of the Municipal Waste Planning, Recycling, and Waste Reduction Act, 53 P.S. Sections 4000.101 et seq., or the terms or conditions of any Municipal Waste Management Plan approved by DEP under that Act.

18. The permittee shall not allow solid waste generated outside the host county of the permitted facility to be received, disposed, or otherwise managed at the facility if the transportation to, or management at, the facility would violate applicable laws in affect in the county or state in which the waste was generated, or state or local solid waste management plan in effect where the waste was generated.

19. This facility may not accept for disposal, or for processing, truckloads composed primarily of leaf waste.

20. No lead acid batteries shall be placed into mixed waste or be disposed of at this facility.

21. Form 19, Quarterly and Annual Groundwater Analysis Form, must be submitted in duplicate for the quarterly and annual testing of monitoring well numbers: GFD-1S, GFD-2S, GFD-3S, GFD-4S, GFD-5S, GFU-6S, GFU-7S, GFU-8S, GFD-9S, GFD-10S,GFD-11S, GFD-12S, GFD-13S, GFU-6D, GFD-1DR, and GFD-4D. The sampling is to be performed on a quarterly basis for analysis, and the analytical data for all parameters shall be submitted to DEP within 60 days of the date the last well is sampled for each quarterly sampling event, which end on March 31, June 30, September 30, and December 31, respectively. Monitoring well data is to be submitted to the Lower Bucks Joint Municipal Water Authority and Aqua PA at the same time the data is submitted to DEP. Two quarters of overlapping sampling events shall be conducted with respect to all monitoring well replacements at the site. After achievement of two quarters of sampling, an evaluation report shall be submitted to DEP for review and approval to abandon the wells being replaced. A revised Form 18 and Form 37 Certification shall be submitted to DEP after completion of the work.

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The quarterly monitoring program shall include testing of stormwater runoff samples from the major drainage areas. One sample shall be collected from the main swale leading to each of the sedimentation basins and tested for inorganic leachate indicator parameters. These include: Total Alkalinity, Ammonia-Nitrogen, Chemical Oxygen Demand, Chloride, pH, Potassium, Specific Conductivity, Sodium, Sulfate, and Total Organic Carbon. The analytical results should be reported on Form 19 and be submitted to DEP at the same time as the quarterly groundwater results.

The annual monitoring program shall include the collection of surface water samples from the outfalls of each sedimentation basins or, if no discharge is occurring, from the impounded water in basin. Surface water sampling shall be scheduled as necessary to acquire an appropriate sample from each basin's outfall or impounded water. Failure to collect a sample because the basin(s) is (are) dry at the time that annual groundwater sampling is being conducted during the calendar quarter shall be considered a violation of this condition unless the permittee can demonstrate that the basins were dry throughout the entire calendar quarter. In addition to the parameters listed on Form 19, each groundwater and surface water monitoring point shall be sampled for Tritium as part of the annual water quality analyses, as a minimum.

22. A report on the sampling of the influent leachate for all parameters on Form 19 shall be presented in tabular form and on a graph, and shall be submitted to DEP quarterly and annually with the monitoring well data.

23. The witness zone between the primary and secondary liner must be monitored on a weekly basis to determine the rate of flow, if any. These results must be submitted to the Southeast Regional Office.

24. All mixed loads of residual waste and municipal waste are to be managed as municipal waste in accordance with 25 Pa. Code 299.201(b).

25. Removal or reuse of daily cover from a cell is prohibited.

26. The capping of the landfill must follow the "Cap as you Go" practice. The construction sequence of the landfill must be followed closely, to ensure this practice and to minimize open areas waiting to be capped. No settlement accommodation plan (SAP) is approved for the landfill and disposal or capping operations above final permitted elevations, whether temporary or otherwise, are not authorized under this permit.

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27. The construction of the landfill shall follow the construction sequence described in Form 14, Table 14-3, which is incorporated into this permit pursuant to Condition No. 1, above.

28. Sediment Basins 1 and 2 and any temporary basins must be constructed and operational prior to the commencement of disposal in their respective phase of the Fairless Landfill construction schedule, which is incorporated into this permit by reference pursuant to Condition No. 1 above.

29. Borrow Pit 20 (BP-20) shall be clean closed during waste disposal operations in cells 7/8 and prior to construction of cells 9/10. See Note No. 7 in Drawing 86086B-10, above.

30. Any substitution of an equivalent material, which is not specifically approved by DEP in the permit application for the landfill construction or closure activities, shall be provided to DEP for approval prior to its use.

31. Progress reports, including work performed, deviations from approved design and future work for construction, filling, and capping activities, shall be submitted to DEP at no less a frequency than bi-weekly (i.e., every two weeks).

32. This permit does not authorize the discharge of air emissions unless the Bureau of Air Quality has approved the discharge of these emissions.

33. Failure to obtain other necessary permits may result in the suspension or revocation of this waste management permit.

34. The permittee shall submit a permit modification application, no later than one year from the date of issuance of this permit, for changes necessary to permanently cease the recirculation of brine (Reverse Osmosis concentrate from the Landfill Treatment Plant, both prior to or subsequent to evaporation and crystallization) including, but not limited to, establishment of a permanent off-site transportation strategy to authorized wastewater treatment plants or solidification of the brine such that it may be disposed as a solid (nonliquid) waste. Upon DEP approval of the modification application, recirculation of brine shall cease in accordance with the schedule contained in the DEP approval. Until prohibited in accordance with the aforementioned schedule, no more than 20,000 gallons per day of brine may be recirculated at Fairless Landfill, provided that brine is sprayed on the landfill waste disposal area at least 75 feet from the outside slope of the landfill. The recirculation of raw leachate is not authorized as part of this permit.

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35. Leachate seep occurrences and repairs shall be reported in writing to DEP at no less a frequency than bi-weekly (i.e., every two weeks) and recorded in the facility's daily operational record.

36. Fairless Landfill shall utilize site-specific meteorological data as part of its approved nuisance minimization and control plan. The weather station shall collect time, temperature, wind speed, wind direction, and humidity readings and shall provide this information in real time via publicly available internet access as well as via recorded data maintained by the landfill operator. This weather station may be repositioned as needed based on operational conditions but shall provide weather data representative of conditions at the Fairless Landfill. A third-party vendor shall perform instrument audits and calibration for the weather station at six-month intervals. The permittee shall submit the vendor's report to DEP for review. The weather station located at the permittee's offices on New Ford Mill Road and currently used by both the GROWS North and Tullytown Resource Recovery Facility Landfills may be utilized if it can be shown, through the aforementioned audit and calibration requirements, that the weather station is functional, accurate, and representative of conditions at the Fairless Landfill.

37. The utilization of a scale house, laboratory, public convenience center, and radiation staging area (Scale Facility Complex) is authorized to be utilized jointly between the GROWS North Landfill, the Tullytown Resource Recovery Facility Landfill, and the Fairless Landfill subject to the following conditions:

    a. Pursuant to this permit, the Scale Facility Complex is hereby incorporated in the permit area of the Fairless Landfill and shall be the responsibility and liability of Waste Management of Fairless, LLC to operate and maintain in accordance with this permit and the applicable rules and regulations of DEP. The Scale Facility Complex may be open from 2 a.m. to 8 p.m. and only utilized at those hours by Fairless Landfill and GROWS North Landfill. Operating hours of the Scale Facility Complex for vehicles utilizing the Tullytown Resource Recovery Facility Landfill shall be governed by the more restrictive operating hours contained in the Tullytown Resource Recovery Facility Landfill permit. Use of the scale shall at all times comply with all applicable requirements of the Solid Waste Management Act, the Municipal Waste Regulations, and the applicable terms and conditions of the permits of the authorized facilities utilizing the Scale Facility Complex.

    b. The use of the Scale Facility Complex shall not modify any other permitted operational activities at Fairless Landfill.

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c. The use of the Scale Facility Complex by Tullytown Resource Recovery Facility, GROWS North, and Fairless Landfills shall be managed to prevent traffic congestion at the intersections or the approach routes leading to the respective landfill facilities.

d. The special waste laboratory shall serve Tullytown Resource Recovery Facility, GROWS North, and Fairless Landfills. However, the operational procedures and waste acceptance/screening plan requirements contained in each facility's permit shall govern the required operations for each respective facility.

e. The Scale Facility Complex is incorporated by this permit into the Fairless Landfill permit area and Waste Management of Fairless, LLC, as the permittee, shall be responsible for ensuring that the Scale Facility Complex is routinely cleaned and maintained using sweepers and laborers.

f. If the Scale Facility Complex opens before 6 a.m. pursuant to either the GROWS North or the Fairless Landfill permit, all vehicles shall be directed to the appropriate landfill, unless restricted by manifest to Tullytown Resource Recovery Facility Landfill. Those vehicles restricted to Tullytown Resource Recovery Facility Landfill shall be directed to wait along the private entrance road located on Waste Management property (the scale house access roadway) until such time that they may be processed through the scale facility in compliance with the permitted hours of operation of Tullytown Resource Recovery Facility Landfill.

g. When waste from Fairless Landfill, GROWS North Landfill, or Tullytown Resource Recovery Facility Landfill is directed through the Scale Facility Complex, individual site access control shall be managed and electronically verified by a card reader system. All recordkeeping shall be maintained separately for each facility. The form of the recordkeeping shall not be changed without written approval from DEP.

38. Operation of the Public Convenience Center (PCC) at the Scale Facility Complex is further subject to the following conditions:

a. The PCC shall consist of a designated area that allows the public to drop-off their household MSW and C&D waste into roll-offs, which will then be hauled to the working face of the appropriate operating landfill, thereby eliminating residential vehicular traffic from the working face with associated safety improvements.

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b. The use of this PCC by the GROWS North Landfill, the Tullytown Resource Recovery Facility Landfill, and the Fairless Landfill shall not cause traffic congestion at the intersections or the approach routes leading to either facility.

c. The use of this PCC by the GROWS North Landfill, the Tullytown Resource Recovery Facility Landfill, and the Fairless Landfill shall not cause nuisance, odor, or dust.

d. Roll-off containers that are staged at the PCC shall be watertight so that no leachate leakage occurs and shall be covered when not in use. Roll-off containers that contain waste shall be removed and emptied daily.

e. This PCC shall serve the GROWS North Landfill, the Tullytown Resource Recovery Facility Landfill, and the Fairless Landfill. However, the operational procedures and waste acceptance/screening plan requirements contained in each facility's permit shall govern the required waste acceptance/screening criteria for the PCC.

f. This PCC facility is located at the shared Scale Facility Complex. The operator of the landfill whose permit area is designated as containing the Scale Facility Complex shall be responsible for ensuring that the PCC is routinely cleaned and maintained using sweepers and laborers as specified the associated operation plan.

g. Operation hours for the PCC shall be between the hours of 5 a.m. to 6 p.m., Monday through Saturday, irrespective of the operation hours for the Scale Facility Complex. The PCC shall be closed on Sunday.

39. Revisions or controls authorized under this permit, or future modifications must also be consistent with the applicable requirements of the Federal Clean Air Act or the Pennsylvania Air Pollution Control Act and any permit(s) issued thereunder.

40. The Nuisance Minimization and Control Plan, incorporated into this permit by reference pursuant to Condition No. 1, above, includes the following operational techniques designed to minimize and control odors and shall be implemented as part of routine operations except as further modified by this permit:

a. Accelerated installation of gas collection wells and infrastructure, including the use of horizontal gas collection trenches as interim control measures in the platform of the tipping areas.

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b. Use of a temporary cap to cover open areas, where waste disposal is not expected to occur for some time, in order to minimize leachate generation and odors. When used, the temporary cap shall be placed over intermediate soil cover. Removal of the temporary cap shall be minimized to the greatest extent practicable in order to minimize the exposed area of previously disposed waste.

c. Use of odor control and odor neutralization chemicals via direct application to the working face, fixed misting lines, and portable sprayers. Both misting and vapor systems may be utilized, with the vapor systems used during cold weather months when the regular misting systems may freeze. MSDS sheets on the odor control chemicals used shall be provided to DEP when new odor control products are utilized.

d. Daily cover, whether soil, ADCM, or a mixture thereof, shall not be removed or reused.

e. Tonal back-up alarms on landfill equipment shall be replaced with white noise back-up alarms meeting OSHA requirements to mitigate noise nuisances related to landfill operations if needed to address noise complaints.

41. The Quality Assurance and Guidance Document for the Installation of Lining Systems (QAGD) as an attachment to Form 24 for use for quality assurance procedures during the construction of geosynthetic lining systems at the facility is incorporated by reference. The QAGD is a technical reference and DEP may rely on it as a reference in the course of permit application and construction certification reviews. DEP reserves the right to question specifics on the site or case-specific quality assurance plans during the course of its review.

42. Inclinometers shall be installed to monitor deformation of the mechanically stabilized earthen (MSE) berm. The inclinometers shall be located in the MSE berm at a spacing of no less than one per disposal cell. The permittee shall provide DEP with the proposed installation location of each inclinometer and shall obtain DEP concurrence of each location prior to installation. While the inclinometer(s) cannot be installed until after the pertinent portion of the MSE berm has been constructed, waste disposal operations in the proximate cell may not commence until the inclinometer(s) has(have) been installed and made operational.

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43. Sediment elevations in the sedimentation basins shall be surveyed on an annual (calendar year) basis and the basins clean out as needed to restore the basins to required design capacity. The results of the annual sediment survey(s) shall be submitted as part of the Annual Operation Report submittal that is due on or before June 30 of each year.

WASTE ACCEPTANCE AND CLASSIFICATION PLAN

44. a. The approved waste acceptance and classification plan allows Fairless Landfill to accept the following categories of residual waste requiring chemical analysis, residual wastes with chemical analysis waived, and municipal waste requiring special handling:

Residual Waste Requiring Chemical Analysis (Including the Residual Waste Code):

000 - Combustion Residues

001 - Coal-Derived Bottom Ash
002 - Coal-Derived Fly Ash
003 - Flue Gas Desulfurization Residue (FGD)
004 - Incinerator Bottom Ash
005 - Incinerator Fly Ash
006 - Incinerator Mixed Ash
007 - Other Ash

100 - Metallurgical Process Residues

101 - Foundry Sand
102 - Slag
103 - Refractory Material
104 - Grindings, Shavings
105 - Ferrous Baghouse Dust
106 - Nonferrous Baghouse Dust
107 - Ferrous Scrap, including Auto Recycle
108 - Nonferrous Scrap
109 - Sandblast Abrasive and Residue

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110 - Air Emission Control Dust
111 - Lubricating Soaps
112 - Mill Scales, Heat Treat Scales
113 - Dross, Skims

200 - Sludges, Scales

201 - Water Treatment Plant Sludge/Sediment
203 - Industrial Wastewater Treatment Sludge/Sediment including Acid Mine Drainage Sludge
204 - Metallurgical Sludge
205 - Food Processing Sludge
206 - Paint, Coating Sludge, and Scale
207 - Tank Bottoms
208 - Still Bottoms
209 - Oily Sludge, Petroleum Derived
210 - Air Emission Control Sludge (excluding FGD Sludge and Gypsum)
211 - Other Industrial Sludge
212 - Lime/Cement Kiln Scale, Residue
213 - Lime-Stabilized Spent Pickle Liquor
214 - Cooling Tower Sediment/Sludge
215 - Flue Gas Desulfurization (FGD) Sludge (including FGD Gypsum)
216 - Filter Socks from Erosion and Sedimentation Controls

300 - Chemical Wastes - (Wastewaters Containing Chemicals, Cleaning Agents, Detergents, etc. are reported as 420)

301 - Acidic Chemicals (pH <6)
302 - Basic Chemicals (pH >8)
303 - Combustible Chemicals, Nonhazardous
304 - Chemical Salts
305 - Spent Activated Carbon
306 - Surface Coatings (e.g., Solid, Semi-Solid Paints, Polishes, Adhesives, and Inks)
307 - Filter Media/Aids (e.g., Diatomaceous Earth, Ion Exchanging Resins, and Silica Gels)

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308 - Spent Dyes
310 - Detergents, Cleaning Agents
311 - Off-Specifications Products, Intermediates
312 - Pharmaceutical, Biological (Mfg. and Lab Wastes)
313 - Wax, Paraffin
314 - Alcohols (Nonhazardous)
315 - Solvents (Nonaqueous, Nonhazardous)
316 - Solvents (Aqueous, Nonhazardous)
317 - Glycols/Antifreeze, Machine Coolants
318 - Photographic Chemicals (Nonhazardous)
320 - Spent Plating Baths (Nonhazardous)
399 - Other Chemical Wastes

400 - Generic Wastes

401 - Leather Wastes
402 - Rubber, Elastomer Wastes
403 - Wood Wastes (Scrap Lumber, Pallets, Particle Board)
404 - Paper, Laminated Paper, Cardboard Wastes
405 - Textile Wastes (Yarn, Fabric, Fiber, Elastic)
406 - Glass Wastes (Cullet)
407 - Polyethylene, Polystyrene, Polyurethane, Other Nonhalogenated Plastics
408 - Glass Reinforced Plastics
409 - PVC, Teflon, CPE, Other Halogenated Plastics
410 - Electronic Component Wastes (Off-Spec Semi-Conductors, Circuit Boards)
411 - Agricultural Wastes (Fertilizers, Pesticides, Feed, Feed Supplements)
412 - Photographic Wastes (Film and Photographic Paper)
413 - Asphalt (Bituminous), Asphalt Shingles
414 - Ceramic Wastes
415 - Linoleum Wastes
416 - Thermal Insulation Waste (Cellulose, Glass, Wool)
417 - Wiring, Conduit, Electrical Insulation
418 - Sawdust, Wood Shavings/Turnings
419 - Empty Containers (Metallic, Nonmetallic Drums, Pails)
424 - Treated Wood, Railroad Ties

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430 - Food Waste (Excluding Wastewater Treatment Sludge)
440 - Resins
450 - Polymers (Other Than 407, 409)
460 - Vinyl (Sheet, Upholstery)
470 - Spent Filters (Air/Gas)
471 - Spent Filters (Aqueous)
472 - Spent Filters (Nonhazardous Fuel, Oil, Solvent)
473 - Paint Filters, Other Cloth/Paper Filters, Supersacs
474 - Grease
480 - Refractory (Furnace, Boiler other than 103)
481 - Carbon/Graphite Residue/Scrap
482 - Baghouse Dust (Other than 105, 106)
483 - Blasting Abrasive/Residue (Other than 109)
484 - Gypsum Plaster Molds, Drywall
499 - Other Generic Waste

500 - Special Handling Residual Wastes

501 - Asbestos-Containing Waste (Friable Asbestos Containing Waste, Insulation, Brake Lining, etc.)
502 - PCB Containing Waste (as defined in 25 Pa. Code 287.1)
503 - Oil-Contaminated Waste (Absorbents, Rags)
504 - Paints (Liquid)
505 - Spent Catalysts
506 - Contaminated Soil/Debris/Spill Residue and Near-Surface Horizontal Directional Drill (HDD) Cuttings (Nonpetroleum) (Dredge Material, Water Intake Debris and Sediment, Coal Mill Rejects)
507 - Waste Petroleum Material Contaminated Soil/Debris
508 - Virgin Petroleum Fuel-Contaminated Soil and Debris
509 - Waste Oil that is not Hazardous Waste Oil (automotive, machining, cutting, etc.)
510 - Waste Tires

700 - Industrial Equipment, Maintenance Waste/Scrap

701 - Pumping, Piping, Vessels, Instruments, Storage Tanks

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702 - Scrap from Maintenance and Product Turnaround
703 - Batteries (Nonhazardous)
704 - Grinding Wheels, Sanding Disks, Polishing Belts, Welding Rods, Broken Tools
710 - Plant Trash
799 - Other Maintenance Waste

800 - Noncoal Mining, Oil and Gas, and Other Well Drilling Wastes

801 - Nonoil and Gas Well Drilling Waste - includes residuals, and drill cuttings from monitoring well and drinking water well construction. For this facility, does not include drilling fluids.

900 - Miscellaneous

901 - Auto Shredder Fluff
902 - Nonhazardous Residue from Treatment of Hazardous Waste (Other than 203)
999 - Other

Residual Wastes with Chemical Analysis Waived

The categories of residual wastes that qualify for the waiving of chemical analysis by DEP are limited to those listed below.

499	Animal Droppings (Manure)
413	Cured Asphalt (Solidified)
405	Carpet or Fabric Scrap Waste
414	Ceramic Insulation Waste
499	Cured Resin Waste
402	Cured Rubber, Elastomer waste
499	Dead Animals (Nonexperimental)
419	Empty Container Waste (RCRA Empty)
499	Empty (Dried) Commercial Paint Can Waste
499	Fencing (Chain-Link and Barbed)
407	Foam Type Wastes (Rigid Plastic Foam, Expanded Polystyrene Foam, and Polyurethane)
430	Food Waste (Excluding Treatment Sludges)

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470	Fresh Air Intake Filters waste
499	Gaskets - Unused (Rubber and Cork)
408	Glass Reinforces Plastics (Fiberglass)
406	Glass Waste (excluding Specialty Glass and Glass Sludges)
409	Halogenated Plastics (PVC, CPE, and Teflon)
406	Incandescent Light Tubes/Bulbs
499	Labels/Packaging Waste
401	Leather Scraps
415	Linoleum Waste
499	Metal Scrap (Excluding Powdered Grindings or if Contaminated with Fluids or Oils)
407	Nonhalogenated Plastics
403	Nontreated Wood Waste
405	Nylon Materials
472	Oil Filters, Used (Hot Drained and Nonterne Plated)
499	Packing/Shipping Material
404	Paper and Cardboard Waste
499	Personal Protective Equipment Waste
499	Screen Waste
499	Shingle Scrap
416	Thermal Insulation Waste (Cellulose, Glass, and Wool)
417	Wire and Wire Scrap (Conduit and Electrical Insulation)
403	Wood Wastes (Excluding Treated Wood)

Municipal Waste Requiring Special Handling:

- Municipal Sewage Sludge
- Processed Infectious Waste
- Chemotherapeutic Waste (after being processed by incineration)
- Nonhazardous Ash Residue from Municipal Waste Incineration

b. The maximum total concentrations for non-TCLP organics in residual waste, municipal waste, and municipal waste requiring special handling are not to exceed the following limits: 2,500 ppm for aromatic halogenated hydrocarbons; 5,000 ppm for aliphatic halogenated hydrocarbons; 10,000 ppm for aromatic hydrocarbons; and 50,000 ppm for volatile and semi-volatile organics.

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c. For acceptance of virgin petroleum contaminated soil and debris, Form U is to be substituted for Form FC-1 if the TPH concentration exceeds one percent. See also 44.v(v) for acceptance procedures for TPH concentrations less than one percent (10,000 ppm).

d. The permittee shall not accept any residual waste or municipal waste requiring special handling whose chemical constituents are not included or are in excess of the maximum acceptance concentrations as delineated in the waste analysis and classification plan, unless a major permit modification is submitted and approved by DEP. Any new waste request not approved in this plan must be submitted as a major permit modification.

e. The permittee shall not accept, receive, dump, discharge, process, or dispose hazardous waste as defined in 25 Pa. Code Chapter 261a or 40 CFR Part 261.

f. All residual and municipal waste requiring special handling from new generators must be consistent with the requirements stated in the waste analysis and classification plan incorporated by reference pursuant to Condition 1.

g. The permittee must submit a waste disposal request and source reduction strategy from each individual large quantity residual waste generator. The permittee must submit a waste disposal request from each individual generator of municipal waste requiring special handling. Proof of submission to DEP would be dated certified mail return receipt cards, signed, dated, acceptance receipts for hand-delivered requests, signed, dated receipt from overnight mail/federal express deliveries, or some other means, such as electronic submission, acceptable to DEP. Except for disposal requests including residual waste code 999 (Other), the wastes indicated on Forms U, 35, 36, or 43 may be accepted for disposal by the permittee 15 days after proof of submittal to DEP, unless otherwise notified by DEP in writing. Wastes identified as 999 (Other), may not be accepted until specific written approval is received from DEP. If, at any time, it is determined by DEP that the waste included in the disposal request is not consistent with the waste analysis and classification plan or the design of the landfill or waste reduction strategy, the permittee shall be notified and acceptance of this waste may be prohibited until deficiencies have been corrected. The permittee may be subject to any and all applicable enforcement action to the Solid Waste Management Act and the Rules and Regulations promulgated thereunder, if waste is accepted not consistent with the waste analysis and classification plan. This subcondition is not

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applicable to those Residual Wastes with Chemical Analysis Waived as listed in Condition 44.a, above.

h. All submissions covered by Condition 44.g must be sent to the host municipality and the host county at the same time they are submitted to DEP, unless the host municipality/county specifically notifies both the permittee and DEP in writing that they do not wish to receive the submissions and affirmatively waives their right to receive the submissions. An alternative submittal or notification process for the individual disposal request submittal process that is acceptable to the host municipality/county may be substituted, upon written notification to DEP, in the event the municipality/county does not wish to completely waive their rights under this subcondition.

i. The permittee shall submit, to DEP's Southeast Regional Office, an amended appendix to the permit that lists all residual waste and municipal waste requiring special handling accepted for disposal at the facility. This amended appendix shall be submitted for the calendar quarter by April 20, July 20, October 20, and January 20 for the January – March, April – June, July – September, and October – December quarters, respectively. This amended appendix shall include the information by generator, including the waste type, approved quantity, quantity accepted, generator identification number, and the identification number for each Form U, Form 35, Form 36, and Form 43 for all waste accepted at the landfill during the calendar quarter covered by the report. The appendix must include the anniversary acceptance date for each generator of residual waste and municipal waste requiring special handling.

j. Form 26R, the annual analysis report and annual analysis data from generators of municipal waste requiring special handling (Forms 35, 36, and 43) is to be kept on file for each waste generator at the landfill site. This is due at Fairless Landfill from the generator one year after DEP receives Forms U, 35, 36, or 43 submissions. For small quantity residual waste generators, analysis data and/or certification pertaining to hazardous waste determination criteria is to be kept on file. The waste cannot continue being accepted if the landfill does not have an annual submission of Form 26R or annual analytical data from generators of municipal waste requiring special handling on file.

k. Any new large quantity generator of Residual Wastes with Chemical Analysis Waived, as listed in Condition 44.a, above, that proposes to use the landfill must submit Forms U and 25R to the landfill.

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l. The landfill must keep certification documents from all small quantity generators on file indicating that their waste streams are not hazardous.

m. The landfill's annual report, submitted by June 30 of each year, must include documentation that the analysis or certification required under Section 273.313 for chemical analysis of waste for each waste stream from each individual generator utilizing the landfill for disposal is on file.

n. All Forms U, 35, 36, 43, and FC-1 documents must be kept on file and each assigned a sequential identification number which is to be recorded on all forms submitted to DEP.

o. Hazardous waste, as defined under 25 Pa. Code 261a, may not be accepted at the facility for disposal. Any residual waste generator whose analysis reaches 85 percent of the hazardous waste limit shall provide additional analysis and documentation to justify that the waste is below the hazardous waste limit.

p. No residual waste is to be accepted from any facility bulking/mixing different categories of residual (Form U) waste, unless such facility is permitted by DEP for this purpose.

q. Form U's from individual generators of friable asbestos containing waste do not have to be submitted.

r. New sources of incinerator residue from resource recovery incinerators shall be tested in accordance with the following procedure. The analysis data shall be submitted to the Southeast Regional Office. Analyses data generated by resource recovery incineration permit requirements can be submitted to comply with the following conditions:

   i. A grab sample of resource recovery incinerator residue is to be taken from each incoming load of ash residue to be tested for pH. All of this sampling data shall be submitted with the data from the composite sampling below.

   ii. For a minimum of the first eight weeks of incinerator operation, testing shall be done on a weekly composite sample comprised of at a minimum daily grab sample. Each grab sample shall be tested for pH. The weekly composite sample shall be tested for pH, lead, chromium, and cadmium. Also, for the initial sampling period, an analysis for all Form 41 parameters shall be run on each fourth week composite sample. All data from

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this sampling period shall be submitted to DEP at the conclusion of the eight-week period.

iii. Upon receiving written approval from DEP, testing shall be done on a monthly basis for all Form 41 parameters and reserve alkalinity for a minimum of six months. The monthly composite sample is comprised of a minimum of one random grab sample from each day of operation. All grab samples shall be of an equal amount. Data from this sampling period is to be submitted to DEP on a monthly basis.

iv. Upon receiving written approval from DEP, testing shall be done on a quarterly basis for all Form 41 parameters and reserve alkalinity. The quarterly composite sample is comprised of weekly random grab samples. All grab samples shall be of an equal amount. Data from this sampling is to be submitted to DEP on a quarterly basis.

s. Infectious and chemotherapeutic incinerator ash must contain less than five percent volatile solids. Incinerator ash from other sources has no volatile solids limit.

t. Wastes for quantity increase requests for previously approved waste streams from specific generators may be accepted for disposal immediately. Each request must include the most recent generator's annual report and analytical data for submissions more than 12 months old.

u. RCRA empty containers can be accepted as Residual Wastes with Chemical Analysis Waived.

v. i. All solid wastes excluded under 25 Pa. Code 261a.4(b) and 40 CFR 261.4(b) may be accepted for disposal except for waste categories listed under Sections 261.4(a)(4), (6), (8), (10), (18), and (20). The unacceptable waste includes:

(I) Source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954.

(II) Household hazardous waste collected by a collection contractor under Section 1512 of Act 101.

(III) Coal refuse as defined in the Coal Refuse Disposal Control Act.

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(IV) Treatment sludges from coal mine drainage treatment facilities.

(V) Pulping liquors (black liquor) that are reclaimed in a pulping liquor furnace and then re-used in the pulping process.

(VI) Spent sulfuric acid used to produce virgin sulfuric acid.

ii. Corrosivity and Ignitability, as defined in 40 CFR 261.21 and 261.22, will replace pH and flashpoint, respectively, as acceptance criteria for disposal.

iii. If a specific waste stream has been found to be consistent based on 25 standard fingerprint analyses, then the frequency can be reduced to one standard fingerprint analysis per day for each specific waste stream from a specific generator.

iv. Sampling frequencies for oil contaminated waste, contaminated soils, site cleanup waste, oil washing material, thermally treated soil, and bioremediated soil must satisfy the requirements of SW-846 (or equivalent). If the sampling frequency does not meet the requirements of SW-846 (or equivalent), then the sampling frequency must be at least one sample per 500 cubic yards.

v. A Form FC-1 is to be submitted for virgin petroleum contaminated soil and debris containing less than one percent total petroleum hydrocarbons (10,000 ppm). A Form U is to be submitted for virgin petroleum contaminated soil and debris containing greater than one percent total petroleum hydrocarbons. For virgin petroleum contaminated soil and debris of containing less than one percent total petroleum hydrocarbons, the facility is permitted to accept the waste without written approval from DEP pursuant to, and consistent with, the provisions of Appendix V of the Waste Acceptance Plan.

w. Prior to commencement of disposal operations at Fairless, the permittee shall certify, by providing a list in writing, as to which previously approved residual wastes and municipal wastes requiring special handling from current generators approved for waste acceptance at GROWS North and/or TRRF Landfills are consistent with the Form R Waste Acceptance and Classification Plan approved herein for Fairless. Waste streams from generators so certified may then be transitioned to, and accepted at, Fairless when disposal operations commence. After the

commencement of disposal operations at Fairless, any new or modified disposal requests must be submitted to Fairless pursuant to Condition 44, herein.

45. All approved sources of residual waste and municipal waste requiring special handling are to be analyzed on an annual basis for parameters included in the approved Form U, Module 1, Form 35, Form 36, or Form 43 submissions.

LEACHATE MANAGEMENT

46. Two leachate storage tanks, each 1.42 million gallons (101' dia. and 25' high) shall be utilized for on-site storage of leachate. The first tank shall be constructed and available for use prior to the commencement of acceptance of waste for disposal, and the second tank shall be constructed and available for use prior to commencement of waste disposal operations in Cell 7 or 8, whichever cell is constructed first. Leachate shall be discharged directly to the Leachate Treatment Plant (LTP) for treatment and discharge in accordance with Condition 48 of this permit.

47. a. Secondary containment, consistent with the requirements of 25 Pa. Code 285.122, shall be provided for each tank and/or tank farm.

b. All stormwater collected within the secondary containment area(s), shall be inspected. If there is evidence of leachate present within the containment area(s), stormwater shall be conveyed to the Leachate Treatment Plant before it is discharged to the environment. If there is no evidence of leachate present in the secondary containment area(s), the stormwater may be directed to an adjacent stormwater management channel in accordance with, and subject to, any procedures, practices or requirements as may be specified by DEP's Clean Water Program. Standard erosion and sedimentation control measures shall be implemented to control run-off from the disturbed area during and after the construction of leachate storage facilities.

c. The vehicular transportation of leachate is not an approved leachate treatment method for the Fairless Landfill until such a change in method, as may be authorized under Act 45, is authorized through the submission and approval of a major permit modification to address the change in method. In the event that vehicular transportation of leachate becomes necessary, the permittee shall notify DEP in writing of its intent and basis for implementing vehicular transportation of leachate. The notice shall include the commencement date of the transportation, the specific

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conditions requiring the vehicular transportation of leachate, and the anticipated duration. Written notification shall be provided by the permittee within forty-eight (48) hours of the commencement of the vehicular transportation of leachate. Written updates shall be provided every two weeks during the duration of vehicular transportation (when the event exceeds two weeks) and upon the cessation of vehicular transportation. These written updates shall include the total duration of the event as of the date of the update, the total amount of leachate transported as of the date of the update and the incremental amount of leachate transported since the previous written update, and the available storage capacity in gallons and percent of available storage. Nothing in this permit condition shall be construed as authorizing a change in the facility's approved leachate treatment method.

48. a. Leachate generated by the Fairless Landfill shall be conveyed to the Leachate Treatment Plant, incorporated herein as part of the Fairless Landfill permit area, for processing prior to discharge, via NPDES permit, to the Delaware River and/or via piped discharge to an approved off-site Publically Owned Treatment Works (POTW).

b. The generic concept of piped discharge to an off-site POTW is incorporated into the Fairless leachate management plan. However, the only actual POTW discharge alternative approved at this time is discharge to the Morrisville Pollution Control Facility (Morrisville Plant), owned and operated by the Municipal Authority of the Borough of Morrisville (Authority). This discharge alternative is further subject to any restrictions or limitations that may be placed upon the alternative by DEP or the Delaware River Basin Commission. Any other off-site POTW direct discharge alternative(s) will require further modification of the Fairless Landfill's leachate management plan prior to implementation. The type(s) of further modification(s) is(are) to be governed by the specifics of each individual request. However, a request to discharge directly to a POTW other than the Authority's shall not be construed, in and of itself, as requiring a major modification to the Fairless Landfill leachate management plan because of the concept approval contained herein unless the specifics of the request would otherwise require the submission of a major modification application.

c. Title 25 Pa. Code 273.275(b) requires an on-site leachate storage system to have sufficient capacity at least equal to the maximum expected production of leachate for any 30-day period for the life of the facility as estimated pursuant to 25 Pa. Code 273.162. Fairless Landfill may not rely on storage capacity available at GROWS Landfill, GROWS North Landfill, or

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Tullytown Resource Recovery Facility Landfill for the purpose of complying with 25 Pa. Code 273.275(b), as noted above.

GAS MANAGEMENT

49. The permittee shall install and operate its Gas Management Plan for the facility as an active gas management system in accordance with approved plans and designs. Additional wells may be installed, if warranted by site conditions, subject to DEP approval via either the construction certification or permit modification process, the choice of which is at DEP's discretion. There are 259 gas wells shown on drawing 86086B-40 and Gas Extraction Well Schedule shown on drawing 86086B-42.

a. Provision for the direct sale of landfill gas to PECO Energy (PECO), or its successor, to utilize the landfill gas either at the Pennsbury Power Plant or at the boilers at the United States Steel – Fairless Works facility is authorized under this permit provided that the permittee may not implement changes to the landfill gas agreement with PECO or its successor that result in modifications to the landfill gas design or system without DEP's prior approval. It shall be DEP's decision to determine if the changes constitute a major modification to the landfill gas management plan.

b. The Fairless Landfill gas compressor station and conveyance pipeline are hereby incorporated into the Fairless Landfill gas management plan.

c. The landfill gas flare system located at the Fairless Landfill may be used only for emergency situations as described in the application documents incorporated into this permit by Condition No. 1, above, or as may be authorized by applicable air permits.

EQUIVALENCIES (Form Q)

50. a. Alternate Subbase material. A proposed alternative to the 6-inch thick low permeability soil subbase layer is a Geosynthetic Clay Liner (GCL) consisting of bentonite encapsulated between two layers of nonwoven geotextile. GCL will be installed on the prepared subgrade of which the upper one foot will have maximum particle size of one inch.

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b. Leachate Detection Zone. A geocomposite drainage layer (HDPE geonet core with a needle punch nonwoven geotextile heat bonded to both sides) in lieu of the 12-inch granular layer.

c. i. Final Cover Grading. A design configuration of at least a 16 foot-wide terrace (bench) for every 40 feet maximum rise in elevation on the slope is proposed instead of a terrace at least 15 feet wide on slope of every 25 feet maximum rise in elevation. The benches will be graded at minimum of inward slope 12.5%.

ii. Final cover system configuration 1. A 10 oz/sy nonwoven geotextile, 40 mil textured on both sides geomembrane, and geocomposite drainage layer as shown in drawing 86086B-35, detail 1.

iii. Final cover system configuration 2. A combination of geomembrane/drainage layer and 10 oz/sy nonwoven geotextile as shown in drawing 86086B-35, detail 1A.

d. Alternate Daily Cover Material (ADCM) as described in Condition 51, below.

e. The facility is permitted to use two specific aggregate gradation materials for the protective cover as provided in Table J-2(2). The protective cover material shall have a maximum particle size of 1.5 inches, shall be classified as GW, GP, or SP as defined by USCS and shall be used as follows:

i. Coarse aggregate No.1 (modified AASHTO No. 8) may be used with geocomposite.

ii. Coarse aggregate No. 2 (modified AASTHO No. 57) shall be used with a geocomposite as per Note 1 of Details 1A and 2A of Drawing 86086B-22.

Additionally, Protective Cover shall meet the minimum permeability of 0.20 cm/sec. If less than 0.20 cm/sec, then leachate collection laterals shall be installed as shown in Drawing 86086B-08.

f. The facility is permitted for the use of glass cullet material as gas extraction well backfill, gas system header backfill, leachate force main backfill, use in construction of landfill access road subgrades, the use as a general fill material, and utilization of glass cullet beneath the final cap in areas of settlement and in the cap drainage layer subject to the following sub-conditions:

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i. Temporary landfill access road subgrades and subbases will utilize no more than a forty percent (40%) glass cullet/mixture.

ii. Final landfill access roads depicted on final development plans, including subgrades and subbases, will utilize no more than a ten percent (10%) glass cullet/soil mixture.

iii. For road construction utilizing glass cullet and soil, the ratio of cullet to soil will be done by the use of individual loads during road construction. For a 40% mixture, three loads of soil must be mixed with two loads of glass cullet utilizing a bulldozer to incorporate the two materials. For a 10% mixture, nine loads of soil will be mixed with one load of glass cullet utilizing a bulldozer to incorporate the two materials.

iv. For use of glass cullet in the landfill cap drainage layer, engineering test must be performed to determine suitability including the permeability and grain size as required by the cap design criteria. As built, documentation must be submitted with Form 37 pertaining to the use of glass cullet in the landfill cap drainage area.

ALTERNATE DAILY COVER MATERIAL (ADCM)

51. An equivalency to use alternate daily cover materials (ADCM) in lieu of the soil material composition required in section 273.232. The following materials are approved for use as ADCM at Fairless Landfill. The following ADCM have been previously approved by DEP for statewide use.

- Municipal Incinerator ash
- Fly ash conditioned with cement kiln dust
- Recycled paper deinking sludge
- USDA clay loam soil texture classification
- Coal ash, as subject to waste placement within 24 hours

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- Sanifoam
- RUSMAR AC-645 Long Duration Foam
- No. 3ML-9791 Foam
- Processed construction and demolition waste
- Propat (patented processed auto shred material produced by Polarized Schiabo Neu Company)
- Posi-shell
- Nonpetroleum contaminated soil
- Fairo-Cover (shredded auto fluff produced by Fairless Iron and Metal, LLC)

The following subconditions a. through f., apply to all approved ADCM at the facility:

a. All stormwater runoff from ADCM applied at the working face or from ADMC stockpiles must be managed as leachate, unless otherwise approved in writing by DEP. Stormwater runoff from uncontaminated soil from nonspecific borrows area and clay loam soils applied as daily cover will not have to be managed as leachate.

b. No ADCM is to be utilized on a side slope, unless runoff from the ADCM is directed into the leachate collection system. Uncontaminated soils from nonspecific off-site borrow areas and clay loam soils can be placed on side slopes without directing runoff into the leachate collection system.

c. DEP is to be notified one week prior to making any changes in types of ADCM utilized at the site.

d. All processed or unprocessed materials consisting of solid waste(s) utilized as ADCM under approvals granted in this permit or subsequent modifications, are wastes and not

recyclable materials, and count towards the ADV of the facility. The wastes are subject to the host municipality benefit fee(s) of Act 101.

e. All categories of ADCM approved under this permit are to be only utilized as daily cover, unless otherwise indicated.

f. Neither soil nor ADCM, whether used in place of or in addition to soil, are to be removed from the previous day's working face or cell prior to starting operations the following day, nor may soil or ADCM be reused.

The above referenced ADCM have received separate approvals for use as ADCM, and are included on the statewide-approved equivalency list. Based upon DEP's Policy and Procedure for Municipal Waste Facility Equivalency Approvals, the permittee is authorized to utilize these materials, subject to the terms and conditions of their individual approvals, at the Fairless Landfill. Failure of any of these materials to perform satisfactorily at the Fairless Landfill, or failure of the permittee to comply with the terms and conditions upon which the original reviewing region based its approval, shall be grounds for revocation of the approval herein granted. The details of each ADCM are provided in Attachment-I, below.

NONSITE SPECIFIC OFF-SITE SOURCES SOIL AND AGGREGATE MATERIAL

52. The facility is permitted to utilize nonsite specific off-site sources of soil for construction material and cover material subject to the following subconditions:

a. For the use of dredged material, chemical analysis data of the dredged material must be submitted to DEP for approval in accordance with sampling protocol outlined below for each dredge disposal area, or replenished dredge disposal area, at least thirty (30) days prior to excavation:

i. Dredge Sampling Protocol:

Procedures:

- The dredge deposits will be subdivided into 50,000 cubic yard sections.

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- For all inorganic parameters: One composite sample will be collected from each 50,000 cubic yard section. Each composite sample will be taken from five locations within each 50,000 cubic yard section.

- For Volatile Organic Compounds (VOCs): Each of the 50,000 cubic yard sections (identified above) will be screened with a Photoionization Detector (PID). The material will be extracted from ground surface to the total depth of dredge pile using a hand auger or other method acceptable to DEP. Once extracted, the materials will be scanned with a PID at one-foot intervals. Field screening will be performed at a location shielded from the wind, and away from gas tanks, or gas-powered equipment. One sample discrete location will be selected and a sample will be collected from each 50,000 cubic yard section. The sample interval with the highest PID reading will be collected for analysis. If the materials are all nondetect (i.e., do not exceed background PID readings), a minimum of one sample for the 50,000 cubic yard section will be collected.

Laboratory Analysis:

Samples that are collected according to the above sampling procedure shall be analyzed for the following parameters:

- Volatile Organics (EPA Method 8260B)
- Total Metals and TCLP: AG, AS, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, and Zn
- Pesticides (EPA Method 8081A/8082), plus Lindane and Methoxychlor
- Total Petroleum Hydrocarbons (TPH)
- Cyanide
- Sulfide
- pH

- Total PCBs (Method 608 GC/ECD), PCBs, 209 congeners (Method 1668A GC/ECD)

- Radioactivity: Radium 226 (EPA 903.1), Gross Alpha (EPA 900.0), Gross Beta (EPA 900.0), Radium 228 (EPA RA-05), Radium Total (EPA RA-05)

ii. For the use of dredged material, Physical Test Data of the dredged material consisting of one composite sample in accordance with the sampling protocol outlined in the EPA SW846 Manual for every 10,000 yards of dredge material demonstrating that the dredged material will satisfy the performance standards of DEP, thirty (30) days prior to excavation of any dredge disposal site or replenished dredge disposal site.

iii. Unless dewasted pursuant to Chapter 287.7 or otherwise determined by DEP not to be a waste (based upon the data provided pursuant to Subconditions 52(a)(i) and 52(a)(ii), above), dredged material is regulated as residual waste, is not a recyclable material, and counts towards the daily volume of the facility. These wastes are subject to the host municipality benefit fee(s) of Act 101.

Unless determined by DEP not to be a waste, use of dredged material pursuant to this Condition (52) is limited to alternative daily or intermediate cover uses, or structural fill uses located within lined areas of the landfill, subject to the acceptability of the physical and chemical analyses required in Subconditions 52(a)(i) and 52(a)(ii), above. If determined not to be a waste, use of dredge material shall be consistent with the dewasting determination.

b. Uncontaminated soil material other than dredge material from nonsite-specific off-site sources (soil material that meets clean fill requirements) shall have no use restriction at the landfill other than the requirements listed below, provided that the material is not placed in or on waters of the Commonwealth:

i. Uncontaminated soil may be used as a source of daily, intermediate, and final cover soils as well as structural fill and subgrade fill based on the chemical and physical suitability of the soils for each designated purpose.

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ii. Uncontaminated soil is further subject to the approved Quality Assurance Program and Testing Protocol for Nonsynthetic Material of Form J. Use of uncontaminated soil from nonsite specific off-site sources pursuant to this condition shall be adequately described in accordance with Chapter 273.117(a)(2) and (b).

iii. Determinations that soil from nonsite specific off-site sources is suitable for use at the landfill pursuant to this Subcondition 52(b) shall also be consistent with DEP's Management of Fill Policy and shall be keep on file by the permittee for the duration of the facility's bond. These records shall be made available to DEP upon request.

c. Contaminated soil from nonsite-specific off-site sources shall be utilized pursuant to this subcondition:

i. Soil material that does not meet clean fill requirements shall be considered a waste and not a recyclable material, and shall be used only as daily or intermediate cover pursuant to Attachment – I, below, except as otherwise allowed pursuant to Subcondition 52(c)(ii) below. Material subject to this Subcondition 52(c)(i) shall be subject to applicable fees and shall be counted against the facility's daily volume.

ii. If the soil material does not meet the clean fill requirements but does meet the regulated fill requirements, then it may be used as structural or subgrade fill at the landfill provided that said soil is chemically and physically suitable for each designated purpose and provided that said use is further authorized by a DEP approval pursuant to General Permit No. WMGR096 for the beneficial use of regulated fill. Soil utilized under this Subcondition (52(c)(ii)) shall not be considered a waste for the purposes of fee and daily volume determinations.

d. No material other than soil meeting clean fill requirements or dewasted dredge material, if authorized pursuant to a dewasting determination, shall be utilized in the construction of the final cover at the landfill.

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RADIATION MONITORING ACTION PLAN

53. This permit also approves the Radiation Protection Action Plan for Solid Waste (RPAP), consisting of approval of a radiation monitoring, detection and action plan received on February 5, 2014, and revised on March 12, 2015.

    a. Pursuant to Section 613 of the Solid Waste Management Act, 35 P.S. Section 6018.613, DEP may recover its costs to abate a public nuisance related to radioactive waste including its costs of management, transport, and disposal of the radioactive waste processed, stored, disposed, or rejected at the facility.

    b. Approval of this permit modification does not guarantee operational effectiveness. Failure to operate this equipment to perform as intended or designed, and implement the Action Plan according to the application documents herein approved, for any reason, shall be sufficient grounds for revocation or suspension of the facility's waste permit in part or in its entirety.

FINANCIAL ASSURANCE

54. A valid and current certificate of liability insurance shall be maintained at the facility. A copy of the current certificate, listing DEP as a certificate holder and providing a 60-day notice period prior to cancellation or termination, shall be submitted to DEP's Southeast Regional Office, Waste Management Program, as required by 25 Pa. Code Section 271.374 of the municipal waste regulations.

55. The bond between Waste Management of Fairless, LLC and DEP for the Fairless Landfill in the amount of $52,815,089 is hereby incorporated as part of this permit. Upon receipt of written notice from DEP, this bond will have to be updated within 90 days in accordance with Chapter 271 of the municipal waste regulations.

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ATTACHMENT-I

I. Municipal incinerator ash as ADCM subject to the following conditions:

a. pH of the ash must be less than 12.5 standard units.

b. Moisture content must be within the range of 10 to 30 percent.

c. Ash for use as an ADCM must originate from generators with functioning metal recovery operations and shall not contain large metal pieces.

d. The thickness of the ash layer applied as ADCM must be sufficient to provide adequate coverage of waste to meet the daily cover performance standards, but shall be no more than six inches in depth. Where a six-inch depth is not sufficient to provide adequate coverage, better waste compaction shall be practiced or other approved daily cover materials shall be utilized in place of ash.

e. Storage of ash shall be within the working area such that any runoff from the ash shall be contained within the landfill's leachate collection system.

f. Testing of incoming ash, whether for disposal or use as an ADCM, shall comply with approved waste acceptance procedures as contained in this permit.

g. This approval is restricted to municipal incinerator ash. The permittee shall provide written notification to DEP of the generator(s) ash being utilized as ADCM. Said notification shall be provided prior to the use of the ash as an ADCM.

II. The following materials have received previous approvals (approving region noted in parentheses) for use as ADCM, and are included on the statewide-approved equivalency list. Based upon the DEP's Policy and Procedure for Municipal Waste Facility Equivalency Approvals, the permittee is authorized to utilize these materials, subject to the terms and conditions of their individual approvals, at the Fairless Landfill. Failure of any of these materials to perform satisfactorily at the Fairless

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Landfill, or failure of the permittee to comply with the terms and conditions upon which the original reviewing region based its approval, shall be grounds for revocation of the approval herein granted:

- Fly ash conditioned with cement kiln dust (SERO).
- USDA clay loam soil texture classification (NWRO).
- Sanifoam (SERO).
- RUSMAR AC–6454 Long Duration Foam (SWRO).
- 3ML-9791 Foam (SWRO).

III. Recycled paper deinking sludge (RPDS) subject to the following conditions:

a. Approval for use of RPDS as alternate daily cover is limited to the RPDS generated by Hagerstown Fiber Limited and Marcal Paper Mills, Inc. (KAOFIN), at this time. Other sources of RPDS may not be used as alternate daily cover without first obtaining written approval from DEP.

b. If DEP determines, upon inspect ion that the RPDS is not meeting the daily cover performance standards specified in Section 273.232(b), the permittee must:

i. Upon notification from DEP, immediately cease the use of RPDS as landfill alternate daily cover. Notification can be in the form of an inspection report.

ii. Submit to DEP a report, which explains why the RPDS is not adequately meeting the performance standard(s), as well as what steps will be taken to improve the quality of the alternate daily cover and prevent noncompliance with Section 273.232(b).

Under the above circumstances, the RPDS may not be utilized until DEP is satisfied that the continued use of RPDS will not result in noncompliance with Sect ion 273.232(b). In the event the alternate daily cover cannot meet the required performance standards, DEP reserves the right to revoke approval.

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c. A five-day supply of daily cover soil material shall also be maintained on the site as required by Section 273.232(d), in the event that the RPDS does not comply with the performance standards as outlined in Attachment-I(III)(b), above.

d. RPDS may not be applied as alternate daily cover within forty (40) linear feet of an exterior side slope. If in the judgment of DEP, the RPDS is determined to be a causative agent in the generation of leachate seeps, DEP may suspend the use of RPDS as landfill daily cover.

e. The RPDS material l should be dewatered to thirty-five percent (35%) to sixty percent (60%) solids contents. The permittee must verify the solids content of incoming RPDS.

f. RPDS may not be stored/stockpiled at the landfill for greater than twenty- four (24) hours; i.e., this material is intended to be utilized for daily cover purpose as it is generated on a daily basis. All RPDS must be stored/stockpiled on the lined landfill area.

IV. Coal Ash, as subject to waste placement within 24 hours and as subject to the following conditions:

a. The testing of incoming ash, whether for disposal or use as ADCM, shall comply with approved waste acceptance procedures and the Form U approved by DEP for that source of coal ash.

b. Coal ash is not to be utilized as ADCM under adverse weather conditions, including periods of rain, snow or excessive wind.

c. Coal ash is to be used as ADCM only when it is covered by additional solid waste the next day.

d. Storage of coal ash shall be within the working area, including the establishment of a berm, such that any runoff from coal ash storage is contained within the landfill's leachate collection system.

e. If, at any time, the coal ash presents a problem related to erosion, dust off-site tracking or traffic ability, its use as ADCM shall be discontinued until such time as the problem(s) are resolved to the satisfaction of DEP.

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f. Coal ash approved for use as ADCM shall be analyzed quarterly or when the coal ash source is changed, whichever occurs first, using the chemical parameters contained in the Bureau of Mining and Reclamation Module 25. DEP will consider a reduction in analytical frequency to once annually if, after a minimum of four quarterly analyses, the coal ash demonstrates no significant differences in the analysis of variance (ANOVA) of the total concentrations (mg/kg) for each of the Module 25 metals analyzed, including boron and sodium, and the coal ash's pH shows no significant variances.

g. Coal ash produced at the U.S. Gen New England, Inc. Brayton Point Station, Somerset, Massachusetts, is approved for use as ADCM conditioned upon continued compliance with this sub-condition. New sources may be approved by DEP in writing based upon sufficient demonstration by the permittee that the physical and chemical properties of the coal ash from the new source is suitable for both (1) disposal at this landfill and (2) use as ADCM consistent with this sub-condition.

V. Processed construction and demolition waste material: The source of processed C&D material approved in this permit modification will be the STAR ADC materials (sized at two-inch minus material) produced at STAR's Vorick II facility in Brooklyn, NY; Recovermat, Waste Management of New Jersey, Inc., Amboy Facility; Karta Industries, Inc., in Peekskill, New York; the Gun Hill Facility located at 620-636 Truxton Street, Bronx, New York; the Mercer Group International of New Jersey Material Recovery Facility, Mercer County, New Jersey; and the Eagle Recycling of New Jersey Materials Recycling Facility, Hudson County, New Jersey subject to the following conditions:

a. Areas upon which processed C&D material has been used must be covered with either conventional daily cover (soil) or additional waste within seven (7) days.

b. Storage or stockpiling of any approved processed C&D alternate daily cover, as approved by this permit modification, shall not occur off the lined area of the landfill without obtaining written DEP approval. In addition, the stockpile areas must have appropriate erosion and sedimentation controls in place before stockpiling is initiated.

c. If DEP inspections indicate an alternate daily cover approved by this permit modification is not meeting the daily cover performance standards specified in 25 Pa. Code Section 273.232, the permittee must:

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i. Upon notification by DEP, immediately cease the use of the alternate daily cover. Notification can be in the form of an inspection report.

ii. Submit a report to DEP which explains why the alternate cover material is not meeting the applicable performance standards, and what steps will be implemented to improve the quality of the alternate daily cover and prevent noncompliance with 25 Pa. Code Section 273.232.

Under the above circumstances, the alternate daily cover may not be utilized until DEP is satisfied that the continued use of the alternate daily cover will not result in noncompliance with 25 Pa. Code Section 273.232. In the event the alternate daily cover cannot meet the required performance standards, DEP reserves the right to revoke approval.

d. Each source of the processed construction and demolition material must be pre-approved in writing by DEP.

e. Testing of incoming C&D materials, whether for disposal or use as an ADCM, shall comply with approved waste acceptance procedures.

f. The thickness of processed C&D layer applied as ADCM must be sufficient to provide adequate coverage of waste to meet the daily cover performance standards, and shall be between six (6) to twelve (12) inches in depth. Where a 12-inch depth is not sufficient to provide adequate coverage, better waste compaction shall be practiced or other approved daily cover materials shall be utilized in place of processed C&D.

VI. Propat (patented processed Auto Shred Material produced by Prolerized Schiabo Neu Company) and Fairo Cover (shredded auto fluff produced by Fairless Iron and Metal, LLC) as an ADCM subject to the following conditions:

a. This approval is limited to the Propat material produced by Prolerized Schiabo Neu Company and Fairo Cover produced by Fairless Iron and Metal, LLC. Failure of either of these products to perform satisfactorily at the Fairless Landfill, or failure of the permittee to comply with the terms and conditions upon which the original issuing region based its approval, shall be grounds for revocation of the approval here in granted.

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b. The ADCM as received must have a moisture content, and contain cementitious material, as described in the manufacturer's process information, sufficient at all times to allow the material to meet the daily cover performance standards, but at no time shall the moisture content be below fifteen percent (15%).

c. The ADCM as received must be shredded to particle size no greater than two (2) inches.

d. Prior to utilizing the ADCM, the permittee shall obtain, and keep available at the site for DEP review, copies of the applicable permit approvals from the original issuing region. The permittee is responsible for demonstrating compliance with the terms and conditions of the original approval of the ADCM.

e. Areas upon which the material has been used as an ADCM must be covered with either conventional daily cover (soil) or additional waste within seven (7) days. The material may also be used as an ADCM on the leading edge of the fluff lift layer of waste in newly constructed cells. The ADCM is considered waste received and disposed.

f. The stormwater from this ADCM shall be treated as leachate and be diverted into the landfill's leachate collection system.

VII. Posi-Shell as an ADCM subject to the following conditions:

a. This approval is limited to the Posi-Shell material that received approval as an ADCM and is listed on the statewide approved equivalency list. Based upon DEP's Policy and Procedure for Municipal Waste Facility Equivalency Approvals, the permittee is authorized to utilize this product, subject to the terms and conditions of its original approval, at GROWS North Landfill. Failure of this product to perform satisfactorily at GROWS North Landfill or failure of the permittee to comply with the terms and conditions upon which the original issuing region based its approval shall be grounds for revocation of the approval herein granted.

b. Areas where Posi-Shell has been used must be broken up (cracked) before additional waste is placed on top.

c. Posi-Shell may not be used as an alternate daily cover in the following areas:

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i. Each partial lift for which the operator intends to place no additional waste for three (3) days.

ii. Each partial or completed lift that represents final permitted elevations for that part of the facility.

VIII. Nonpetroleum Contaminated Soil as an ADCM subject to the following conditions:

a. This approval is limited to the Nonpetroleum Contaminated Soil that received approval as an ADCM from the South Central Regional Office and is listed on the statewide approval equivalency list. Based upon DEP's policy and procedure for municipal waste facility equivalency approvals, this ADCM may be approved via a minor modification for use at GROWS North Landfill. Failure of this material to perform satisfactorily at GROWS North Landfill or failure of the permittee to comply with the terms and conditions upon which the original issuing region based its approval shall be grounds for revocation of the approval herein granted.

b. All ADCM that does not meet DEP's current Management of Fill policy must be managed and stored on a lined area of the landfill.

c. Soil contaminated with residual waste listed in Attachment-II, below, qualifies for use as daily cover, under the following conditions:

i. The primary source of soil contamination is approved for disposal in accordance with the facility's Form R, Waste Analysis and Classification Plan, approval criteria.

ii. It can be demonstrated that the soil meets the performance standards and design requirements of Section 273.232 of the Solid Waste Regulations.

iii. ADCM consists primarily of soil, meeting the approximate maximum percentage of contaminants listed on Attachment-1. Percentage may be calculated if actual quantities are known, or estimated using any available data.

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d. In addition to the residual waste contaminated soils listed in Attachment-II, soils containing approximately twenty-five percent (25%) or less of Construction and Demolition Waste may be used as daily cover, provided that the daily cover is composed of materials that are primarily six (6) inches in diameter or smaller.

e. All Nonpetroleum Contaminated Soil used as an ADCM is a waste and not a recyclable material, and counts towards the ADV of the facility. This waste is subject to the host municipality benefit fee(s) of Act 101.

f. The stormwater from this ADCM shall be treated as leachate and be diverted into the landfill's leachate collection system.

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ATTACHMENT-II

(Refer to Condition 51 and Attachment-I (VIII)

RWC	Description	Max. Allowable Percent in Soil
001	Coal-derived Bottom Ash	25 Percent
002	Coal-derived Fly Ash	25 Percent
004	Incinerator Bottom Ash	25 Percent
006	Incinerator Mixed Ash	25 Percent
101	Foundry Sand	25 Percent
102	Slag	25 Percent
103	Refractory Material	25 Percent
107	Ferrous Scrap, including Auto Recycle	10 Percent
206	Paint, Coating Sludge, and Scale	10 Percent
306	Surface Coatings (to be individually requested with waste approval)	25 Percent
313	Wax, Paraffin	25 Percent
406	Class Wastes excluding Industrial Refractory Material	25 Percent
413	Asphalt (Bituminous)	25 Percent
414	Ceramic Wastes	25 Percent
504	Paints (liquids)	10 Percent
506	Nonhazardous Metals Contaminated Soils	25 Percent
902	Nonhazardous Residual from Treatment of D002-D008 Hazardous Waste	

Re 30 (eh16wm)077

State of New Jersey

DONALD T. DIFRANCESCO
Acting Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

DEC - 3 2001

Mrs. Gail Rosati, President
United Trucking, Inc.
47 Broadacre Drive
Mt. Laurel, New Jersey 08054

CERTIFIED MAIL 7000167000013
RETURN RECEIPT REQUESTED 88323360

RE: Solid Waste Transporter License

N.J.S.A. 13: 1E-126 et seq.

Dear Mrs. Rosati:

This is to advise you that the investigative report from the Attorney General required under N.J.S.A. 13:1E-126 et seq. has been received by the Department of Environmental Protection.

Based on our review of the aforementioned investigative report, the Department is hereby issuing a Solid Waste Transporter License to:

UNITED TRUCKING, INC.

This letter will serve as documentation that a solid waste transporter license has been issued. This license must be renewed annually by filing the Annual License Update form and any other change of information concerning your company or its operation as required by the Department.

You may also be required to obtain a Certificate of Public Convenience and Necessity prior to commencing solid waste business operations. Questions regarding this certificate should be directed to the Bureau of Solid Waste Regulation at (609) 984-2080. Any transportation equipment must be registered prior to commencing operations. Questions regarding equipment registration of the above license should be directed to the Bureau of Hazardous Waste Regulation at (609) 292-7081.

Sincerely,

Norine Binder

Norine Binder, Chief
Bureau of Hazardous Waste Regulation

LC: 01/UntdTrkg-B:lc
c: Harley Williams
Mike DeTalvo

State of New Jersey

Department of Environmental Protection

Division of Solid and Hazardous Waste
401 East State Street 4th floor West Wing
PO Box 414
Trenton, New Jersey 08625-0414
Paula Greenberg
Direct Telephone (609) 984-6852
Solid Waste Regulation Telephone (609) 984-2080
Fax (609) 984-6874

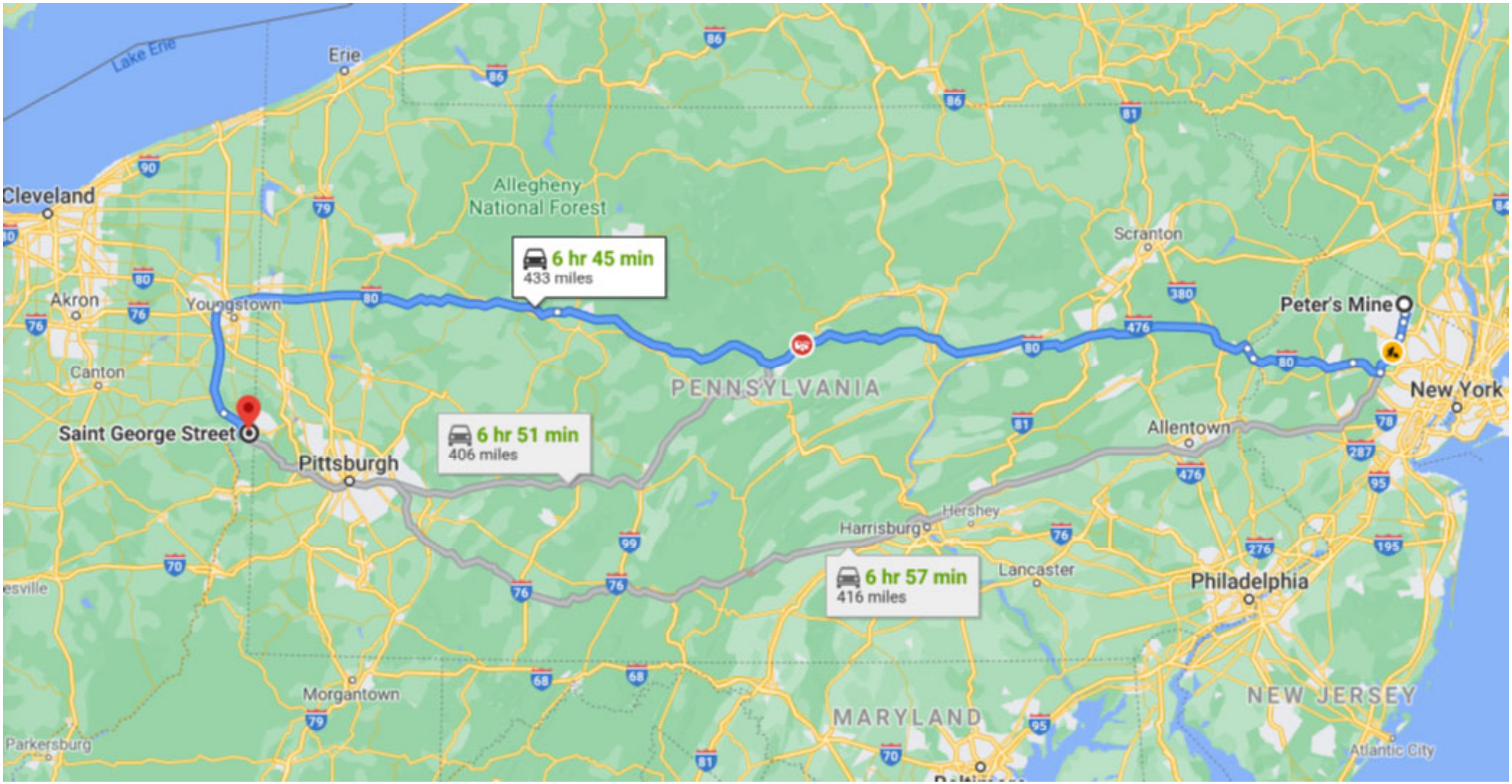
Solid Waste Number: SW2247
United Trucking, Inc.
47 Broadacre Drive
Mount Laurel NJ 08054
Telephone (856) 778-9775
Fax (856) 778-0984

Enclosed Solid Waste collector Economic Regulation Questionnaire must be completed each quarter and on time. If there was no activity so state. If you need assistance call Paula Greenberg at (609) 984-2080.

By June 30 of each year a customer list is required per N.J.A.C. 7:26H-5.9 (C) enclosed

New Jersey is an Equal Opportunity Employer
Recycled Paper

Attachment B



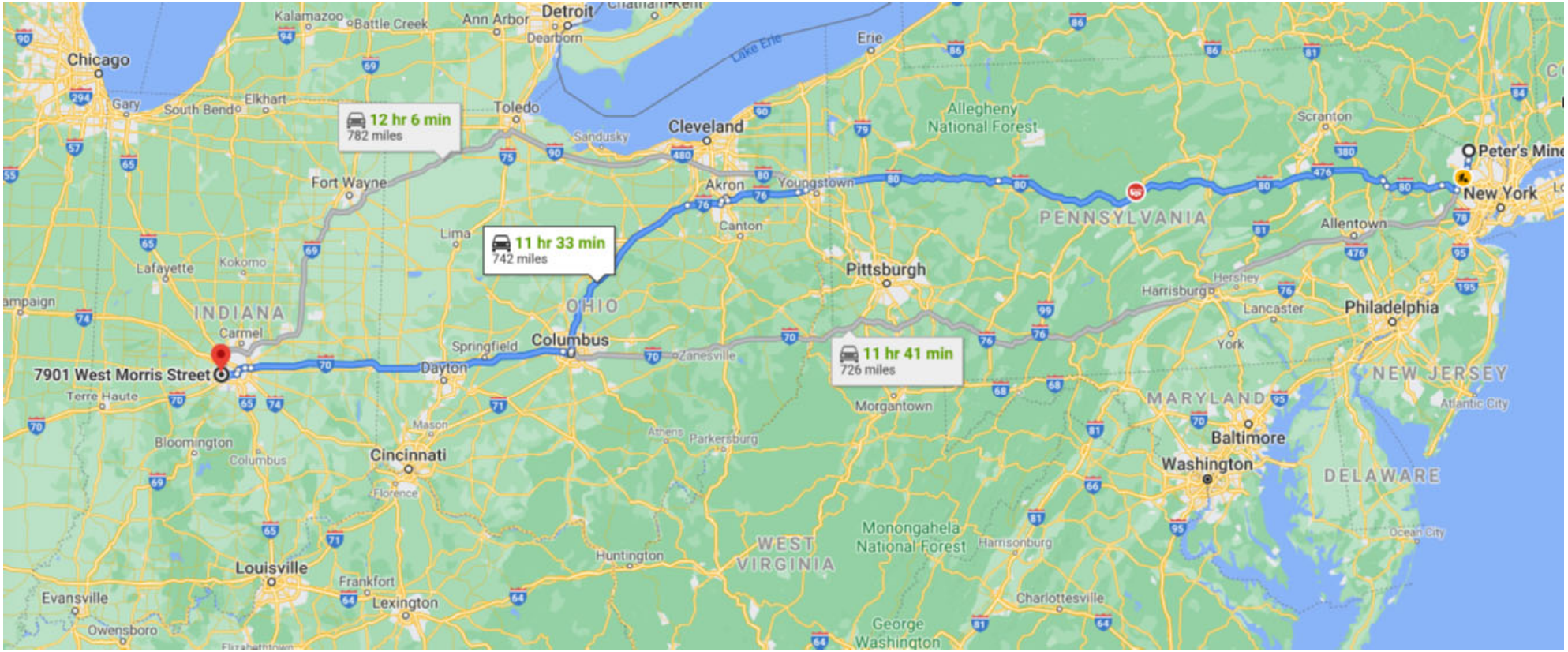
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Heritage Thermal Services
250 Sait George St. East Liverpool, OH

Figure: 3-1

Date: 11/18/20

RECON®
Remedial Construction Services, L.P.



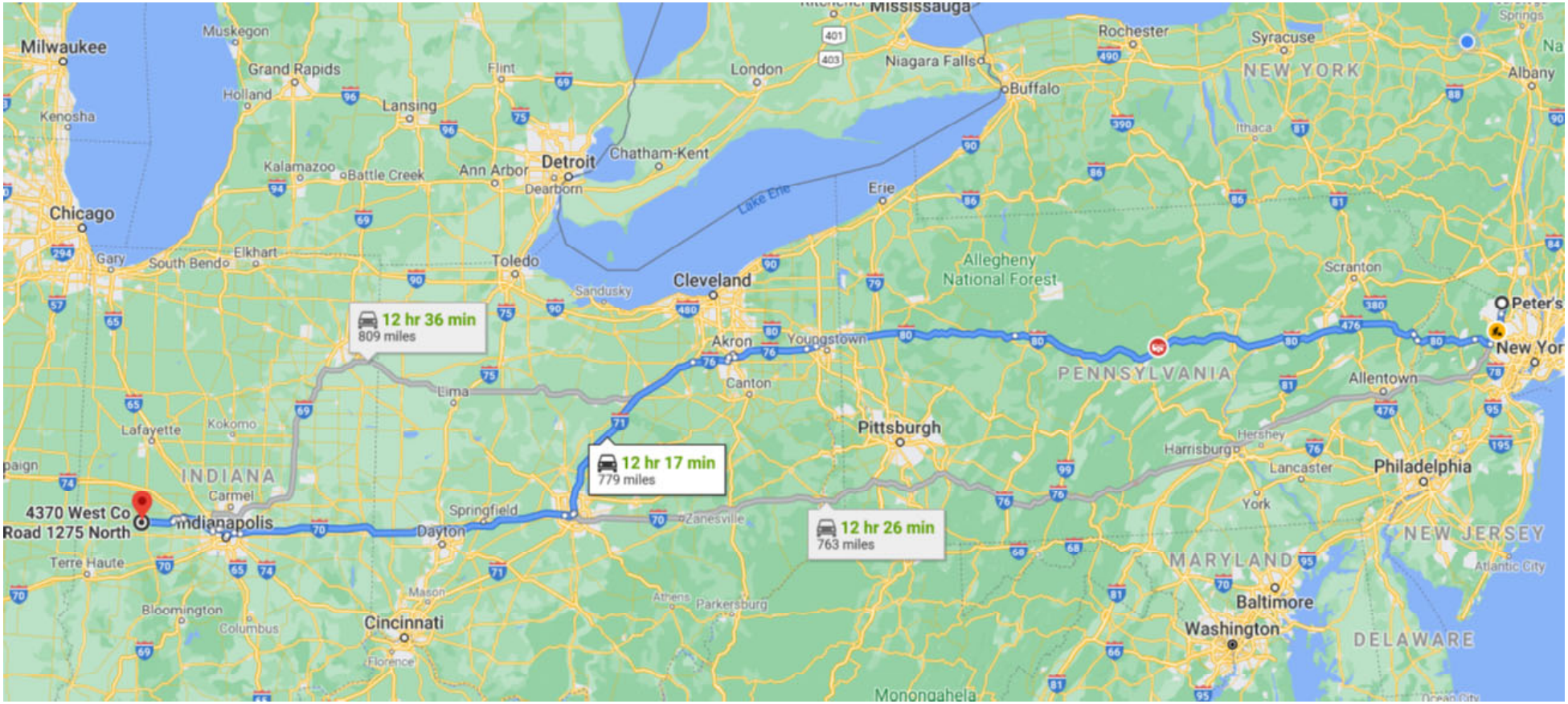
RECON®
Remedial Construction Services, L.P.

RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Heritage Environmental Services
7901 W. Morris St. Indianapolis, IN

Figure: 3-2

Date: 11/18/20



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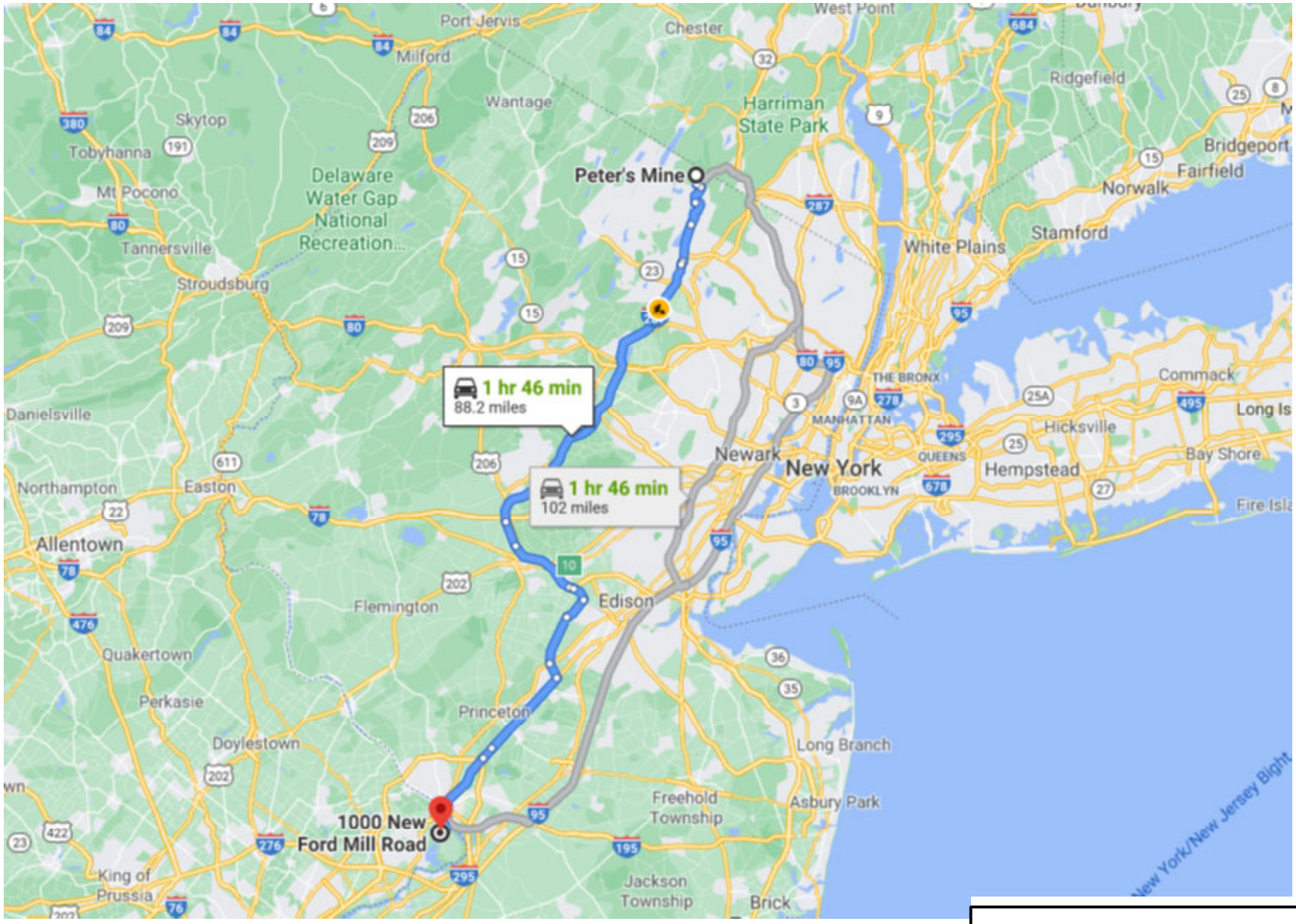
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Heritage Landfill
4370 W CR-1275N Roachdale, IN

Figure: 3-3

Date: 11/18/20



RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Waste Management FairlessLandfill
1000 New Ford Mill Rd. Morrisville, PA

Figure: 3-4

Date: 11/18/20

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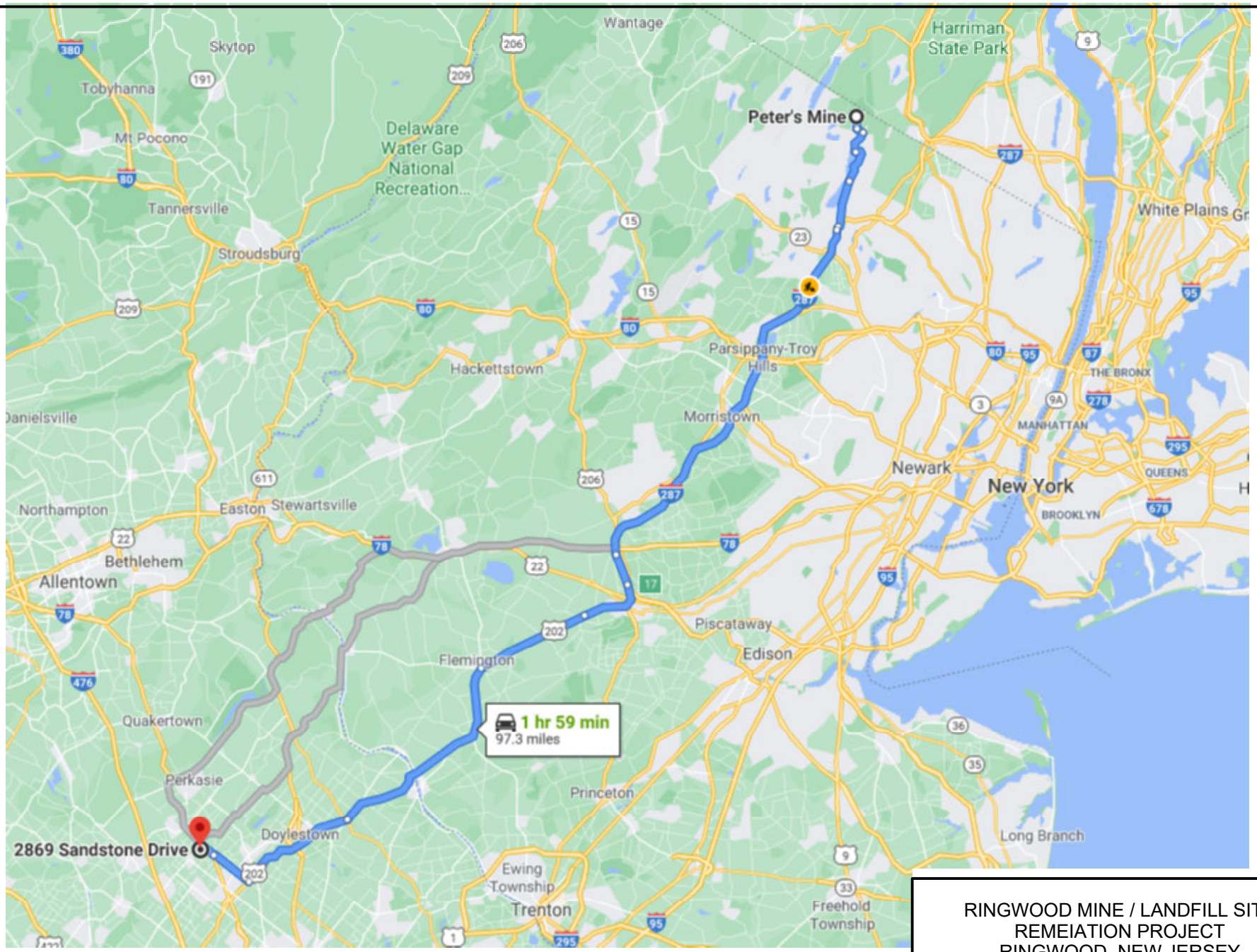
Remedial Construction Services, L.P.



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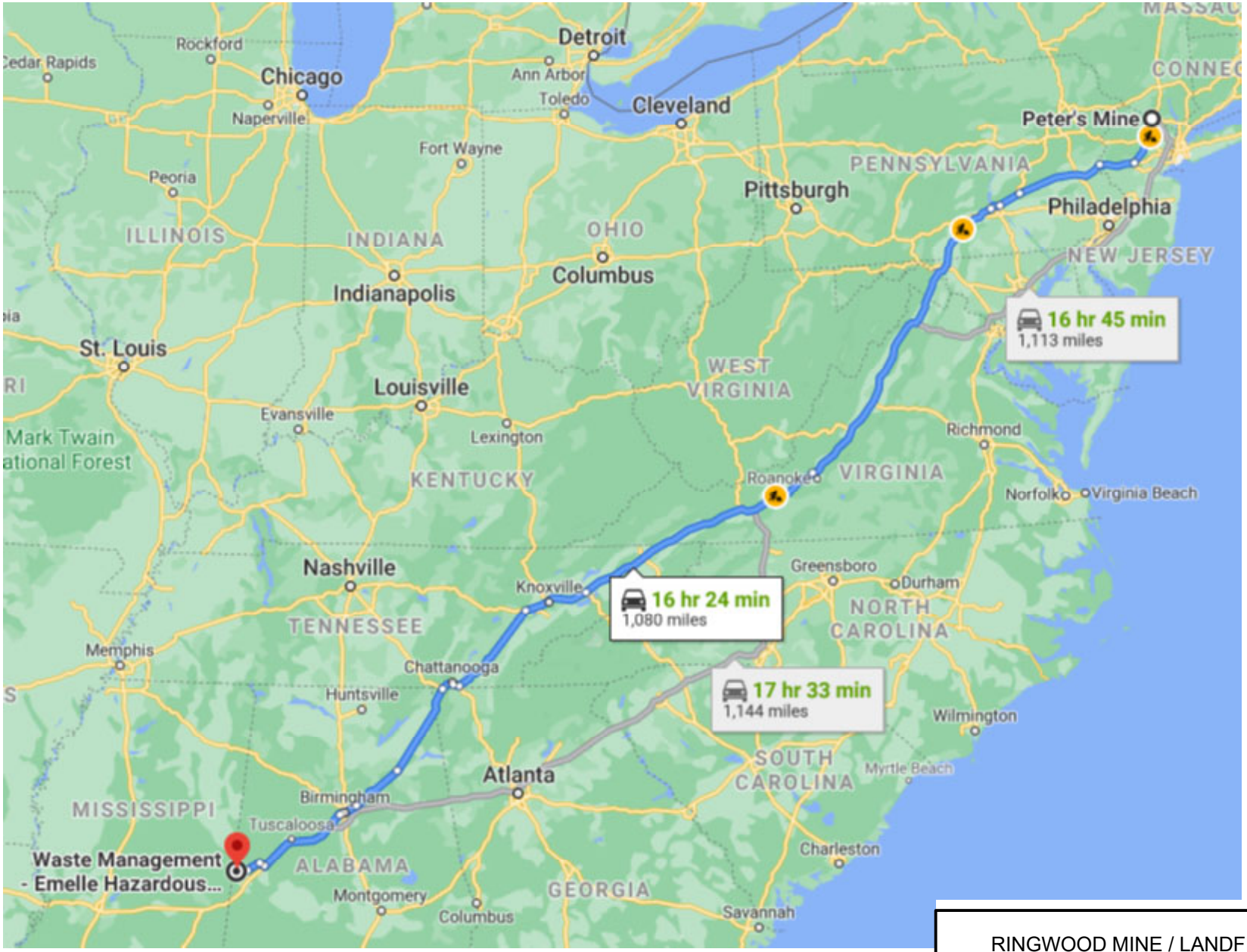
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Republic Environmental
2869 Sandstone Dr. Hatfield, PA

Figure: 3-5

Date: 11/18/20



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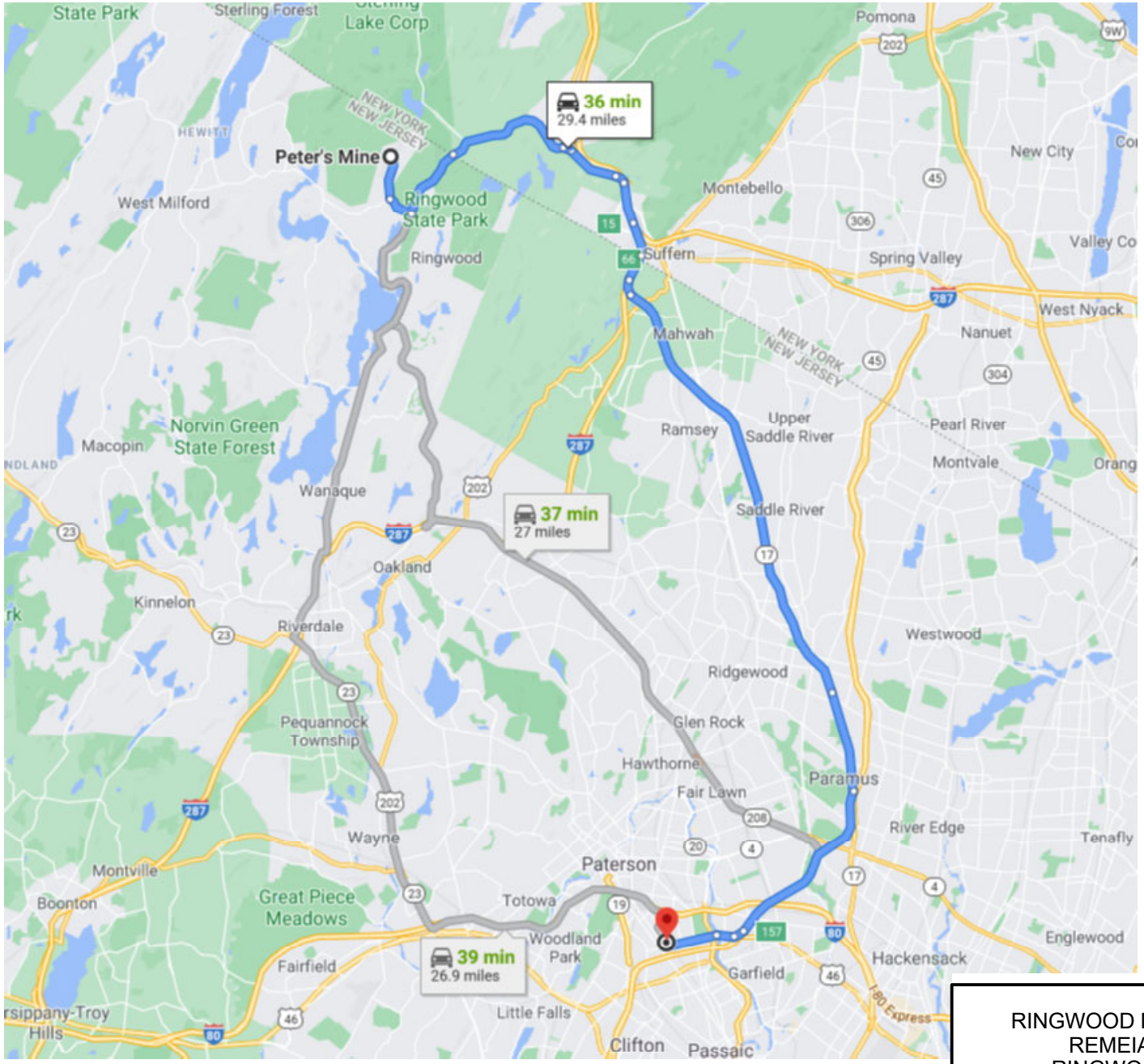
RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Chemical Waste Management
36964 ALabama Highway 17 North, Emelle, AL

Figure: 3-6

Date: 11/18/20



RECON®
Remedial Construction Services, L.P.

RINGWOOD MINE / LANDFILL SITE
REMEIATION PROJECT
RINGWOOD, NEW JERSEY

Route to Gaeta Recycling Facility
278 West Railway Ave Paterson, NJ

Figure: 3-7

Date: 11/18/20

Appendix I

TECHNICAL SPECIFICATIONS (PREPARED BY TETRA TECH)

Ringwood Mines/Landfill Superfund Site
Operable Unit Two Remedial Design
Technical Specifications
Ringwood, New Jersey

PREPARED FOR:
The Ford Motor Company

PREPARED BY:
CORNERSTONE ENGINEERING GROUP, LLC

cornerstone
A TETRA TECH COMPANY

100 CRYSTAL RUN ROAD, SUITE 101
MIDDLETOWN, NEW YORK 10941

February 2017
Revised October 2017
Revised August 2020

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01 60 00 Product Requirements
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46 01 00 Temporary Wastewater Treatment Equipment

SECTION 00 73 01 – Supplementary Conditions and Clarifications

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Supplementary Conditions and Clarifications of requirements of the Contract Documents to emphasize certain project aspects.

B. Be advised that the Contract Documents, as defined in the Invitation to Bid, are all equally binding on the performance of the work under the Contract regardless of the form of any individual document.

C. Immediately advise the Owner's Representative of any discrepancies or disagreements between the various Contract Documents, and obtain clarification from the Owner's Representative before proceeding with any work for which the requirements may not be completely clear.

1.2 THIRD PARTY COORDINATION

A. Coordinate with third parties solely through the Owner's Representative, **de maximis, inc**., unless otherwise directed by the Owner's Representative.

B. Be responsible for implementing the work in accordance with all of the requirements of the Consent Decree for Remedial Action for Operable Unit 2, Ringwood Mines/Landfill Superfund Site (Consent Decree). Before starting work, be responsible for preparing an approvable Remedial Action Work Plan per the requirements of the Consent Decree.

C. Contractor is reminded that the properties on which the work is to be performed are not owned by the Project Owner. The properties are owned by the Borough of Ringwood and the State of New Jersey.

D. Work on the property owned by the State of New Jersey shall be fully in conformance with the Right of Entry Agreement between the New Jersey Department of Environmental Protection, Division of Parks & Forestry and Ford Motor Company. Contractor is advised of the following requirements in Exhibit C to the Right of Entry Agreement:

1. Schedule a pre-construction inspection with Rosa Yoo of the NJDEP (Rosa.Yoo@dep.nj.gov).
2. Prohibition on sediment generating activities potentially impacting Ringwood Creek and the tributaries on Site during the period from March 15 through June 15 of any given year.
3. Perform an Endangered and Non-Game Species snake survey if there is any potential to disturb rock outcrops, rock ledges, or similar rock features.
4. Employ and deploy state-approved venomous snake monitors from April 1 through October 31 of any given year where work is being performed to check for the presence of reptiles and amphibians in the work area.

5. Install a silt fence/barrier to restrict movement of reptiles and amphibians into the work area, prior to the start of land disturbance.

E. Coordinate traffic controls and plans with the Borough of Ringwood, through the Owner's Representative, prior to the start of any work.

F. The Site is located adjacent to residential areas. As required by the approved Remedial Design, take all reasonable measures to minimize construction nuisances to residents.

G. Direct all employees to deal respectfully with residents but direct any and all questions to the Owner's Representative.

H. The work includes restoration and mitigation of riparian zones and extensive planting plans for this work. Prepare for approval by the New Jersey Department of Environmental Protection (NJDEP) a complete schedule of planting including plant sizes, quantities, species, spacing, herbivory protection, and watering. Obtain NJDEP approval to this schedule before the planting begins. Identify nurseries to supply plant materials and prepare the planting schedule as early in the project as possible but no later than 3 months after notice to proceed.

I. Plantings shall be warrantied for 12 months. Be responsible for planting, maintenance, and watering for an initial 12-month period following planting.

1.3 PERMIT EQUIVALENTS

A. Contractor shall be bound by all of the requirements of the permit equivalents issued by the NJDEP.

B. While Contractor is responsible for all permit equivalent requirements, contractor is specifically advised of the following requirements:

1. Prepare a manual for habitat best management practices prior to the start of construction.
2. Retain the services of a qualified wildlife biologist to help implement the plan and train all employees working at the Site.
3. Retain the services of herpetologist to inspect work areas for the presence of wood turtles or timber rattlesnakes, after installation of a perimeter silt/debris fence, and prior to the start of any land disturbance, and to help relocate wood turtles or timber rattlesnakes out of the work area, if any are found.
4. Clearing of trees 3 inches or greater in diameter at breast height is prohibited from April 1 to November 15 of any given year. Additional restrictions may apply starting on March 15 if vernal pools are observed or nests or breeding habitats are found in trees.

1.4 BOROUGH OF RINGWOOD RECYCLING CENTER

A. Be responsible for construction of the new Borough of Ringwood Recycling Center in the O'Connor Disposal Area (OCDA) on top of the completed remediation.

1. Completion of the remediation in accordance with the approved design shall provide for removal/relocation of waste in any area that may be subject to future disturbance for operation and maintenance of the Recycling Center.
2. Removal of the existing Borough of Ringwood Recycling Center may not commence for planting of the mitigation area until the new Recycling Center is fully functional.

1.5 FORD APPROVED DISPOSAL FACILITIES

A. Waste disposed of off-Site will be at the following Ford-approved disposal facilities only, subject to final approval of the USEPA as a part of the Remedial Action Work Plan:

Heritage Environmental	Mike Gullen	(313) 304-9516	mgullen@heritage-interactive.com
MPS Group	Harmony Jagger	(248) 318-4814	hjagger@mpsgrp.com
Clean Harbors	Darrell Poliquin	(734) 664-0767	Poliquin.Darrell@cleanharbours.com
Waste Management, Inc.	Josh Tregoning	(608) 576-7518	jtregoni@wm.com

1.6 MISCELLANEOUS

A. Ringwood Creek and the Site-related tributaries to Ringwood Creek form the headwaters to a portion of the Wanaque Reservoir potable water supply. Be advised that releases of any kind into surface waters or impacts of any kind on the surface waters are strictly prohibited. Protection of surface waters will be strictly enforced, up to and including a stop work order.

B. If Owner issues a stop work order due to inadequate environmental protection, Contractor shall have no right to standby compensation, loss of revenue or profit, or consequential damages associated with the stop work order, and Contractor will not be permitted to resume work until adequate environmental protection is restored.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 00 73 19 – Health and Safety Requirements

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Health and Safety Requirements for construction at the Ringwood Mines/Landfill Superfund Site. Requirements include training, personal protective equipment, and specific information to be included in a Contractor generated Health and Safety Plan. Additionally, this Section requires measures to be implemented for safe working conditions throughout construction.

1.2 SITE CONDITIONS

A. The Site is comprised of three areas: The Cannon Mine Pit (CMP), Peter's Mine Pit (PMP), and the O'Connor Disposal Area (OCDA).

B. Contractor is advised the soils and groundwater in the project area may be contaminated.

C. Owner takes no responsibility for the completeness or accuracy of the information provided regarding site conditions. Contractor is solely responsible for making its own determinations regarding site conditions and the health and safety of its employees.

1.3 CONTRACTOR RESPONSIBILITY, TRAINING, AND PPE REQUIREMENTS

A. Contracor is solely responsible for the health and safety of its employees.

B. During construction, be responsible for managing the site, controlling access, and checking credentials for visitors, per the Contractor's site-specific health and safety plan.

C. While on Site personnel are required to at a minimum don:

1. General work clothes.
2. Hard hat.
3. Safety glasses.
4. Steel toe boots.
5. Hi-visibility safety vests.

D. Other personal protective equipment (PPE) shall be as defined in the Contractor's site-specific health and safety plan.

E. Personnel working on Site must be Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-hour trained, and be current with 8-hour HAZWOPER refresher training, and have a current OSHA required medical clearance from a qualified health care provider, as applicable.

F. Supervisory personnel shall have completed the 8-hour HAZWOPER Supervisor Training.

G. Requirements for 40-hour training may be modified per the provisions of OSHA 1910-120 for non-intrusive activities.

1.4 SUBMITTALS

A. Provide a Health and Safety Plan (HASP) which establishes policies and procedures to protect workers and the public from the potential hazards posed by the work. The HASP must be prepared and submitted to the Owner's Representative before site activities proceed. Owner's Representative will review the submitted plan and indicate only whether Contractor may proceed.

B. The Health and Safety Plan shall conform to all requirements under 29 CFR 1910.120, and 29 CFR 1926. At a minimum the plan shall:

1. Name key personnel and alternates responsible for site safety.
2. Describe risks associated with each operation conducted.
3. Confirm that personnel are adequately trained to perform their job responsibilities and to handle the specific hazardous situations they may encounter.
4. Include provisions for daily safety meetings.
5. Describe the protective clothing and equipment to be worn by personnel during various site operations.
6. Describe any site-specific medical surveillance requirements.
7. Describe the program for periodic air monitoring, personnel monitoring, and environmental sampling (if needed).
8. Describe the actions to be taken to mitigate existing hazards to make the work environment less hazardous.
9. Define site control measures, visitor logs, exclusion zones, etc., and include a site map.
10. Define means to monitor and protect the surrounding community, including both an encompassing workspace and community air monitoring program. Air monitoning program should include thresholds for respirator requirements and stopwork conditions.
11. Establish decontamination procedures for personnel and equipment.
12. Set forth the site's Standard Operating Procedures for Health and Safety.
13. Include a site-specific contingency plan for site emergencies.

C. Documentation of medical monitoring.

D. Documentation of personnel training.

E. Documentation of personnel respirator qualification and fit testing, if respirators are in use or are planned for use.

F. During Construction:

1. Maintain required forms and OSHA records on site as applicable.
2. Maintain a site chemical inventory and index of Safety Data Sheets for the chemical or products present on site.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

A. Implement health and safety procedures in accordance with the accepted site-specific Health and Safety Plan and all relevant regulations.

B. Control site access at all times, including access through all open gates during working hours.

C. Implement health and safety monitoring in accordance with the Health and Safety Plan, and provide monitoring results to the Owner's Representative on a regular basis; maximum of one week intervals.

D. Update Health and Safety Plan as needed as the work progresses, and advise the Owner's Representative of any changes.

E. Prepare Job Safety Analyses (JSAs) for all activities to be performed for the completion of the Work. Maintain JSAs on site.

F. Update JSAs as necessary during the course of the work.

G. Coordinate with the Owner's Representative in the event of questions regarding protection of community or emergency situations.

H. In the event of an emergency or release execute all reporting responsibilities in accordance with the requirements of the Health and Safety Plan.

I. Prepare incident reports for any occurrences resulting in injury or property damage and for any occurrences deemed to be near misses. Incident reports shall be provided to the owner for review within 24 hours of the occurrence.

END OF SECTION

SECTION 01 11 00 – Summary of Work

PART 1 - GENERAL

1.1 PROJECT LOCATIONS AND ACCESS

A. Project Location:

1. The Site (also referred to as Project Site) is Operable Unit No. 2 of the Ringwood Mines/Landfill Superfund Site located in the Borough of Ringwood, New Jersey.

1.2 SCOPE OF WORK

A. General:

1. The Work consists primarily of closure of three land areas of concern (AoCs) known as Cannon Mine Pit (CMP), Peter's Mine Pit (PMP), and O'Connor Disposal Area (OCDA), all former landfills. The project includes excavation, fill, grading, on-site material re-use, off-site disposal, and construction of engineered caps. Work also includes construction of associated stormwater controls and preparation for and construction of a new recycling center to be built on the OCDA area. The work is more fully detailed in the Remedial Design Drawings (Drawings) and these Technical Specifications (Specifications) and is outlined further below.

B. Principal Features include:

1. Pre-mobilization documentation:

    a. Remedial Action Work Plan including Independent Quality Assurance Team, Health and Safety Plan, Emergency Response Plan, Field Sampling Plan, Quality Assurance Project Plan, Construction Quality Assurance/Quality Control Plan, Transportation and Disposal Plan.
    b. Site access and layout plans.
    c. Utilities survey.
    d. Habitat Best Management Practices Plan.
    e. Baseline project schedule.
    f. Baseline site conditions survey.

2. Submittals for materials and equipment ongoing, and prior to use in the project.
3. Mobilization and demobilization of equipment, labor, and construction of temporary facilities.
4. Clearing and grubbing in the areas of work.
5. Installation of effective sediment and erosion controls.
6. Excavation as indicated on the drawings to remove or consolidate fill/waste materials.
7. Dewatering and water treatment during construction operations.

8. Moving and stockpiling of excavated material, segregating according to material type.
9. Containment, characterization and re-use, or off-site disposal, of excavated soil, fill and waste.
10. Segregation and containment of paint waste, and characterization and off-site disposal.
11. Backfilling and filling of excavated areas, including compaction, and rough and final grading.
12. Installation of an engineered cap, consisting of a non-woven geotextile and 2 feet of clean fill material.
13. Full restoration of local roadway areas disturbed during construction, including but not limited to pavement, curbing, and striping.
14. Abandonment, decommissioning and relocation of groundwater monitoring wells and landfill gas monitoring wells.
15. Installation of institutional controls including permanent fencing surrounding the specified AoCs.
16. Topsoil, seeding, and site restoration, riparian zone and wetland restoration, and maintenance on all plantings.
17. Surveying/Record Documentation.
18. Implementation of dust and vibration control/monitoring measures during intrusive work activities.
19. Preparation of all submittals associated with work activities and materials.
20. Establishment and maintenance of work area Exclusion Zones as required.
21. Procurement of imported materials that meet contract and permit specifications.
22. Snow/ice removal, maintenance of site roadways and work areas during the winter months.
23. Installation, maintenance and repair of traffic control measures as required, both on and off site.

C. The above description of the Work is for general information and contractor orientation only and does not limit the responsibility to accomplish the Work in strict conformance with the Contract Documents.

D. Environmental Observations:

1. The Work shall be performed in strict conformance with the applicable requirements of the federal, state, and local agencies having jurisdiction, and in accordance with the requirements of the Contract Documents.

E. The Work includes all items shown on the Drawings and specified in the Specifications as well as all ancillary, appurtenant, or miscellaneous items reasonably inferred to be included for a complete project, whether specifically called out or not. There will be no entitlement to additional compensation for such reasonably inferred project components.

1.3 EXISTING SITE CONDITIONS

A. Be advised that construction of this project is at former landfills and entails working in, on and adjacent to buried solid wastes and contaminated soils. The Site is also a former mine and working at the site entails working in, on and adjacent to mine tailings and former mine structures.

B. Available project information is attached to these specifications to provide information on Site conditions, wastes, mine tailings, and contaminated soils and other materials. This information is provided for the Contractor's benefit. The Owner makes no warranties, expressed or implied, regarding the completeness or accuracy of the available project information. The Contractor is solely responsible to perform prudent and responsible actions to assure the health and safety of Contractor's employees, subcontractors, and visitors during the performance of this project.

1.4 DRAWINGS

A. Where "as shown," "as detailed," "as noted," or words of like meaning are used in these specifications, it shall be understood that reference is being made to the Drawings included in the Contract Documents unless otherwise specified.

1.5 CODES AND STANDARDS

A. All work to be done and materials and equipment transported, handled, stored or installed shall be done in strict conformance with the applicable orders, rules and regulations of the United States Government, the State of New Jersey, and with all other County, City, or District requirements. Nothing contained in these Specifications or shown or noted on the Drawings shall be construed to permit work not conforming to these orders, rules and regulations.

B. When Drawings or Specifications call for material or construction of a better quality or larger size or capacity than may be required by applicable codes or standards, the provisions of the Drawings and Specifications shall take precedence over the requirements of the code or standard. If there is any other conflict between the Construction Plans or Specifications and the requirements of applicable codes and standards, the more stringent provisions shall govern.

1.6 MANUFACTURERS' SPECIFICATIONS AND INSTRUCTIONS

A. Unless otherwise indicated or specified, all manufactured materials, products, processes, equipment, or the like shall be installed or applied in accordance with the manufacturers' instructions, directions, or specifications. Said installation or application shall be in accordance with printed instructions furnished by the manufacturer of the material or equipment concerned for use under conditions similar to those at the job site.

B. Any deviation from the manufacturers' printed recommendations shall be explained and acknowledged as correct for the circumstances, in writing by the particular manufacturer. The Contractor will be held responsible for all installations not conforming to the manufacturers' recommendations. If any item of material or equipment is installed not in accordance with a manufacturer's recommendations, the Contractor shall make all changes necessary to achieve such compliance, at its sole cost.

C. Upon delivery, complete a Receiving and Inspection Report for all materials, products, etc. brought to the site, confirming compliance with specifications.

1.7 WORK QUALITY

A. Perform shop and field work by mechanics and workers skilled and experienced in the fabrication and installation of the work feature involved. Perform all Work under this Contract in accordance with the standard practices of the various trades involved and in accordance with the Drawings, shop drawings, and these Specifications.

B. All Work shall be erected and installed plumb, level, square and true, or true to indicated angle, and in proper alignment and relationship to the work of other trades. All finished Work shall be free from defects and damage.

C. The Owner reserves the right to reject any materials and work quality which are not considered to be up to the general standards of the various trades involved. Such inferior material or work quality shall be repaired or replaced, as directed, at no additional cost to the Owner.

1.8 FIELD MEASUREMENT AND TEMPLATES

A. Secure all field measurements required for proper and accurate fabrication and installation of the Work included in this Contract. Exact measurements are the Contractor's responsibility. Furnish or obtain all templates, patterns, and setting instructions required for the installation of all Work. Verify all dimensions in the field.

1.9 TESTING LABORATORY

A. Procure the services of an independent testing laboratory(ies) as necessary to meet all of the requirements for testing of the Work to verify it has been properly completed, as shown on the Drawings or provided for in these specifications.

B. Provide the name(s) of independent testing laboratory to the Owner’s Representative prior to the start of construction. The Owner reserves the right to accept or reject a testing laboratory with or without cause, and will notify the Contractor if a laboratory is not acceptable.

C. Any analytical laboratory used for the project must be approved by the Owner, must be within the Owner’s system, and must have data validated by the Owner’s approved data validation provider (currently Cadena).

D. Each laboratory must hold valid certificates or registrations for performing the required testing.

E. Owner may elect to separately retain the services of a testing laboratory as a quality assurance measure. Cooperate in all respects with the Owner’s Representative in the collection of samples for testing, providing assistance in obtaining samples and access to materials as required.

1.10 PERMITS AND LICENSES

A. Except as enumerated in this Section, have or obtain all necessary licenses, registrations, permits, or approvals necessary to complete the Work, and assure that all Subcontractors have the same. Employ a Permit Manager with experience in obtaining and assuring all documentation necessary to complete the Work. Submit the qualifications of the Permit Manager along with a description of the planned process for permit management prior to the commencement of the Work.

B. Should Contractor be levied any fines, penalties, or other costs for any incomplete or missing license(s) to properly complete the work, Contractor shall be solely responsible for addressing and rectifying such fines, penalties, or costs. Be responsible for any costs incurred by the Owner due to missing or incomplete licenses which are the contractor's responsibility.

C. Owner will provide the following permit equivalents prior to the associated work:

1. Soil Erosion and Sediment Control Plan Certification (including construction stormwater approval from the NJDEP) from the Hudson-Essex-Passaic Soil Conservation District.
2. General Permit Nos. 5 and 11 per NJAC 7:7A-5.5 and 5.11 for wetlands work on a landfill.
3. Individual Flood Hazard Area permit equivalent for work in the riparian zone of Park Brook (adjacent to the PMP Area and OCDA).
4. A Highlands Act Applicability Determination for an exemption for remediation per NJAC 7:38-2.3(a)15.
5. A NJPDES Permit by Rule equivalent per NJAC 7:14A-7.5 for a dewatering discharge to groundwater.
6. Water Lowering for the PMP Area Pond, pursuant to NJAC 7:25-6.25.

1.11 OWNER'S REPRESENTATIVE

A. ***de maximis, inc.*** shall be the Owner's Representative for any and all contracting issues and shall be the party contracting with the Contractor on behalf of the Project Owner.

B. The Project Owner is Ford Motor Company, and has the ultimate decision making authority for the Work. The Project Owner is interchangeable with the term Owner in these Specifications, the Form of Agreement, and Contract Documents.

C. The Property Owners are the Borough of Ringwood and the State of New Jersey. Cooperate with Owner's Representative to keep the Property Owner's informed and to comply with any and all property access requirements. Communicate with Property Owner's through the Owner's Representative.

D. Owner's Representative shall have the following meanings as used in these Specifications:

1. Shall be the representative(s) of the Project Owner.

2. All of the following shall have the authority to act as the Owner's Representative, but shall coordinate through the primary Owner's Representative, ***de maximis, inc.***:
   a. Ford Motor Company Project Manager
   b. ***de maximis, inc.***
   c. Tetra Tech, Inc.

3. Where the term Engineer is used, it shall mean Tetra Tech, Inc.
4. Where the term Independent Quality Assurance Team is used, it shall mean the team assembled by the Engineer, and with no contractual relationship with Contractor.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 20 00 – Price and Payment Procedures

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Payment Schedule.
2. Application for Payment.
3. Change procedures.
4. Defect assessment.
5. Unit Prices
6. Alternates.

1.2 PAYMENT SCHEDULE (schedule of values)

A. Submit printed schedule of values, acceptable to the Owner, on Contractor's standard form or electronic media printout. Clearly show on payment schedule:

1. Each payment item.
2. Units for unit price items and provide backup documentation for quantities.
3. Percentage completion basis for lump sum items.
4. Allowance for testing and maintenance or warranty services.
5. Retainage.
6. Any other fees, taxes, or charges and date at which payment is due.

B. Submit Payment Schedule within 20 days after Form of Agreement is signed or no later than five days prior to mobilization.

C. Revise Payment Schedule as necessary to list approved Change Orders with each Application for Payment.

1.3 APPLICATION FOR PAYMENT

A. Submit three copies of each Application for Payment.

B. Content and Format:

1. Use Schedule of Values for listing items in Application for Payment, and clearly indicate associated item(s) for which payment is requested.

C. Submit updated schedule with each Application for Payment.

D. Payment Period:

1. Submit as indicated in Payment Schedule.

1.4 CHANGE PROCEDURES

A. Submittals:

1. Contractor/Equipment Supplier shall provide a Notice of Change including a detailed description of proposed change, basis for the change, with supplementary or revised Specifications, a change in Delivery Time, if necessary, and with the period of time during which the requested price will be considered valid. Prepare and submit estimate within seven days of Notice of Change.

B. Change Order:

1. Based on Notice of Change and Contractor's fixed price or unit price quotation as approved by the Owner’s Representative.

C. Document each quotation for change in Project Cost or Time with sufficient data for the Owner’s Representative to allow evaluation of quotation.

D. Change Order Forms:

1. Submit on form acceptable to Owner’s Representative.

E. Execution of Change Orders:

1. Owner’s Representative will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

F. Correlation of Contractor Submittals:

1. Promptly revise Payment Schedule and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum.
2. Promptly revise Delivery Schedule to reflect change in Time.

1.5 DEFECT ASSESSMENT

A. Replace any defective material, component, part, or appurtenance, or portions thereof, not conforming to specified requirements.

B. If, in the opinion of Owner’s Representative, it is not practical to remove and replace the defective material, component, part, or appurtenance, and the defective material, component, part, or appurtenance does not affect the performance of the Work, Owner’s Representative will direct appropriate remedy or adjust payment.

C. If the defective material, component, part, or appurtenance remains, stipulated sum will be adjusted at discretion of Owner.

D. Authority of Owner's Representative to assess defects and identify payment adjustments is final.

1.6 UNIT PRICES

A. Take measurements and compute quantities. Owner's Representative will verify measurements and quantities.

B. Unit Quantities:

1. Quantities and measurements indicated on Bid Form are for Contract purposes only. Actual quantities provided shall determine payment.
2. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.
3. When actual Work requires greater than 25% change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

C. Payment Includes:

1. Full compensation for required labor, materials, products, tools, equipment, plant and facilities, transportation, services and incidentals, erection, application, or installation of item of the Work, overhead and profit.

D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Owner's Representative multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

E. Measurement of Quantities:

1. All measurement of quantities are in place.
2. Weigh Scales: Inspected, tested, and certified by applicable State weights and measures department within past year.
3. Platform or Portable Scales: Of sufficient size and capacity to accommodate conveying vehicle, calibrated and certified.
4. Metering Devices: Inspected, tested, and certified by applicable State department within past year.
5. Measurement by Weight: From scale measurements and weight tickets.
6. Measurement by Volume: Measured by cubic dimension using mean length, width, and height or thickness or by survey certified by a licensed NJ land surveyor and comparison of surfaces generated from survey. Cubic dimension measurements shall only be used with the approval of the Owner's Representative. All volume measurements shall otherwise be by certified survey.
7. Measurement by Area: Measured by square dimension using mean length and width or radius or by survey certified by a licensed NJ land surveyor of actual completed area of work. Area dimension measurements shall only be used with the approval of the Owner's Representative. All area measurements shall otherwise be by certified survey.

8. Linear Measurement: Measured by linear dimension, at item centerline or mean chord, or by survey certified by a licensed NJ land surveyor. Linear dimension measurements shall only be used with the approval of the Owner's Representative. All linear measurements shall otherwise be by certified survey.

1.7 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's sole option. Accepted Alternates will be identified in the final Form of Agreement. The Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.

B. Coordinate related Work and modify surrounding Work:

1. Coordinate related requirements among Specification Sections as required.
2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 QUANTITIES

A. Submit weight, measurements, survey, and/or other suitable documentation with Application for Payment to verify number of units requested for payment in each Application for Payment. Insufficient documentation will be cause for rejection of Application for Payment.

B. For Lump Sum items, percent completion shall correspond to actual status of completion. Excessive percent completion estimates that do not correspond to actual status of the work will be cause for rejection of Application for Payment.

C. Quantities shall correspond to Contractor's schedule and schedule of values.

3.2 APPLICATION FOR PAYMENT

A. Submit monthly at the same time each month, and not later than the 15th day of the month following the month corresponding to the Application for Payment.

B. Each Application for Payment following the initial Application for Payment shall be consistent with the previous applications.

C. Submit with Waiver of Lien on form prescribed in the Form of Agreement or approved by the Owner's Representative.

D. At Substantial Completion provide all necessary final record documentation supporting that work is 100% complete. Submit final Application for Payment only after completion of all project closeout requirements.

E. Application signed by an Authorized Representative attesting to the accuracy of the application.

END OF SECTION

SECTION 01 25 00 – Substitution Procedures

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quality assurance.
2. Product options.
3. Product substitution procedures.

1.2 QUALITY ASSURANCE

A. Contract is based on products and standards established in Drawings and Technical Specifications (Contract Documents) without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals:

1. Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by the Owner's Representative.

1.3 PRODUCT OPTIONS

A. See Section 01 60 00.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Owner's Representative will consider requests for substitutions only within 30 days after date of Owner-Contractor Agreement established in Notice to Proceed, unless otherwise agreed to in writing.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor. Otherwise substitutions will be assumed to offer a quality, availability, warranty, or cost advantage, and should be so noted in documentation.

C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:

1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
3. Reference to Article and Paragraph numbers in Specification Section or Drawing.
4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
5. Changes required in other Work.
6. Availability of maintenance service and source of replacement parts as applicable.
7. Certified test data, as applicable, to show compliance with performance characteristics specified.
8. Samples when applicable or requested.
9. Other information as necessary to assist in evaluations by Owner’s Representative.

D. A request constitutes a representation that Bidder:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same or better warranties for substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit requests for substitutions on form acceptable to Owner.
2. Submit electronic files via electronic mail to Owner’s Representative for each Request for Substitution for consideration. Limit each request to one proposed substitution.
3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
4. Owner’s Representative will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 30 00 – Administrative Requirements

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Coordination and Project conditions.
2. Definitions.
3. Field Engineering.
4. Site Mobilization/Preconstruction meeting.
5. Progress meetings.
6. Pre-installation meetings.
7. Closeout meeting.
8. Alteration procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Verify that utility requirements, if any, are compatible with utilities available at the site. Verify all utility requirements and availability prior to mobilization, project setup, or start of work.

B. Coordinate Work of various Sections having interdependent responsibilities for future installation, maintenance and other activities associated with the proposed Work.

C. Coordinate space requirements for support and staging areas, access controls, site access, vehicle queueing

D. Submit construction schedules for major work elements for approval by the Owner's Representative, including major excavation, fill, and construction milestones. Submit initial schedule at preconstruction meeting and at least biweekly thereafter. Identify all important milestones and critical path items in each schedule submittal.

1.3 DEFINITIONS

A. As used in these specifications:

1. Contract – the Agreement executed between the Owner and Contractor providing the terms and conditions for execution of the Work.
2. Contract Documents – these specifications, the Drawings, and the Agreement, and any other items called out in these specifications as Contract Documents.
3. Contractor – the entity entering into an Agreement with Ford Motor Company to provide the equipment and services specified in the Contract Documents. Contractor may be the Bidder or another duly authorized entity taking responsibility for execution of the Contract.

4. Engineer – A professional engineer duly authorized to practice engineering in the State of New Jersey and designated by Ford Motor Company to provide engineering services related to the Project.
5. Owner's Representative – entity representing interests of Owner, employed either by Owner, Engineer, or any other duly authorized entity.
6. Owner – Ford Motor Company.

1.4 FIELD ENGINEERING

A. Employ Land Surveyor registered in State of New Jersey.

B. Locate and protect survey control and reference points. Promptly notify Owner's Representative of discrepancies discovered.

C. Control datum for survey is that shown on Drawings.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit copies of site drawings, as necessary, signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

G. Maintain complete and accurate log of control and survey work as Work progresses.

H. Install, maintain, and relocate as necessary GPS base stations, as needed to complete the work.

1.5 SITE MOBILIZATION/PRECONSTRUCTION MEETING

A. Owner's Representative will schedule and preside over meeting after Notice of Award.

B. Attendance Required:

1. Owner's Representative, Owner, Contractor, and major Subcontractors.

C. Regulatory agencies may participate in the site mobilization/preconstruction meeting and Contractor and Subcontractors shall work with Owner's Representative to find a mutually acceptable date and time for the meeting.

D. Minimum Agenda:

1. Designation of personnel representing parties in Contract.
2. Procedures and processing of field decisions, submittals, substitutions, applications for payment, proposal requests, Change Orders, and Contract closeout procedures.
3. Use of premises by Owner and Contractor.
4. Owner's requirements.

5. Health and safety.
6. Work restrictions.
7. Construction facilities and controls provided by Owner.
8. Temporary utilities.
9. Site layout.
10. Security and housekeeping procedures.
11. Schedules.
12. Progress meeting schedule.
13. Application for payment procedures.
14. Procedures for testing.
15. Quality Control/Quality Assurance.
16. Procedures for maintaining record documents.
17. Requirements for inspections and acceptance of work.
18. Daily/weekly Contractor reporting requirements, including photo documentation.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to meeting Attendees.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at weekly intervals, unless otherwise approved by the Owner's Representative.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Contractor superintendent, Contractor project manager, major subcontractors and suppliers, Owner's Representative, and others as appropriate to agenda topics for each meeting.

D. Minimum Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittal schedule and status of submittals.
6. Review of material or equipment delivery schedules.
7. Maintenance of Progress Schedule including 3-week look ahead (biweekly distribution at minimum).
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Health and safety.
14. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to meeting Attendees.

1.7 PREINSTALLATION MEETINGS

A. If required in individual specification sections, or as otherwise may be necessary for major construction phases, convene pre-installation meetings at Project site prior to commencing such Work.

B. Require attendance of parties directly affecting, or affected by Work of specific section.

C. Notify Owner's Representative four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of construction procedures.
2. Review coordination with related Work.

E. Record minutes and distribute copies within two days after meeting to participants.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 ALTERING OF PROPOSED WORK

A. Revisions to submittals (e.g., work plans) will not be considered for change orders related to documentation if the Client and/or Client Representative is not satisfied with the work product.

B. Submit written request in advance of altering elements affecting:

1. Dimensions of proposed Work (i.e., excavation depth, final grading).
2. Efficiency, maintenance, or any other elements of final work product.
3. Work of Owner or separate contractor.

C. Execute cutting, fitting, and altering, including excavation and fill, to complete Work, and to:

1. Fit the several work elements together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and non-conforming Work.

D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

E. Remove debris and abandoned items from area.

F. Remove unsuitable material and replace material as specified for finish Work.

G. Execute Work by methods to avoid damage to other work.

H. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

I. Identify hazardous substances or conditions exposed during the Work to Owner's Representative for decision or remedy.

J. Finish surfaces as specified in individual Specification Sections.

END OF SECTION

SECTION 01 33 00 – Submittal Procedures

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal procedures.
2. Construction progress schedules.
3. Proposed product list.
4. Product data.
5. Use of electronic CAD files of Project Drawings.
6. Shop Drawings.
7. Test reports.
8. Certificates.
9. Manufacturer's instructions.
10. Manufacturer's field reports.
11. Contractor review.
12. Construction photographs.

1.2 SUBMITTAL PROCEDURES

A. Prepare a complete submittal for all equipment and material to be installed or utilized prior to ordering, fabrication, and/or delivery. Returns, repairs, modifications, or other work resulting from an incomplete or inaccurate submittal are the sole responsibility of the Contractor, and shall be completed at no additional cost to the Owner.

B. Coordinate all elements related to each submittal and prepare complete, accurate, and detailed shop drawings to show inter-relationship of the various components of the work. Be solely responsible for integrating the components of the work during construction. An incomplete submittal or shop drawing shall not be cause for a change in the scope of work or an increase in costs.

C. Include details and dimensions in submittals as necessary to properly evaluate products, materials, and installation. Graphic submittals without details or dimensions will be returned without review.

D. Transmit each submittal with form acceptable to the Owner’s Representative.

E. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

F. Identify:

1. Project, Contractor, manufacturer or supplier, and Specification Section number or Drawing appropriate to submittal.

G. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, and coordination of information is according to requirements of the Work and Contract Documents.

H. Schedule submittals to meet Schedule submitted with Bid, and deliver to Owner's Representative. Coordinate submission of related items.

I. For each submittal for review, allow 10 business days excluding delivery time to and from Contractor. The need for expedited submittals shall be communicated and agreed to in advance with the Owner's Representative.

J. Identify variations in Contract Documents and product or system limitations, especially which may be detrimental to successful performance of completed Work.

K. Allow space on submittals for Contractor and Owner's Representative review stamps.

L. When revised for resubmission, identify changes made since previous submission.

M. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

N. Incomplete Submittals:

1. Will not be reviewed. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of the Owner or Owner's Representative.

O. Submit all receiving and inspection reports as materials and equipment are received, checked for compliance, and readied for use in the project. All receiving and inspection reports should be submitted before any materials or equipment are incorporated into the work.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial Schedule within 20 days after date of Owner-Contractor Agreement and prior to preconstruction meeting. After review, submit detailed schedules no less than biweekly, modified to accommodate revisions recommended by Owner's Representative.

B. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other parties as directed by the Owner's Representative.

C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

D. Submit computer generated gant chart with separate line for each major portion of Work or operation, identifying first workday of each week.

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float times, critical path items, and duration, as applicable.

F. Indicate estimated percentage of completion for each item of Work at each submission.

G. Revisions to Schedules:

1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule.
4. Report corrective action taken, or proposed, and its effect.

1.4 CONSTRUCTION COST PROJECTIONS

A. Submit detailed project cost projections no less than monthly, including actual costs for completed months as well as projected costs for upcoming months. Track costs on a task level with additional costs for tasks out of scope.

B. Distribute copies of the reviewed cost projections to the Project site file and other parties as directed by the Owner's Representative.

C. Instruct recipients to promptly report, in writing, problems anticipated by the cost projection.

1.5 PRODUCT LIST

A. Within 30 days after date of Owner-Contractor Agreement, submit list of agreed upon equipment and materials including any substitutions, for confirmation. Include name of manufacturer, trade name, and model number, as applicable, of each piece of equipment or materials.

1.6 PRODUCT DATA

A. Product Data:

1. Submit to Owner's Representative for review for assessing conformance with information given and design requirements expressed in Contract Documents.

B. Include complete product information to cover each requirement in the specifications.

C. Submit electronic submittals via email as PDF electronic files.

D. Mark each submittal to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

E. After review, distribute according to "Submittal Procedures".

1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings:

1. May only be used to expedite production of Shop Drawings or other Submittals for the Project. Use for other Projects or purposes is not allowed.

B. Distributed only under the following conditions:

1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-constructed conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be returned.
4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.8 SHOP DRAWINGS

A. Shop Drawings:

1. Submit to Engineer for assessing conformance with information given and design requirements expressed in Contract Documents.

B. Indicate special requirements, if any (e.g., utilities, interdependencies, etc.).

C. When required by individual Specification Sections or Drawings, provide Shop Drawings signed and sealed by a Professional Engineer responsible for designing components shown on Shop Drawings.

D. Include signed and sealed calculations to support design.

E. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

F. Make revisions and provide additional information when required by authorities having jurisdiction.

G. Submit electronic submittals via email as PDF electronic files.

H. After review, produce copies and distribute in accordance with “Submittal Procedures” article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.9 TEST REPORTS

A. Submit reports to Owner’s Representative.

B. Submit test reports for information for assessing conformance with information given and design requirements expressed in Contract Documents.

C. Tests shall be performed and certified by independent laboratories, as applicable (e.g., clean fill analytical data).

1.10 CERTIFICATES

A. Submit certification by manufacturer, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to, or exceeds, specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Owner’s Representative.

1.11 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturer's installation, operation, and maintenance instructions, all as applicable.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, finishing, operation, and maintenance to Owner’s Representative for delivery to Owner. Submit electronically unless otherwise approved in writing by the Owner.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports to Owner’s Representative, if applicable.

B. Submit report within 30 days of observation to Owner’s Representative for information.

C. Submit reports for information for assessing conformance with information given and design requirements expressed in Contract Documents.

1.13 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Owner's Representative.

B. Contractor: Responsible for:

1. Determination and verification of materials.
2. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
3. Determination of accuracy and completeness of dimensions and materials of construction.
4. Confirmation and coordination of dimensions to meet field installation requirements (see Available Information).
5. Stamp, sign, or initial and date each submittal to certify compliance with requirements of Contract Documents.

C. Do not fabricate, deliver, purchase, or otherwise take action on products for which submittals are required until approved submittals have been received from Owner's Representative. Any action taken prior to submittal approval is solely at Contractor's risk, and any additional costs resulting from such action shall be borne solely by the Contractor.

1.14 CONSTRUCTION PHOTOGRAPHS

A. Provide digital photographs of site and construction throughout progress of Work to Owner's Representative.

B. Each month submit electronic copies of date/time stamped photographs on a compact disc (CD) or via acceptable alternative delivery method, with Application for Payment, progress reports, or schedule updates.

C. Take a minimum of 10 photographs per week, or as required to cover each key aspect of the Work, indicating relative progress of work, in representative locations.

D. Deliver a complete copy of electronic photographs to Owner's Representative with project record documents. Catalog and index files in chronological sequence; include typed table of contents.

PART 2 - PRODUCTS

2.1 Submittal list and processing log.

2.2 Submittals shall include, but not necessarily be limited to the following:

Specification	Submittal(s)
00 73 19	Health and Safety Plan and Supporting Documents
01 50 00	Site Layout Plan
01 70 00	Record Drawings at Closeout
01 70 00	Warranties
01 81 13	Sustainable Materials Plan
02 60 00	Waste Disposal Handling, Transporters, Qualifications
02 86 00	Paint Waste and Drum Plan
31 05 19	Geosynthetics, Qualifications
31 10 00	Site Clearing & Handling Procedures
31 20 00	Soil Materials and Handling
31 20 00	Vibration Monitoring Plan
31 20 00	Earthwork Record Drawings
31 23 19	Dewatering Shop Drawings/Plan
31 37 00	Rip-Rap
31 50 00	Excavation Support
32 12 16	Asphalt and Aggregate
32 15 40	Crushed Stone Paving
32 31 13	Fence and Gates
32 92 19	Seed, Plant Materials, Qualifications
33 24 13	Gas Monitoring Wells
33 29 00	Groundwater Monitoring Wells
33 42 11	Pipe
34 78 14	Portable Axle Scale
46 01 00	Water Treatment Plan

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 35 43 - Environmental protection

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for environmental protection of air, water, and land resources.

B. Furnish all labor, equipment, and materials required for environmental protection during and as the result of construction operations.

1.2 RELATED SECTIONS

A. Section 01 50 00 – Temporary Facilities and Controls

B. Section 31 10 00 – Site Clearing

C. Section 31 25 13 – Erosion and Sediment Controls

1.3 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal, State, and local laws and regulations concerning environmental protection, as well as the specific requirements stated in this Section and elsewhere in the Specifications and on the Drawings.

B. Implement soil erosion and sediment controls as required by these Specifications, shown on the Drawings, as described in Section 31 25 13 – Erosion and Sediment Controls, and per the Soil Erosion and Sediment Control Plan approved by the Hudson-Essex-Passaic Soil Conservation District.

C. Dispose or recycle construction debris in accordance with all applicable Federal, State and local regulations and requirements.

1.4 QUALITY ASSURANCE

A. Provide at least one person in responsible charge for this portion of the work, who shall be thoroughly familiar with the areas to be preserved (riparian zone, transition area, and wetlands), and means and methods of preservation. Said person shall direct the work performed under this section.

1.5 PRE-CONSTRUCTION SURVEY REPORT

A. Prior to start of construction activities, Contractor and Owner's Representative shall make a joint survey of the site and clearly demarcate areas to be preserved and sensitive receptor locations. Document the survey results in a daily report and in a markup of site plan(s) to be kept on Site.

B. Protect the existing conditions/features at the site during construction. Repair any damage to these existing conditions/features resulting from construction activities prior to completion of project, at no additional cost to the Owner.

1.6 NOTIFICATION

A. Owner's Representative will notify Contractor in writing of suspected noncompliance with Federal, State, or local environmental laws, regulations or permits.

B. Upon notification, inform Owner's Representative of the proposed corrective action and take such action, if appropriate.

C. Owner's Representative may issue a stop work order for all or any part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any suspensions.

PART 2 - PRODUCTS

2.1 GENERAL

A. All material shall be in accordance with Contractor's plan for environmental protection.

2.2 MATERIALS

A. Red or fluorescent pink vinyl flagging.

B. Fencing, 48" tall, high density polyethylene (HDPE) with nominal mesh opening size of 1.25" x 1.25", orange, and mounted on metal T posts, minimum 72" in length, or approved equal.

PART 3 - EXECUTION

3.1 PROTECTION OF LAND RESOURCES

A. Land resources outside the limits of work shall be preserved in their current condition. Disturbance of riparian zone, wetlands, or transition areas not within the limits of work is strictly prohibited. Restore to pre-construction conditions or better after completion of project any area designated for preservation, at no additional cost to the Owner. Be responsible for any penalties or fines issued because of inappropriate disturbance of protected areas.

B. Demarcate limits of wetlands and transition areas to be protected, using flagging, fencing, sediment barriers, or other approved means, in accordance with the requirements of the Drawings and Specifications.

C. Confine construction activities to areas defined in the Contract Documents unless specific written approval is granted in advance by the Owner's Representative.

D. Do not allow discharge of contaminants into any riparian zone, wetlands, transition area, or water body. Any temporary control measures shall be removed after the area has been stabilized and work has been completed.

E. Limits of work include areas for storage of construction equipment and material, and shall be cleared in a manner which will not negatively affect the environment during or after the construction period. Do not enter beyond the limits of the working area except with the prior written approval of the Owner's Representative.

F. Location of storage of equipment and materials for the performance of the work shall be limited to staging areas identified prior to the start of the Work.

G. Remove all temporary construction facilities and unused materials and equipment from the work site prior to final payment. Disturbed storage areas shall be graded, filled, and or otherwise restored to original conditions or stabilized per the approved Soil Erosion and Sediment Control Plan.

3.2 PROTECTION OF WATER RESOURCES

A. Do not pollute streams, lakes, or reservoirs with fuels, oils, or other harmful materials. Be responsible to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers, streams and impounded water. Perform all work in such a manner that objectionable conditions will not be created in streams through, or bodies of water adjacent to, the project area.

B. Surface drainage from cuts and fills within the construction limit, whether or not completed, shall be graded to control erosion within acceptable limits.

C. Take measures to prevent chemicals, fuels, oils, grease, waste washings, and other harmful materials from entering public waters. Should any spillage into public waters occur, immediately notify the proper authorities. Be responsible for any and all work and cost associated with the cleanup of spillages.

D. Disposal of any materials, wastes, trash, garbage, oil, grease, chemical, etc., in areas adjacent to streams or other waterways is strictly prohibited. If any such material is dumped in an unauthorized area, remove the material and restore the area to its original condition. If necessary, contaminated soils and vegetation shall be excavated, disposed of and replaced with suitable fill material, compacted and finished with topsoil and vegetation, all at the expense of the Contractor.

3.3 PROTECTION OF FISH AND WILDLIFE

A. Prevent any interference or disturbance to fish and wildlife. Do not alter water flows or otherwise disturb native habitat adjacent to the project area in waterways or in areas that are to remain undisturbed.

B. Fouling or polluting of water or wildlife habitat will not be permitted. Wash waters and wastes shall be processed, filtered, ponded, or otherwise treated prior to their release under a permit equivalent for water management for dewatering. Discharges into streams or other waterways is strictly prohibited. Should polluting or fouling of any watercourse occur, immediately notify the proper authorities. Be responsible for any and all work and costs associated with the cleanup of polluted or fouled waters.

C. The project area contains habitat for, and potentially, species that are state threatened, endangered, or special concern including marbled salamander, bald eagle, barred owl, cerulean warbler, cooper's hawk, great blue heron, red-shouldered hawk, veery, wood thrush, bobcat, eastern box turtle, timber rattlesnake, wood turtle, blue headed vireo, broad winged hawk, golden winged warbler, hooded warbler, northern goshawk, whip-poor-wil, worm eating warbler, arrowhead spiketail, brush tipped emerald, sable clubtail, northern copperhead.

D. Prepare a Habitat Best Management Practices Manual prior to the start of construction. Maintain Manual in the active work area for reference, if needed. The Manual shall contain:

1. A photograph of each state threatened, endangered, or special concern species.
2. A description and/or photograph of the conditions under which such species would most likely be found (e.g., den, nest, etc).
3. A description of procedures to follow should a state threatened, endangered, or special concern species be encountered.
4. Contact information for a wildlife biologist that may assist with procedures to deal with a state threatened, endangered, or special concern species if encountered.

E. Retain the services of a wildlife biologist to assist with the preparation of the Habitat Best Management Practices Manual, and be available as a resource if needed, as described above in D.4.

F. With the retained wildlife biologist, prepare and implement a Habitat Best Management Practices training session for workers at the Site. Such training shall describe the content and use of the Habitat Best Management Practices Manual and shall occur prior to the start of any disturbance. If new employees are brought to the Site, the training shall be repeated for such employees.

G. Contractor is advised that timing restrictions may apply as follows:

1. From March 15 to June 15, if a vernal pool is identified in the work area, and the area can remain undisturbed and still permit the project to proceed under the regulatory-approved schedule, construction within the vernal pool area shall be postponed. Obtain the prior, written approval of the Owner's Representative to disturb vernal pools within the March 15 to June 15 time period.
2. Tree clearing may be restricted during the time period from March 15 to June 30, if nests or other breeding habitat are found in trees at the time of the Work. Obtain the prior, written approval of the Owner's Representative to perform tree clearing within the March 15 to June 30 time period.
3. Activities in the 100-year flood plain of flood hazard area of Park Brook, which could introduce sediment into the stream or which could cause an increase in the natural level of turbidity of the stream are prohibited during the period between March 15 and June 15.

3.4 MAINTENANCE

A. Dispose of all debris and waste in a manner approved by the Owner's Representative. Toilet facilities shall be kept clean and sanitary at all times.

B. Remove materials no longer required on the site so that the site, access routes to the site, and any other areas disturbed by operations. Present a neat, orderly, workmanlike appearance.

C. Remove all surplus material and debris of every nature resulting from operations before final payment. Restore the site to a neat and orderly condition satisfactory to the Owner's Representative.

3.5 DUST CONTROL

A. Maintain all excavation, embankments, stockpiles, access roads, borrow areas, and all other work areas within the project boundaries free from dust which would cause a hazard or nuisance, or which would contribute to surface water contamination.

B. Approved temporary methods for dust control include the spraying of water and the removal of dried soil from land or roadway surfaces with self-loading motor sweepers or vacuum trucks. Repeat water spraying water at such intervals as to keep the disturbed areas dampened.

C. The use of additives is prohibited unless approved in writing by the Owner's Representative prior to application. Penetrating asphaltic materials, oils, or any other such materials are strictly prohibited.

D. Dust control is to be performed regularly as required to prevent nuisance or hazardous conditions.

E. Tarping of material stockpiles as required to prevent nuisance or hazardous conditions and prevent erosion.

3.6 NOISE AND VIBRATION CONTROL

A. Use every effort and means to minimize noise caused by operations. Provide working machinery equipped with adequate muffler systems. Be responsible for maintaining compliance with all applicable noise regulations and all State and local noise ordinances.

B. Limit construction activities to daytime hours, and orient equipment when in stationary mode, such that the noisiest components are oriented away from residential areas to the extent practicable.

C. Approval of the Owner's Representative is required along with all pertinent work permits for any evening or weekend work activities.

3.7 PROHIBITED CONSTRUCTION PROCEDURES

A. Disposal of any material in unauthorized areas, including but not limited to riparian zones, wetlands, transition areas, and stream corridors is strictly prohibited.

B. At a minimum, the following construction procedures are prohibited:

1. Dumping of spoil material into any stream corridor, wetland, surface water or unspecified location.
2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridor, wetland, or surface water.
3. Pumping of silt-laden waters from excavation into any natural surface waters, stream corridor, or wetland.
4. Damaging vegetation adjacent to, or outside of, the limit of work.
5. Disposal of trees, brush, and other debris in any stream corridor, wetland, surface water or unspecified locations.
6. Permanent or unspecified alteration of the flow line of any stream outside the limit of work shown on the Drawings.
7. Open burning of project debris.
8. Locating of storage/stockpile areas in environmentally sensitive area.

C. No vehicles, equipment, or material shall be stored, placed, deposited, etc. in protected areas, except as necessary to perform the work in such areas as shown on the Drawings or called for in these Specifications.

3.8 CLEAN-UP, REMOVAL, REPAIR AND RESTORATION

A. Clean up:

1. After work is complete, clean up any remaining materials, debris, trash, etc. Keep the protected area free from construction and other debris at all times.

B. Removal:

1. After all work has been completed remove any remaining flagging, fence, posts, ties and all other debris. Restore the ground to a condition similar to prior to work, or the condition of surrounding ground after work is complete.

C. Repair:

1. Repair any damage caused during completion of the work described in this Section.

D. Restoration:

1. Restore all areas disturbed during performance of the Work to match finished grade and finished surfaces as shown on the Drawings and as specified herein.

END OF SECTION

SECTION 01 50 00 – Temporary Facilities and Controls

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction Facilities:

a. Field offices and storage.
b. Vehicular access.
c. Parking.
d. Progress cleaning and waste removal.
e. Project identification.
f. Traffic regulation.
g. Fire-prevention.

2. Temporary Controls:

a. Fencing.
a. Security.
b. Dust control.
c. Erosion and sediment control.
d. Pollution control.

3. Removal of utilities, facilities, and controls.

1.2 FIELD OFFICES AND STORAGE

A. All structures and facilities are to be designed for year-round operation.

B. Designated existing spaces may be used for field offices and for storage and staging of materials and equipment. Coordinate with Owner in advance if planning to use existing spaces by submitting an overall site layout plan prior to start of the Work.

C. Engineer's Field Office:

1. Triumph Modular 12x60 with bath; (https://www.triumphmodular.com/wpcontent/uploads/2014/08/12x60_bath_plan.pdf), or equivalent. Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture including conference table approximately 10'x4', six (6) new folding chairs, and drawing display table. Provide four (4) desks with four (4) four filing cabinets, four (4) Staples Desk Chair (model 51463-cc), or equivalent, and four waste baskets. Provide all new Keurig K-cup coffee maker, microwave, and 3.2 cubic foot mini-fridge. Provide one potable water cooler/heater and one paper cup dispenser with cups. Replenish the supply of water, coffee/tea, and cups as required by Owner Representative. Place 2 desks, 2 filing cabinets, and 2 desk chairs in larger office. Place 1 desk, 1 filing cabinet, and 1 desk chair in smaller office. Arrange all remaining furniture in the conference area or as appropriate.

D. Construction Manager's Field Office:

1. Triumph Modular 10x44; (https://www.triumphmodular.com/wpcontent/uploads/2016/05/10x44_bath_plan.pdf) with bath, or equivalent. Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture including conference table approximately 8'x2.5', four (4) new folding chairs, and drawing display table. Provide two (2) desks, two (2) two filing cabinets, two waste baskets, and two (2) Staples Desk Chair (model 51463-cc), or equivalent. Provide all new Keurig K-cup coffee maker, microwave, and 3.2 cubic foot mini-fridge. Provide one potable water cooler/heater and one paper cup dispenser with cups. Replenish the supply of water, coffee/tea, and cups as required by Owner Representative.

E. Regulatory Field Office:

1. Use existing Owner trailer. Be responsible that office is weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment. Equip with two desks, two chairs, and one filing cabinet.

F. Contractor's Field Office:

1. Be responsible for size and furnishing of Contractor field office. Provide space for Project meetings, with table and chairs to accommodate ten persons.

G. Be responsible for providing utilities (power, sanitary water, disposal, etc.) to all field offices.

H. Internet Connection and Computing: Equip each field office with the following:

1. High speed internet connection and wireless 802.11 b/g/n router, or better
2. One (1) All-in-One printer/scanner/copier machine capable of ledger size (11'x17") without reduction and network connectivity via wired Ethernet or wireless (802.11 b/g/n, or better).
3. Be responsible for providing all machine maintenance, service, and replenishment of consumables (ink/toner and paper).

I. Do not use permanent facilities for field offices or for storage.

J. Construction; Portable or mobile buildings, or buildings constructed with floors raised aboveground, securely fixed to foundations with steps and landings at entrance doors:

1. Structurally sound, secure, weathertight enclosures for office and storage spaces. Maintain during progress of Work; remove enclosures at completion of Work.
2. Thermal Resistance of Floors, Walls, and Ceilings; Compatible with occupancy and storage requirements.
3. Exterior Materials; Weather-resistant, finished in one color acceptable to Owner's Representative.
4. Interior Materials in Field Offices; Sheet-type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
5. Lighting for Field Offices; 50 ft-C at desktop height; exterior lighting at entrance doors.
6. Interior Materials in Storage Sheds, if used; As required to provide specified conditions for storage of products.

K. Environmental Control:

1. Heating, Cooling, and Ventilating for Offices; Provide automatic equipment to maintain an ambient air temperature of 70 degrees Fahrenheit (F) +/- 3 degrees.

L. Storage Areas and Sheds:

1. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to suit requirements in Section 01 60 00 – Product Requirements.
2. Control temporary storage of waste or contaminated materials in accordance with the provisions of the Contract Documents.
3. Control all emissions (runoff, subdrainage, odors, etc.) from waste or contaminated materials to meet the provisions of the Health and Safety Plan and Community Air Monitoring Plan.
4. Be responsible and immediately clean up releases of any kind from the storage areas.

M. Maintenance and Cleaning:

1. Provide janitorial services for field offices on a daily basis including but not limited to sweeping, emptying waste baskets, servicing of toilets, weekly mopping of floors, sanitizing toilet seats, providing towels, toilet tissue, and soap to the lavatories, and monthly washing of floors and windows (inside and out).
2. Provide periodic cleaning and maintenance for sheds and storage areas.
3. Maintain walks, ramps, and stairs free of mud, water, snow, and the like.

N. Removal:

1. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to same or better condition as original condition.

1.3 VEHICULAR ACCESS

A. Comply with all Ford Motor Company security requirements. Confirm security requirements at preconstruction meeting.

B. Construct temporary all-weather access roads to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.

C. Construct temporary crossings, if required, to span low areas and allow unimpeded drainage.

D. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

E. Locate as approved by Owner.

F. Equip all site vehicles and equipment with back-up alarms.

G. Provide unimpeded access for emergency vehicles. Maintain 20 foot-wide driveways with turning space between and around combustible materials.

H. Provide and maintain access to fire hydrants and control valves free of obstructions.

I. Establish stabilized construction entrances and decontamination pads as indicated on the Remedial Design Drawings and the approved Soil Erosion and Sediment Control Drawings, as a means of removing mud and contaminants from vehicles and equipment before entering streets.

J. Use existing on-Site roads for construction traffic designated by Owner.

K. Do not impede access by local residents to driveways or their properties. Provide temporary access as required if work necessitates obstruction of residential access.

L. Do not stage vehicles (delivery or otherwise) on public roadways outside of the entrance gates. Coordinate deliveries such that vehicles can enter the site upon arrival.

1.4 PARKING

A. Provide temporary gravel surface parking areas to accommodate construction personnel as necessary. Locate as approved by Owner and in accordance with site plan required prior to the start of construction.

B. Tracked vehicles are not allowed on paved public roads.

C. Maintenance:

1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

D. Removal, Repair:

1. Remove temporary materials and construction when permanent paving is usable.
2. Repair existing facilities damaged by use, to original condition.

1.5 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of construction waste, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Collect and remove construction waste, debris, and rubbish from Site periodically and dispose of off-Site. Provide dumpsters or roll-offs as required for disposal of waste materials.

C. Handle waste from site excavations or contaminated soils in accordance with Section 02 60 00 – Removal and Disposal of Contaminated Materials.

1.6 PROJECT IDENTIFICATION

A. Project Identification Sign:

1. One painted sign, 32 inches wide by 24 inches tall.
2. Horseshoe Bend Road Entrance to Cannon Mine Pit Area
3. Peter's Mine Road Entrance to Peter's Mine Pit Area and Entrance to O'Connor Disposal Area
4. Content:
   Environmental Investigation/Cleanup in Progress
   Contractor: Name and Contact Information
   For Further Information Contact:
   USEPA, Joseph Gowers, Project Manager, 212-637-4413
   EPA ID No. NJD980529739
5. Graphic Design, Colors, and Style of Lettering: Black text, white background
6. Existing signs in good condition may be used in lieu of new signs.

B. Work Site Informational Signs:

1. Painted informational signs of same colors and lettering as Project identification sign or standard products; size lettering for legibility at 100-foot distance.
2. Provide sign at each field office and storage area, and provide directional signs to direct traffic into and within Work sites. Relocate as Work progress requires.
3. Provide state traffic agency directional traffic signs to and within Site.
4. No other signs are allowed except those required by law.

C. Design sign and structure to withstand 60-mph wind velocity.

D. Finishes, Painting:

1. Adequate to withstand weathering, fading, and chipping for duration of construction.

E. Installation:

1. Install Project identification sign prior to start of Work.
2. Erect at designated location.
3. Erect supports or framing on secure foundation, or suitable feature such as existing fence, and properly brace to resist wind loading. Fasten securely.

F. Maintenance:

1. Maintain clean signs and supports; repair deterioration and damage.

G. Removal:

1. Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.7 TRAFFIC REGULATION

A. Signs, Signals, and Devices, as required for public roadways:

1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
2. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
3. Flag Person Equipment: As required by authorities having jurisdiction.

B. Flag Persons:

1. Provide trained and equipped flag persons to regulate traffic should construction operations or traffic encroach on public traffic lanes, or whenever needed for safe use of public roads.

C. Whenever traffic ingress or egress volume is consistent or high, provide traffic control at points of access to public roads for safety of residents and for safe ingress and egress on public roads.

D. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

E. Haul Routes:

1. Consult with Owner about use of public thoroughfares to be used for haul routes and Site access.
2. See Contract Documents for acceptable traffic patterns.
3. Confine construction traffic to designated haul routes.
4. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.
5. Observe all local traffic laws.

6. Control traffic to minimize noise.
7. Exercise additional precautions during periods such as when school bus traffic is present.
8. Provide, maintain, and repair all traffic control equipment and devices as required.

F. If in the opinion of the Owner's Representative traffic control is required for safe operations and the Contractor has not provided such control, immediately provide such control, or Owner's Representative will arrange for traffic control which will be at the Contractor's expense.

G. Traffic Signs and Signals:

1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

H. Removal:

1. Remove equipment and devices at Substantial Completion.

1.8 FIRE-PREVENTION FACILITIES

A. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

1. Provide minimum of one fire extinguisher in every construction trailer and storage shed, and at all locations where hot work is performed.

1.9 FENCING

A. Maintain existing Site fencing intended to remain during construction.

B. Inspect all perimeter fencing for damage at a minimum on a weekly basis, or more frequently as necessary to maintain site access control.

C. Erect and maintain temporary construction fencing as delineated on the Remedial Design Drawings.

D. Repair any damage promptly to maintain Site security.

E. Maintain signs of fencing.

1.10 SECURITY

A. Security Program:

1. Protect Work on existing premises from theft, vandalism, and unauthorized entry.
2. Initiate program at Project mobilization.
3. Maintain program throughout construction period.
4. Contractor is solely responsible for the security of its equipment and any stored materials for the construction.

B. Entry Control:

1. Restrict entrance of persons and vehicles to Project Site.
2. Allow entrance only to authorized persons with proper identification.
3. Maintain log of workers and visitors and make available to Owner on request.
4. Comply with provisions of Health and Safety Plan.

1.11 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere and into Owner-occupied areas and off-site.

C. Integrate dust control with Health and Safety Requirements (see Section 00 73 19), as appropriate.

D. Visible dust leaving the project site is prohibited.

E. Refer to Section 01 35 43 – Environmental Protection and Section 31 20 00 – Excavation, Fill and Grading for additional requirements.

1.12 EROSION AND SEDIMENT CONTROL

A. Execute in accordance with the Erosion and Sediment Control Plan certified by the Hudson-Essex-Passaic Soil Conservation District.

B. Plan and execute construction by methods to control surface drainage from cuts and fills. Prevent erosion and sedimentation.

C. Minimize surface area of bare soil exposed at one time.

D. Provide temporary measures including hay bales, berms, dikes, drains, and other devices to control water flow, in accordance with approved plans.

E. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

F. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

G. Protect any existing catch basins with sediment bags. Clean or replace sediment bags as needed to maintain performance.

H. Comply with sediment and erosion control plans indicated on Remedial Design Drawings.

I. Refer to Section 01 35 43 – Environmental Protection and Section 31 25 13 – Erosion and Sediment Controls for additional requirements.

1.13 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. Refer to Section 01 35 43 – Environmental Protection for additional requirements.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Final Application for Payment inspection.

B. Clean and repair damage caused by installation or use of temporary Work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 60 00 – Product Requirements

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Products.
2. Product delivery requirements.
3. Product storage and handling requirements.
4. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required. See individual Technical Specifications and Drawings for additional performance requirements.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. All products shall be new and of original manufacture, preferably manufactured to the extent practicable in the USA.

E. Furnish interchangeable components from same manufacturer for when components are being replaced.

F. Any chemical products brought to the site must be pre-approved by the Owner’s Representative, and must have an associated Safety Data Sheet (SDS) kept on site in accordance with applicable regulation.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products according to manufacturer's instructions.

B. Unload equipment using appropriately sized equipment, supplied by Contractor, operated by an experienced operator, in accordance with the manufacturer's instructions.

C. Equipment shall be delivered by Contractor, from manufacturer, properly palletized, covered, or otherwise packaged for storage, outside, without any adverse effects on equipment, materials of construction, or appurtenances.

D. Inspect shipments for compliance with requirements and quantities, and that products are undamaged. Be responsible to provide fully functional products in proper condition for storage and or installation.

E. Provide all necessary equipment and personnel to handle products and place them into specified storage locations; use methods to prevent soiling, disfigurement, or damage.

F. Complete Receiving and Inspection Reports for all materials and products brought on site.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only:

1. Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers:

1. Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers or Equal:

1. Provide products of named manufacturers, and if exercising or equal provision, provide all information necessary to demonstrate that proposed product is equal to named manufacturers.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 70 00 - Execution and Closeout Requirements

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closeout procedures.
2. Project Survey and Stakeout Requirements.
3. Project record documents.
4. Product warranties.
5. Final cleaning.

1.2 CLOSEOUT PROCEDURES

A. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When Work considered to be complete, submit written certification that:
   a. Contract Documents have been reviewed.
   b. Work has been examined for compliance with Contract Documents.
   c. Work has been completed according to Contract Documents.
   d. Work is completed and ready for pre-final inspection.
2. Submittals; Submit following:
   a. Final punch list indicating all items have been received and installed properly, and all work, incidentals, and appurtenances have been properly completed.
   b. Final payment request with final releases and supporting documentation not previously submitted including specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
   c. Accounting statement for final changes to Contract Sum.
   d. Contractor's affidavit of payment of debts and claims on AIA G706 - Contractor's Affidavit of Payment of Debts and Claims or other form acceptable to Owner.
   e. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens, or other form acceptable to Owner.
3. Perform final cleaning of work area of any remaining materials, equipment, debris or other materials remaining from construction.

B. Final Completion Inspection:

1. Within seven days after receipt of request for final inspection, Owner will make inspection to determine whether Work or designated portion is complete.

2. Should Owner consider Work to be incomplete or defective:

a. Owner will notify Contractor in writing, listing incomplete or defective Work.
b. Contractor shall remedy stated deficiencies and send second written request to Owner that Work is complete.
c. Owner will re-inspect Work.
d. Redo and Inspection of Deficient Work: Repeated until Work is accepted.

1.3 PROJECT SURVEY AND STAKEOUT REQUIREMENTS

A. Perform all necessary field survey work required to construct all elements of the Work as shown on Drawings and as specified herein.

B. Execution:

1. Perform survey work by a Surveyor licensed in the State of New Jersey.
2. Coordinate work and Surveyor's work to avoid delays.
3. Establish pre-construction topography of work area.
4. Prior to construction, stake out all work to establish elevations and locations. Plot this information and make available to the Owner's Representative. Establish the exact position of all from control points established at the site.
5. Locate and place all cut, fill, slope, final grade or other stakes and points for the proper progress of the work. Properly guard and flag all control points for easy identification.
6. Be responsible for the accuracy of work and maintain all reference points, stakes, etc., throughout the life of the project. Replace or transfer any damaged or destroyed points, benchmarks, stakes, or any reference points made inaccessible by the progress of the construction. Any of the above points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted on drawing markups and kept available on Site. Make and preserve all computations necessary to establish the exact positions of the work from control points. All computations, survey notes and other records necessary to accomplish the work shall be neatly made.

C. Record Survey:

1. Retain a surveyor licensed in the State of New Jersey to complete a record survey when the Work is complete.
2. Survey shall be tied to State Plane coordinate system NAD 83.
3. Surveys shall be on a grid with a maximum spacing of 50 feet or an equivalent method approved by the Owner's Representative, with additional elevations at slope change locations. The record survey shall include locations and elevations of all other work, including final grading, complete in all respects to fully document the construction.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.

4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, and Product Data
6. Manufacturer's instructions for assembly, installation, or adjusting.

B. Ensure entries are complete and accurate, enabling future reference by the Owner's Representative.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications and Drawings; Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings; Legibly mark each item to record actual construction including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
2. Field changes of dimension and detail.
3. Details not on original Contract Drawings.

G. Provide a final record (as-built) survey as described above.

H. Provide Record Documents suitable for use in the Remedial Action Completion Report, which will be prepared by the Owner's Representative. Cooperate in all respects with Owner's Representative to provide the requisite information for the Remedial Action Completion Report.

I. Submit documents to Owner's Representative with claim for final Application for Payment.

1.5 PRODUCT WARRANTIES

A. Product warranties shall be as follows:

1. One year warranty from date products are placed into service.

B. Obtain warranties in duplicate by responsible suppliers and manufacturers and provide with delivery (sample warranties to be provided with submittals, finals with closeout documents).

C. Verify documents are in proper form, contain full information, and are notarized, if necessary.

D. Submit prior to final Application for Payment.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Execute final cleaning prior to final payment.

B. Clean Site; sweep paved areas of any remaining materials from delivery and installation of products and completion of the Work.

C. Remove waste and surplus materials and rubbish from Site and dispose of properly at no additional cost to Owner.

END OF SECTION

SECTION 01 74 19 – Construction Waste Management and Disposal

PART 1 - GENERAL

1.1 SUMMARY

A. Characterize, manage on site, transport, and dispose of all non-hazardous waste and rubbish generated by the work, and not otherwise covered elsewhere in this specification. Other non-hazardous waste includes asphalt, metal (e.g., fencing), vegetation (e.g., trees and stumps), concrete (e.g., curbs), and miscellaneous rubbish generated by the Contractor in the performance of the Work.

B. Section Includes:

1. Requirements for disposing of waste material during and as the result of the construction operations.

C. Related Sections:

1. Section 02 60 00 – Removal and Disposal of Contaminated Materials
2. Section 31 10 00 – Site Clearing
3. Section 31 20 00 – Excavation, Fill and Grading

1.2 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal, State, and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Drawings and Specifications.

B. Be advised that the disposal of excess excavated material in wetlands, stream corridors, and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove/rectify at his own expense and restore the impacted area.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove waste or surplus material dumped in unauthorized areas and restore to the condition of the adjacent undisturbed area.

B. Uncontrolled off-site reuse of any material is prohibited.

C. Be responsible for any fines associated with improper disposal of waste material.

D. No burning of debris will be permitted on site.

3.2 WASTE MANAGEMENT AND DISPOSAL

A. Segregate each type of material for proper disposal.

B. Vegetative material such as stumps that may contain hazardous or non-hazardous soils shall be managed with the respective soil type. All other vegetation resulting from the work shall be properly disposed of or reused in accordance with these specifications in accordance with all applicable local, state, and federal rules and regulations. Properly stockpile and cover prior to disposal.

C. Any off-site disposal shall be strictly at an Owner-approved facility.

D. Metal for recycling shall be temporarily stored on-site in watertight roll-off containers. Properly dispose of metal by the Contractor in accordance with all applicable local, state, and federal rules and regulations.

E. Characterize concrete in accordance with the New Jersey Department of Environmental Protection requirements for characterization for recycling. Any concrete that does not meet the requirements for recycling shall be properly disposed of, based on analytical data, in accordance with all applicable local, state, and federal rules and regulations.

F. Recycle asphalt removed during construction in accordance with all applicable local, state, and federal rules and regulations.

END OF SECTION

SECTION 01 81 13 – Sustainability Requirements

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sustainability project goals.
2. Sustainability product requirements.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Individual Specification Sections for product requirements.

1.2 REFERENCE STANDARDS

A. New Jersey Department Environmental Protection (NJDEP) Fill Material Guidance for Site Remediation Program (SRP) Sites.

B. USEPA, EPA542-F-10-008, Clean Fuel & Emission Technologies for Site Cleanup.

C. USEPA, Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites.

1.3 SUSTAINABILITY PROJECT GOALS

Comply with the following general sustainable Project goals.

A. Notify Owner's representative if conflicts arise between Work performance and sustainable Project goals.

B. Use resources efficiently:

1. Use construction practices that achieve efficient use of resources and materials.
2. Recycle or reuse Project Site waste.
3. Use recycled content materials, whenever practicable.
4. Use materials that can be recycled.

C. Avoid scarce, irreplaceable, or endangered resources.

D. Use durable materials.

E. Use energy efficiently.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures contains requirements for submittals.

B. Product Data; For products, to the extent practicable with each submittal:

1. Document use of recycled materials in manufactured products.
2. Document use of local materials.
3. Provide alternative recycled materials.

C. With each submittal for products document quantity of reused, recycled, or alternative materials used.

PART 2 - PRODUCTS

2.1 PROHIBITED MATERIALS

A. Do not use materials containing asbestos, polychlorinated biphenyls (PCB), or other hazardous materials.

B. Do not use HCFC-based refrigerants or halon extinguishing agents.

2.2 FUEL

A. 20% biodiesel fuel blend for vehicles and equipment.

B. Provide plan for biodiesel fuel use before start of construction.

2.3 REUSED MATERIALS

A. Follow requirements in Section 31 20 00 – Excavation, Fill and Grading for reuse of excavated materials in accordance with NJDEP Fill Material Guidance for SRP Sites.

B. Follow NJDEP Fill Material Guidance for SRP Sites for alternative clean fill in lieu of natural resources. Provide sources of alternative clean fill as a submittal for fill materials to be used in construction.

PART 3 - EXECUTION

3.1 MATERIALS AND RESOURCES

A. Recycle or salvage minimum of 25 percent by weight of uncontaminated construction and land-clearing waste.

B. Utilize tree mulch per Section 31 20 00 – Excavation, Fill and Grading for preparing amended topsoil, to the maximum extent practicable.

3.2 VEHICLES AND EQUIPMENT

A. Do not permit idling of vehicles and equipment for longer than five minutes.

END OF SECTION

SECTION 02 60 00 - Removal and Disposal of Contaminated Materials

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, equipment, and materials required for proper removal and disposal of contaminated materials as described in this Section and as depicted on the Drawings.

B. Section Includes:

1. Requirements for on-site management, loading, transportation, and disposal of contaminated materials.

C. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements
2. Section 01 81 13 – Sustainability Requirements
3. Section 02 86 00 – Paint Waste and Drum Handling
4. Section 31 10 00 – Site Clearing
5. Section 31 20 00 – Excavation, Fill and Grading
6. Section 31 23 19 – Dewatering
7. Section 34 78 14 – Portable Axle Scale

1.2 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal, State, and local laws and regulations concerning the removal, transport, and disposal of contaminated materials, as well as the specific requirements stated in this Section and elsewhere in the Specifications and on the Drawings.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures

B. At least one week in advance of the Work, submit all documentation, permit applications, and permits relative to the handling, management, discharge, recycling, and disposal of wastes generated from the Work.

C. At least 30 days in advance of any transportation off site for disposal or recycling, submit the following information for each waste transporter:

Name
Address and telephone number
Copy of current, valid waste transporter permit
Letters of commitment

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements

B. Project Record Documents:

1. Quantity by weight of contaminated materials transferred to disposal facility, as documented in disposal manifest and signed bills of lading from disposal facilities. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.

1.5 QUALITY ASSURANCE

A. The Site Superintendent will monitor the Contractor's activities associated with the Work of this Section.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL

A. Handle all contaminated materials in accordance with the Site-Specific Health and Safety Plan.

B. Be advised that the disposal of any material in wetlands, stream corridors, and plains is strictly prohibited. Any violation of this restriction by the Contractor or any person employed by him or her will be brought to the immediate attention of the responsible regulatory agencies with a request that appropriate action be taken against the offending parties.

C. Maintain project documentation with accurate records and material tracking. Maintain on-site copies of all disposal manifests, documenting weight of all materials leaving the site as measured by the portable axle scale and confirmed at the receiving facility. Maintain bills of lading for all materials transported from the site, if not documented in a manifest.

D. For all manifests and bills of lading, obtain the signature of the receiving facility responsible person, verifying receipt of each load of material shipped from the site and the quantity of each load. Copies of the disposal manifest and signed bills of lading shall be submitted prior to Substantial Completion.

E. Coordinate with Owner's Representative regarding disposal facilities prior to start of Work. Contaminated material shall only be disposed at facilities designated by the Owner, and approved by the USEPA.

3.2 CONTAMINATED MATERIALS HANDLING AND STORAGE

A. Stockpile and characterize all excavated materials in accordance with Section 31 20 00 – Excavation, Fill and Grading.

B. Contaminated materials shall be segregated from other excavated material and stockpiled within a temporary containment area, as shown on the Drawings or approved by the Owner's Representative. The containment area shall be lined with 12-mil, scrim reinforced polyethylene liner.

C. Cover stockpiles with plastic sheeting at the end of each working day and when not in active use. Adequately secure plastic sheeting with sandbags or other means to prevent disturbance from the elements such as wind or rain. Shape and grade stockpiles to facilitate surface water drainage.

D. Handle all paint waste, drums and drum carcasses in accordance with the approved Paint Waste, Drum, and Drum Carcass Excavation Plan and the Site-Specific Health and Safety Plan. See Section 02 86 00 – Paint Waste and Drum Handling. This waste is to be classified as contaminated and shall be treated as such.

E. Label stockpiles and contaminated waste with signs as to their waste classification. Prevent intermixing of soil types or contamination using berms or other acceptable control measures. Place warning signs in the areas in accordance with general practices and regulations.

F. Visually inspect temporary containment areas daily to ensure they are not compromised. Replace containment area if holes, tears, or visual strain is observed. Containment area materials are to be disposed of with the contaminated waste. Control storm water accumulation in these areas to prevent overflow of potentially contaminated water beyond the containment areas.

G. Maintain all stockpiles throughout the duration of the project until all contaminated waste has been removed and properly disposed of.

H. Personnel and equipment that come into contact with contaminated materials shall follow decontamination procedures in accordance with the Site-Specific Health and Safety Plan. See Section 00 73 19 – Health and Safety Requirements. Any heavy equipment which has come into contact with contaminated materials shall be inspected and a written inspection report shall be completed prior to it leaving the site.

I. Spent containment area materials, such as plastic, and other disposable equipment or materials, including used PPE such as Tyvek coveralls and gloves, and items such as hoses or tubing, incapable of being decontaminated are to be disposed of with bulk contaminated waste.

3.3 SOILS MATERIAL DEWATERING

A. Dewater saturated material as necessary to meet regulatory and receiving facility requirements. Collect any contact water as contaminated water for treatment in accordance with Section 31 23 19 – Dewatering.

B. Dewater or stabilize materials sufficiently to permit transportation (without the generation of free water during transport) and meet receiving facility requirements at no additional cost to the Owner. Any stabilization materials must be approved by the Owner's Representative and the disposal facility prior to use.

C. Any costs incurred due to rejection of loads by the disposal facility shall be the responsibility of the Contractor.

3.4 COORDINATING WASTE SHIPMENTS

A. Obtain letters of commitment from waste haulers and receiving facilities agreeing to handle and dispose of wastes, for each class of waste. Letters shall specifically state what types and quantities of waste the facility will accept.

B. Be responsible for complying with the disposal facility's testing requirements and other acceptance criteria.

C. Prepare daily and weekly schedules for shipment of waste to each disposal facility, identifying the quantities and dates of shipments. Coordinate the supply of trucks necessary for shipment of waste and the schedule for vehicle arrival so that contaminated waste does not exceed storage capacity on-site. The schedule shall be compatible with the availability of equipment and personnel for material handling operations and ensure that the excavation schedule is maintained.

3.5 PORTABLE AXLE SCALE

A. Operate and maintain portable axle scale as NJ State certified scale. See Section 34 78 14 – Portable Axle Scale.

3.6 MANIFESTING

A. Each truck shall have a proper manifest and placard prior to leaving the site.

B. Each truck entering and exiting the site shall be recorded at the site, as applicable.

3.7 LOADING AND DECONTAMINATION OF TRANSPORT VEHICLES

A. Do not ship any wastes from the site without first obtaining Owner approval of the selected hauler and disposal facilities with proper licenses and permits.

B. All contaminated materials are to be removed from the containment areas as part of the transportation process. Ensure no remnants remain once material from containment area is transferred to the transport vehicle.

C. All transport vehicles for contaminated materials shall have lined beds. Install bed liners prior to loading and to close the liners prior to trucks leaving the site.

D. Prepare contaminated material for transportation in accordance with State and Federal Regulations and all applicable State and US Department of Transportation requirements. Liquid contaminated waste, if any, shall be solidified with a cement binder or transferred to drums to decrease mobility and prevent any leakage.

E. Assure that all transport vehicles are properly covered and placarded, and do not leak any contaminants. Any release of waste of any kind from a transport vehicle shall be reported to the appropriate regulatory authorities, as applicable, and shall be cleaned up by the Contractor at no additional cost to Owner.

F. Externally decontaminate truck after loading in accordance with the Site-Specific Health and Safety Plan. See Section 00 73 19 – Health and Safety Requirements. The Contractor is responsible for decontamination and inspection of transportation vehicles before they enter the support zone to verify no material adheres to the wheels, undercarriage, tailgates, covers or other areas.

G. Weigh each truck empty and full at the scale on site and document in the on-site disposal manifest.

H. Transportation shall be in accordance with all local laws and regulations regarding use of public roads.

I. Trucks entering or exiting the work sites shall not queue on public roads, and shall not stop on public roads (e.g., for tarping) for any purpose other than normal traffic requirements. Trucks with waste shall proceed directly to disposal facilities. All vehicles entering or exiting the work sites shall be fully readied for access to public roads while on the work sites.

END OF SECTION

SECTION 02 86 00 – Paint Waste and Drum Handling

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, equipment, and materials required for proper paint waste and drum handling as described in this Section and as depicted on the Drawings.

B. Section Includes:

1. Requirements for paint waste, drum, and drum carcasses inspection, handling, staging, and characterization.

C. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements
2. Section 01 81 13 – Sustainability Requirements
3. Section 02 60 00 – Removal and Disposal of Contaminated Materials
4. Section 31 10 00 – Site Clearing
5. Section 31 20 00 – Excavation, Fill and Grading
6. Section 31 23 19 – Dewatering

1.2 REFERENCES

A. Hazardous Waste:

1. Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities, as published by OSHA, NIOSH, OSHA, USCG, and EPA, 1985.

1.3 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal, State, and local laws and regulations concerning paint waste and drum handling, as well as the specific requirements stated in this Section and elsewhere in the Specifications and on the Drawings.

1.4 QUALITY ASSURANCE

A. Key personnel and alternates responsible for site safety designated in the Site-Specific Health and Safety Plan will monitor the Contractor's activities associated with the Work specified in this Section.

1.5 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures

B. Paint Waste, Drum, and Drum Carcass Excavation Plan; Prepare Plan and submit to the Owner's Representative a minimum of 30 days prior to the start of Work. Excavation shall not be permitted to proceed until the Plan is approved by the Owner's Representative. The Owner reserves the right to request revisions to the plan as new information is obtained during paint waste and drum handling. The Plan shall include, but is not limited to, the following:

1. Procedures and equipment used for uncovering, inspecting, handling, staging, sampling, and ultimately disposing of paint waste, drums, and drum carcasses, including situations where they are encountered at or below the water table in the PMP area.
2. Identification of associated hazards and hazard control measures to be implemented for paint waste, drum, and drum carcass handling.
3. Information to be recorded for inventory of recovered paint waste, drums and drum carcasses.
4. Hauling company and disposal facility approved by the Owner's Representative. See Section 02 60 00 – Removal and Disposal of Contaminated Materials.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements

B. Project Record Documents:

1. Inventory of recovered paint waste, drums, and drum carcasses.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL

A. Handle all paint waste, drums, and drum carcasses in accordance with the approved Paint Waste, Drum, and Drum Carcass Excavation Plan and the Site-Specific Health and Safety Plan. This waste is to be classified as contaminated and will be treated as such.

B. Provide personnel with proper training, safety gear, and equipment to maximize worker safety in accordance with the Site-Specific Health and Safety Plan and keep the operation as remote as possible from other workers.

C. Ground-penetrating systems, such as electromagnetic wave, electrical resistivity, ground-penetrating radar, magnetometry, and metal detection, shall be used, if applicable, to estimate the location and depth of drums to the maximum extent practicable.

D. A temporary lined containment cell as shown on the Drawings shall be constructed prior to any paint waste or drum handling.

E. Caution should be exercised during soil excavation to minimize the potential for damaging drums. Provide over-pack drums on site for use, if required.

F. Upon encountering paint waste, drums, or drum carcasses during excavation, immediately notify the Owner's Representative.

G. Upon discovery and prior to personnel approaching paint waste or drums, air monitoring shall be conducted by the designated person responsible for site safety, using instruments such as organic vapor monitors and a combustible gas meter, to determine if hazardous conditions exist. Air monitoring systems will remain fully functional within the excavation area to confirm that conditions are acceptable for operations to continue.

H. Personnel and equipment that come into contact with contaminated materials shall follow decontamination procedures in accordance with the Site-Specific Health and Safety Plan. See Section 00 73 19 – Health and Safety Requirements.

3.2 INSPECTION

A. Prior to handling, drums and the immediate vicinity around them should be visually inspected to gain as much information about the drum contents as possible. While labels and characteristics of the drum (material of construction, size, type of head, etc.) may give clues to the material inside the drum, it is possible that the drum was reused and does not contain the material it was intended for.

B. Drums should be visually inspected for integrity to determine if they can be safely moved or handled, and determine if sampling can be conducted in place or if the drum needs to be moved to be sampled.

C. Be alert for new information about potential hazards.

3.3 HANDLING

A. Avoid unnecessary handling.

B. Exercise extreme caution in handling drums that are not intact and tightly sealed. If a drum is unfit for moving, its contents shall be transferred to a sound container. If the contents of the drum cannot be transferred, it will be placed into an overpack drum.

C. Bulging drums should be relieved of pressure, remotely if possible, prior to handling.

D. If adjacent soil is contaminated, it will be containerized with the drum contents for characterization.

E. If paint waste, drums, or drum carcasses are encountered at the water table within the PMP area, notify the Owner's Representative and:

1. Perform any necessary shallow excavation or uncovering to determine the areal extent of the paint waste, drums or drum carcasses, in accordance with the approved Paint Waste, Drum, and Drum Carcass Excavation Plan.
2. Put dewatering equipment into use per Specification 31 23 19 – Dewatering.
3. Excavate below the water table using sloping, benching, or sheeting and shoring to stabilize the excavation while continuously dewatering during excavation.
4. Excavate to the depth necessary to remove encountered paint waste, drums, or drum carcasses or until it is no longer practicable to do so, as determined in conjunction with the Owner's Representative.

3.4 STAGING

A. All paint waste, drums, and drum carcasses shall be segregated and stored within a temporary lined containment area and covered with plastic sheeting as shown on the Drawings, for characterization and off-site disposal. Plastic sheeting shall be secured to prevent disturbance from the elements such as wind or rain.

B. See Section 02 60 00 – Removal and Disposal of Contaminated Materials.

3.5 CHARACTERIZATION AND DISPOSAL

A. Collect samples for characterization in accordance with the requirements of the receiving facility.

B. Consolidation of contaminated materials should be performed only after thorough characterization and as practicable. Only like and compatible materials will be combined after checking compatibility.

C. Paint waste, impacted soils, and other contact materials will be staged until proper containers and transportation is arranged.

D. See Section 02 60 00 – Removal and Disposal of Contaminated Materials for disposal procedures.

END OF SECTION

SECTION 31 05 19 – Geosynthetics for Earthwork

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Geosynthetics as specified or shown on the Drawings, or otherwise required.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Section 31 25 13 – Erosion and Sediment Controls

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Furnish mill certificate from the geotextile manufacturer.

C. Mill certificate shall demonstrate compliance with the chemical, physical, and manufacturing requirements specified.

D. Geotextile will be rejected if it is found to have defects, rips, holes, flaws, deterioration or other damage.

E. Certification that the properties of the Structural Geogrid are equal to or greater than those specified.

F. Geogrid:

1. Construction Procedures – Geogrids installation and soil backfilling procedures.
2. List of components – Manufacturer designation for each type of geogrid along with roll dimensions and number of rolls to be supplied.
3. The manufacturer shall document the partial factors of safety used to compute the allowable tensile strength from the ultimate strength. Documentation should be based on actual testing of product similar to that proposed on this project. The manufacturer should refer to ASTM D5262, D5818, and D6992. The partial factors of safety should include creep, installation damage, and environmental factors (such as groundwater chemistry). The combined material factor of safety is computed by multiplying the partial factors together. The minimum material factor of safety cannot be less than 1.5.
4. Geogrid sample - 4-in. by 16-in. piece or enough to include two entire “rib” sections and a junction (transverse portion that connects the ribs).
5. Certificates - Manufacturer's certification that properties of the supplied geogrid are equal to or greater than those specified.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

2. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

3. ASTM D4759 - Practice for Determining the Specification Conformance of Geosynthetics.

4. ASTM D5262 - Standard Test Method for Evaluating Unconfined Tensile Creep Behavior of Geosynthetics.

5. ASTM D5818 - Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage.

6. ASTM D6637 - Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

7. ASTM D6992 – Standard Test Method for Accelerated Tensile Creep and Creep - Rupture of Geosynthetic Materials Based on Time -Temperature Superposition Using the Stepped Isothermal Method.

1.4 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 – Product Requirements

B. Protect geosynthetics from direct sunlight, ultraviolet rays, temperatures greater than 120°F, temperatures below -20°F, mud, dirt, dust, debris and other deleterious sources during shipment, handling and storage.

C. Maintain geosynthetics wrapped in heavy-duty protective covering until installation.

D. If the Owner’s Representative determines material is damaged or has excessive sunlight exposure, immediately make all repairs and replacements at no additional cost to the Owner.

E. Identify each package with manufacturer's name.

1.5 QUALITY ASSURANCE

A. Perform Work according to manufacturer’s instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Non-woven geotextile manufactured of either polyester or polypropylene.

1. Minimum properties:

Property	Test Method	Minimum Average Roll Value s	Test Frequencies
Mass Per Unit Area	ASTM D5261	8 oz/yd^2	1 / 200,000 ft^2
Grab Tensile Strength	ASTM D4632	230 lbs.	1 / 200,000 ft^2
Trapezoidal Tear Strength	ASTM D4533	70 lbs.	1 / 200,000 ft^2
Permittivity	ASTM D4491	0.7 sec^{-1}	1 test per project
Apparent Opening Size (AOS)	ASTM D4751	70 U.S. Sieve or smaller	1 test per project
UV Resistance	ASTM D4355	70% retained at 500 hrs	Certification

B. Woven geotextile of polypropylene

1. Minimum Properties:

Property	**Test Method**	**Minimum Average Roll Value Require-ments**	**Test Frequencies(1)**
Grab Tensile Strength	ASTM D4632	200 lbs.	1 / 10,000 ft^2
Trapezoidal Tear Strength	ASTM D4533	75 lbs.	1 / 10,000 ft^2
CBR Puncture Strength	ASTM D6241	700 lbs.	1 / 10,000 ft^2
Permittivity	ASTM D4491	0.05 sec^{-1}	1 test per project
Apparent Opening Size (AOS)	ASTM D4751	40 Sieve No. (0.180 mm)	1 test per project
UV Resistance	ASTM D4355	70% retained at 500 hrs	Certification

C. Biaxial Geogrid:

1. Structural Geogrids shall provide an Ultimate Tensile Strength of 1000 lbs/ft in stronger direction and 750 lbs/ft in weaker direction as measured by minimum average roll value (MARV) as tested per ASTM D6637.
2. Geogrid shall exhibit no strength loss in either direction after 4500 hours when tested for UV resistance per ASTM D4355.
3. Bodkin bar used to join geogrid must be HDPE with sufficient strength to allow the full strength of the geogrid to be achieved. Joining methods other than Bodkin bar must be approved by the Owner's Representative.

D. Provide additional test data if required by the Owner's Representative.

PART 3 - EXECUTION

3.1 PREPARATION

A. Grade subgrade to specified elevations on the Drawings.

B. Maintain proper subgrade slope per the Drawings.

C. Remove from subgrade any sharp objects, boulders, stumps, or any materials that may contribute to geosynthetic punctures, shearing, rupturing or tearing.

D. Inspect subgrade for unstable or soft spots, before the geosynthetics are placed. Place additional fill, stone, or geotextile layer to properly stabilize subgrade.

E. Place geosynthetics in the manner and at the locations shown on the Drawings.

F. Field sew or heat fuse geotextile panels as recommended by the manufacturer.

G. Place geotextile on slopes so that the upper strip of geotextile overlaps the next lower strip (i.e., panel end seams are to be shingled down slope).

H. Lay geotextile smooth and free of tension, stress, folds, wrinkles, or creases.

I. Maintain a minimum depth of 12 inches of cover material over the geotextile at all times between the geotextile and wheels, tracks, or any other earthmoving equipment.

J. Repair damaged geotextile with like material cut and placed over the damaged area and overlap the undamaged material a minimum of three feet in each direction. Secure per manufacturer's recommendation by sewing or heat fusing.

K. Geogrid panel elevation shall be zero to three inches (0" – 3") above elevation as indicated on the Drawings.

L. After a layer of geogrid reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold in place until subsequent soil layer is placed.

M. Equipment cannot operate directly on the geogrid. A minimum of six inches (6") of soil cover must be placed before track-mounted equipment can operate over the reinforced zone.

N. Keep geogrid taut when spreading fill.

O. Replace any geogrid damaged during installation.

3.2 PROTECTION

A. Replace any geotextile damaged during its installation or during placement of cover materials at no additional cost to the Owner.

B. Schedule Work so that the covering of the geotextile with a layer of the cover soil is accomplished within 30 days after placement of the geotextile.

C. Replace geotextile exposed for greater than 30 days at the direction of the Owner's Representative at no additional cost to the Owner.

END OF SECTION

SECTION 31 10 00 - Site Clearing

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, tools and appurtenances whether specifically required or reasonably expected to complete the work of clearing, grubbing, and topsoil stripping within the limits of the work site as shown, specified, or required.

B. Remove all surface debris, including but not limited to stumps, trash, dumped residential items, vehicle carcasses, etc., remaining at the start of the work to complete the work of clearing, grubbing, topsoil stripping and stockpiling, or otherwise preparing the site for the work to be performed.

C. Remove, salvage, and stockpile for future reuse topsoil, to the maximum extent practicable.

D. Properly manage all surface debris, vegetation, trees, stumps, or other unsuitable fill material resulting from clearing and grubbing on site in accordance with these specifications or disposed of off-site at a permitted disposal facility that is approved by the Owner's Representative.

E. Any surface debris or vegetation (e.g., stumps) that may be commingled with material potentially classified as hazardous waste shall be separately stockpiled, tested, characterized, and disposed of based on the results of the characterization, in accordance with the requirements of these specifications.

F. Related Sections:

1. Section 01 35 43 – Environmental Protection
2. Section 02 60 00 – Removal and Disposal of Contaminated Materials
3. Section 31 20 00 – Excavation, Fill and Grading
4. Section 31 23 19 – Dewatering
5. Section 31 25 13 – Erosion and Sediment Controls

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Submit:

1. Procedures for handling vegetation and stumps.
2. Stockpiling plan for salvaged topsoil.
3. Procedures for handling debris and waste.

1.3 QUALITY ASSURANCE

A. Conform to applicable Federal, State, and local laws and regulations concerning disposal of debris, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

B. No burning of debris will be permitted on-site.

C. Materials intended for off-site disposal may not be reused on site without the prior written permission of the Owner's Representative and written documentation that the materials meet reuse requirements.

D. The depth and limit of topsoil removal will be in accordance with the Engineer's direction and will be verified as-required during the course of the operation by visual observation.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements

B. Section 01 35 43 – Environmental Protection

C. Verify limits of clearing and grubbing, the extent of the existing landfills, and locations of any staging areas with Owner's Representative prior to start of work.

D. Confirm that soil erosion and sediment controls are in place and functioning properly prior to start of work. No clearing, grubbing, or stripping of topsoil shall commence until appropriate erosion and sediment control measures are installed, except for the work that may be required to complete the installation of erosion control measures.

E. Confirm that areas to remain undisturbed are clearly demarcated prior to start of work.

F. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call NJ One Call service at 811 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
2. Verify location of PMP mine shaft collar prior to commencing work in the PMP area.

B. Coordinate with Owner's Representative prior to start of work regarding all potential obstructions, former mine workings, protection of adjacent property, and handling of surface debris potentially related to local residents.

C. Protect all utilities. Repair any damage to utilities at the Contractor's expense.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain.

C. Protect bench marks, survey control points, monitoring wells, stream gauges and existing structures from damage or displacement.

D. Provide erosion control methods such as mulching, perimeter hay bales, etc., in accordance with the Contractor's approved erosion and sediment control plan, to prevent any sediment from leaving the site or interfering with the Contractor's work area.

E. Protect areas outside the limits of clearing. No equipment or materials shall be stored in or allowed to damage these areas.

F. Protect adjacent stream channel from disruption by equipment or sediment transport. All disturbance of soil for clearing and grubbing shall remain outside the limits of the stream channel. Work adjacent to stream channel shall be performed so that soils or any other materials cannot slough or erode into the stream channel.

G. Protect work in progress adjacent to stream channel in the event of potential flooding conditions. Pull back materials, cover, provide stabilized temporary berms, or use any other approved methods of protection in the event of potential flooding from adjacent stream channel.

H. Do not interfere with normal stream channel flow. Diversion of stream flow is strictly prohibited.

I. Protect all local roads from debris, sediment, or soil tracking in accordance with the approved soil erosion and sediment control plan.

J. Any disturbance of or damage to adjacent structures, property, vegetation, or roadways designated to remain shall be restored to original condition at the Contractor's sole expense.

K. Perform a weekly SWPPP inspection and immediately perform any needed repairs to sediment control measures.

3.4 CLEARING

A. Do not clear, grub, or strip topsoil until the proposed work is staked out, except for the work that may be required to complete the stakeout survey.

B. Clear areas required for access to site and execution of Work.

C. Remove any large surface rocks and boulders.

D. Clear undergrowth and deadwood, without disturbing subsoil.

E. All brush, vegetation, and other plant matter other than trees and stumps cleared during this process may be ground and mulched for reuse as amended topsoil per the provisions of these specifications, provided all such material does not indicate any evidence of contamination. Clean, ground vegetation and mulch may be stockpiled in a designated area to be used in future construction.

F. Tree matter that does not indicate any potential commingling with contaminated material may be:

1. Ground for reuse as mulch, with the approval of the Owner's Representative.
2. Cut and removed from the Work Site for recycle at an approved facility.
3. Cut and make available to local residents for firewood, provided:
    a. Any such offer is approved by the Owner's Representative in writing in advance.
    b. Residents may not be permitted on the Work Site for any reason.
    c. Any additional effort by Contractor to make the cut trees available as firewood will not incur additional costs and be treated as a change order.

G. Tree stumps solely in covers soils and that are not commingled with contaminated soils may be ground for mulch use on site. Treating any stumps in this manner must be approved in writing in advance by the Owner's Representative.

H. Stockpile tree stumps or any other plant matter that are commingled with contaminated material in the waste staging area. Be responsible for transportation and off-site disposal at a permitted solid waste disposal facility, approved by the Owner's Representative.

3.5 REMOVAL

A. Section 02 60 00 – Removal and Disposal of Contaminated Materials

B. Section 02 86 00 – Paint Waste and Drum Handling

C. Comply with all Federal, State and local regulations.

D. Dispose of materials only at fully permitted facilities, approved in advance by the Owner's Representative.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from Work Site to the extent practicable for use in finish grading, without mixing with foreign materials.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site in accordance with the certified Soil Erosion and Sediment Control Plan and protect from erosion. Do not stockpile adjacent to ecologically sensitive areas or stream channel.

D. Spread excess topsoil, if any, in accordance with the direction of the Owner's Representative.

END OF SECTION

SECTION 31 20 00 - Excavation, Fill and Grading

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Excavating mine tailings.
4. Excavating waste materials.
5. Excavating drums or paint waste.
6. Cutting, filling, and grading to meet specified elevations.
7. Stockpiling excavated materials.
8. Containment of contaminated materials and waste.
9. Vibration monitoring

B. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements
2. Section 01 35 43 – Environmental Protection
3. Section 31 10 00 – Site Clearing
4. Section 02 60 00 – Removal and Disposal of Contaminated Materials
5. Section 02 86 00 – Paint Waste and Drum Handling
6. Section 31 23 19 – Dewatering
7. Section 31 25 13 – Erosion and Sediment Controls
8. Section 31 50 00 – Excavation Support and Protection

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
4. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
6. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
7. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
8. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

9. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils [Atterberg Limits].

B. ISEE Field Practice Guidelines for Blasting Seismographs, latest edition.

C. ISEE Performance Specifications for Blasting Seismographs, latest edition.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures

B. Samples:

1. Submit, in air-tight containers, 10 lb sample of all imported materials to testing laboratory specified by Owner's Representative, when requested.

C. Materials Source:

1. Submit name and location of all imported materials suppliers.

D. Material Quality:

1. Submit affidavit from supplier for each clean fill source documenting material is suitable for unrestricted use and is defined as clean fill per NJAC 7:26E-1.8.
2. Submit analytical data confirming quality of material meets requirements as clean fill as defined by the NJDEP in "Fill Material Guidance for SRP Sites".
3. If material suitable for unrestricted use is from a virgin source, submit documentation verifying the basis for determination of a virgin source including chemical test data.
4. Submit analytical data per NJDEP "Fill Material Guidance for SRP Sites" for any imported alternative fill materials.

E. Material Properties:

1. Submit data on physical and geotechnical properties of all imported materials per Section 2.

F. Testing Laboratory:

1. Submit qualifications and certifications for approval.

G. Vibration Monitoring Plan:

1. Submit for acceptance by the Owner's Representative and approval by the USEPA, a Vibration Monitoring Plan prior to start of any work that would produce vibrations. Allow adequate time for review and approval. Do not start vibration inducing work prior to approval of this plan.
2. Plan shall include:
    a. Qualifications of firm and personnel performing vibration monitoring.
    b. Manufacturer's name, model number, and factory calibration documentation for seismograph.

c. Limit of vibration monitoring.
d. Procedures for documenting precondition survey.
e. Location(s) of seismograph(s).
f. Procedures for tracking peak particle velocity (PPV).
g. PPV record keeping and documentation.
h. Demonstration of compliance with PPV requirements of these specifications.
i. Procedures for documenting post-construction conditions.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements

B. Project Record Documents:

1. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
2. Quantity by weight of fill material used in the backfill process. Include associated fees, transportation costs, and taxes for total cost for fill.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with relevant ASTM standards.

B. The Site Superintendent will monitor the Contractor's activities associated with the Work of this Section. This monitoring will include, but not be limited to:

1. Verifying Contractor conformance with requirements for on-site management of excavated materials; and
2. Reviewing Contractor's documentation of soils categories for stockpiling and test data from an independent testing laboratory certified in the State of New Jersey, and acceptable to the Owner's Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stripped and Reused Topsoil:

1. Unclassified.
2. Properly Graded.
3. Free of roots, objectionable rocks (as determined by the Owner's Representative), waste, subsoil, debris, mine tailings, large weeds, invasive species, or other large vegetative matter, and any other objectionable foreign matter.
4. Screening if necessary to remove objectionable material, as determined by the Owner's Representative.

B. Imported Topsoil:

1. Imported borrow, classified as clean fill.
2. Friable loam.
3. Reasonably free of roots, rocks larger than ½ inch, subsoil, debris, large weeds, and foreign matter, and from a source without invasive species visibly present.
4. Screening: Single screened.
5. pH of 5.5 to 7.5.
6. Conductivity of less than 0.5 millimhos per centimeter.
7. Containing minimum of 2.75 percent organic matter.
8. From a virgin source or meets clean fill requirements per New Jersey "Fill Material Guidance for SRP Sites".

C. Topsoil Substitute:

1. Amended soil.
2. Amendments may include sand, silt, clay, organic matter, fertilizer, or lime.
3. Amendments may include tree mulch in proper proportions (20% tree mulch to soil content) to meet requirements of topsoil as specified in B above.
4. Other amendments to meet requirements of topsoil as specified in B above.
5. Imported material shall meet the requirements of 1.3.B, and be classified as clean fill.

D. Excavated and Reused Subsoil Fill:

1. Soil from site excavations.
2. Mine tailings from site excavations.
3. Non-hazardous material.
4. Test frequency; one per maximum of 500 cubic yards:
    a. Corrosivity.
    b. Ignitability.
    c. Reactivity (sulfide, cyanide).
    d. TCLP metals.
5. Does not contain objectionable material and waste with particle size greater than ½ lift thickness placed for compaction, or that would otherwise interfere with compaction.
6. Maximum lift thickness of 12 inches.
7. Screened if necessary to comply with No. 5 above.

E. Unclassified, Imported Subsoil Fill:

1. Non-plastic, well-drained soil with USCS Classification GW, GP, GM, GC, SW, SP, SM.
2. Alternative recycled materials meeting these specifications.
3. Meets New Jersey, Residential, Direct Contact Soil Cleanup Standards per NJAC 7:26D.
4. Free of objectionable material including waste, debris, roots, particles greater than ½ lift thickness, or any other objectionable foreign matter.
5. Maximum lift thickness of 12 inches before compaction.

F. Final Cover Subsoil Fill:

1. Loam texture soil.
2. Mixture of sands, silts, and clays.
3. Less than 35% coarse rock fragments, greater than 1".

4. Less than 35% passing #200 Standard US Sieve.
5. Free of objectionable material including waste, debris, roots, or any other deleterious or objectionable foreign matter.
6. Classified as clean fill.

G. Structural Fill:

1. Classified as clean fill.
2. Natural material.
3. Dense graded aggregate per NJDOT specifications, Section 901.03.
4. Size No. 57.
5. Or equivalent natural material and gradation and acceptable to the Owner's Representative.
6. Alternative recycled materials with documentation demonstrating compliance with the above requirements, and approved in advance, in writing by the Owner's Representative.

H. Crushed Stone Granular Fill:

1. Classified as clean fill.
2. Natural material.
3. Dense graded aggregate per NJDOT specifications, Section 901.03.
4. Size No. 5 or 57.
5. Or equivalent natural material and gradation and acceptable to the Owner's Representative.
6. Alternative recycled materials with documentation demonstrating compliance with the above requirements, and approved in advance, in writing by the Owner's Representative.

2.2 EQUIPMENT

A. Seismograph:

1. 3-component.
2. Capable of measuring particle velocity in three mutually perpendicular directions.
3. Annual factory calibration certificate throughout duration of work.
4. Capable of producing a permanent record of readings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements

B. Section 01 35 43 – Environmental Protection

C. Verify restricted areas are fully demarcated.

D. Verify survey bench marks and intended elevations for the Work are as indicated on Drawings.

E. Complete precondition survey for areas designated for vibration monitoring.

1. Photographic documentation.
2. Photograph entire area of planned vibration monitoring.
3. Structures within area of vibration monitoring.
    a. Interior and exterior photographs.
    b. Note any existing damage or distress.

3.2 PREPARATION

A. Contact New Jersey One Call at 811 or 800-272-1000 not less than three nor more than 10 working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding all construction areas.

B. Verify location of all private utilities that will not be marked by New Jersey One Call in all construction areas:

1. Confirm requirements on the Drawings.
2. Pre-excavation site walk with the Owner's Representative.
3. Hand or "soft-dig" excavation to verify underground features, if locations are uncertain.

C. Identify required lines, levels, contours, and datum.

D. Comply with all local utility company requirements.

E. Protect utilities indicated to remain from damage.

F. Protect all restricted areas, plant life, lawns, residential facilities, and other features to remain at the conclusion of the work and upon final site restoration.

G. Protect bench marks, survey control point, existing structures, fences, paving, and any other features to remain from excavation equipment and vehicles.

H. Place seismographs per approved Vibration Monitoring Plan.

3.3 GENERAL

A. Perform all excavation and fill to lines and grades as shown on the Drawings, specified herein, and as necessary to properly complete the Work.

B. Provide survey and stakeout as required to complete work per contours and elevations and at tolerances specified herein.

C. Do not perform excavation in a manner that interrupts or causes unnecessary ponding of normal drainage.

D. During excavation do not allow drainage that may come in contact with potentially contaminated materials to leave the work area in an uncontrolled manner.

E. Segregate different material types and do not intermix uncontaminated and contaminated materials or waste.

F. Maintain stable excavation slopes per OSHA requirements, and perform all excavation work in a safe and workmanlike manner and accordance with OSHA requirements.

G. Protect and demarcate/barricade all unattended excavation areas. Where there is any evidence of trespass or accessibility to excavation areas by unauthorized foot or vehicular traffic, in addition to normal barricades or demarcation, place lighted barricades around unattended excavation areas.

H. Restrict excavation areas and maintain site security during all phases of earthwork.

I. Personnel and equipment that come into contact with contaminated materials shall follow decontamination procedures in accordance with the Site-Specific Health and Safety Plan. See Section 00 73 19 – Health and Safety Requirements.

3.4 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated or regraded without mixing with foreign materials or subsoil for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in areas designated for stockpiling and staging, as shown on the Drawings. Stockpile heights shall not exceed eight feet. Provide protection from erosion.

D. Reuse topsoil to the maximum extent practicable.

E. If excess topsoil remains during completion of final site restoration work, spread on site at locations as directed by the Owner's Representative.

3.5 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated as shown on the Drawings.

B. During excavation do not mix subsoil with underlying waste or mine tailings.

C. Whenever practicable directly reuse subsoil as fill in the Work to achieve grades as shown on the Drawings.

D. Stockpile subsoil in areas designated for staging and stockpiling and protect from erosion.

3.6 WASTE/UNSPECIFIED FILL/MINE TAILINGS EXCAVATION

A. Perform all waste, unspecified fill, and mine tailings excavation in accordance with the Site-Specific Health and Safety Plan.

B. During any waste, unspecified fill, or mine tailings excavation, keep all air monitoring systems fully functional. Any interruption in air monitoring shall be cause for shutting down the excavation work, at the sole discretion of the Owner's Representative.

C. To the maximum extent practicable keep waste, unspecified fill, and mine tailings segregated.

D. Handle, characterize, and reuse waste, unspecified fill, and mine tailings in accordance with the following:

1. Place materials into approximately 500 cubic yard lots for sampling and analysis for the characteristics of hazardous waste, in areas designated on the Drawings.
2. Any stockpiled material not placed on like material in a previously excavated area or on like material in an area yet to be excavated shall be placed in a temporary lined and covered containment cell as shown on the Drawings.
3. As material is excavated remove observed waste materials that would interfere with reuse and compaction and separately stockpile for proper disposal off site.
4. Collect discrete, representative samples from temporary stockpiles and send to a NJ certified laboratory designated by the Owner's Representative for testing of ignitability, corrosivity, reactivity, and TCLP metals under chain of custody and with rapid analytical turnaround time (24-36 hours).
5. Report test data directly to the Owner's Representative.
6. Sequentially test, verify characteristics for reuse, and reuse material or designate material for separate staging in a lined and covered containment cell for off-site disposal.

3.7 PAINT WASTE AND DRUM EXCAVATION

A. Be advised that during the course of excavation in any area, encountering paint waste, drums, or drum carcasses is a possibility.

B. Upon encountering paint waste, drums, or drum carcasses during excavation, immediately notify the Owner's Representative.

C. All such excavation shall be in accordance with the approved Paint Waste, Drum, and Drum Carcass Excavation Plan. See Section 02 86 00 – Paint Waste and Drum Handling.

3.8 FILLING AND GRADING

A. Use fill materials as specified herein and as shown on the Drawings.

B. Place fill to contours and elevations as shown on the Drawings.

C. Do not place frozen materials.

D. Place fill material in continuous layers and compact in accordance with schedules at end of this section.

E. Maintain moisture content of fill materials to attain compaction specified in schedules at the end of this section.

F. Make grade changes gradual. Blend slopes into level areas.

G. Maintain positive drainage.

H. Repair or replace items indicated to remain damaged by excavation or filling.

I. Do not place lifts of fill material on any surface where standing water is present.

J. Where surface exhibits standing water/interface with groundwater table, provide stabilization of the subgrade with crushed stone and/or geotextile prior to placement of fill, per the Drawings.

3.9 TOLERANCES

A. Top Surface of Subgrade or structural fill: Plus or minus 1/10 foot from designed elevation.

B. Final Grades; Plus or minus 1/10 foot from designed elevations.

C. Topsoil; Specified thickness plus or minus one inch.

3.10 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements

B. Perform in place compaction tests in accordance with the following:

1. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
2. Unless otherwise approved in writing by the Owner's Representative.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests:

1. Modified Proctor – ASTM D1557 per material type requiring compaction testing and no less frequently than every 5,000 cubic yards and any visual change in material or change in material source.
2. Grain size – ASTM C136 or ASTM D422 per Owner's Representative, every 5,000 cubic yards and any visual change in material or change in material source.
3. Atterberg Limits – ASTM D4318 every 5,000 cubic yards and any visual change in material or change in material source.
4. Field Density and Moisture – ASTM D6938, 100' grid or every 50' along linear alignments, per lift.

3.11 PLACEMENT AND COMPACTION SCHEDULES

A. Structural Fill:

1. Maximum 6"-8" loose lifts.
2. Compact uniformly to minimum 95 percent of maximum density per ASTM D1557.

B. Final Cover Subsoil Fill:

1. Maximum 12” loose lifts.
2. Minimum of three passes with conventional earthmoving equipment to unyielding condition.
3. Submit equipment for Owner’s Representative’s approval.

C. Unspecified Fill and Mine Tailings:

1. Maximum 12” loose lifts.
2. Minimum of three passes with conventional earthmoving equipment to unyielding condition.
3. Submit equipment for Owner’s Representative’s approval.

D. Topsoil Fill:

1. Minimum 6” loose thickness.
2. Lightly roll, do not over-compact.
3. Place only when moisture content is appropriate to work the soil.

3.12 VIBRATION MONITORING

A. Perform vibration monitoring in accordance with the approved Vibration Monitoring Plan.

B. Perform vibration monitoring during all periods when earthmoving equipment is in operation, unless otherwise specified in the approved Vibration Monitoring Plan.

C. PPV shall not exceed the allowable frequency dependent particle velocity established by the US Bureau of Mines, Office of Surface Mining Standards, at any adjacent structures.

D. PPV shall not exceed the allowable values specified per C above within 100 feet of the limit of work.

E. If PPV exceeds the above criteria, cease work and consult with the Owner’s Representative prior to restarting work. Prior to restarting work:

1. Demonstrate that measured PPVs are acceptable prior to restarting work, or
2. Develop a plan for reducing PPVs to acceptable levels prior to restarting work.

END OF SECTION

SECTION 31 23 19 - Dewatering

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dewatering.
2. Surface water controls.
3. Operation and maintenance.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Section 31 25 13 – Erosion and Sediment Controls
3. Section 31 37 00 – Stone Riprap
4. Section 46 01 00 – Temporary Wastewater Treatment Equipment

1.2 DEFINITIONS

A. Dewatering includes:

1. Lowering the groundwater table and intercepting horizontal water seepage to control groundwater entering an excavation.
2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations.
3. Discharge of dewatering waters to groundwater within the area of attainment.

1.3 DESCRIPTION

A. Provide dewatering only as necessary where excavation occurs below the groundwater table.

B. Provide surface water controls as necessary to avoid ponding in work areas.

C. Provide dewatering and surface water controls to permit Work to be completed on stable subgrade.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Shop Drawings:

1. Dewatering pumps and capacity.
2. Dewatering system arrangement.
3. Discharge to groundwater system arrangement.
4. Ability to comply with Permit-by-Rule per NJAC 7:14A-7.5.

5. All submitted calculations are to be signed and stamped by a Professional Engineer licensed to practice in the State of New Jersey.

1.5 QUALITY ASSURANCE

A. Comply with authorities having jurisdiction for the following:

1. Water discharge from pumping operations.
2. Comply with NJDEP NJPDES Permit by Rule requirements per NJAC 7:14A-7.5.

PART 2 - PRODUCTS

2.1 DEWATERING EQUIPMENT

A. Temporary dewatering equipment only. No permanent installation or product purchase is required.

B. Select dewatering equipment to meet specified performance requirements.

C. Equipment capable of a minimum of 50 gallons per minute dewatering and discharge to groundwater rates.

D. Provide all necessary pumps, piping, valves, flow meters, and appurtenances for a continuously operating system.

E. Comply with design requirements as illustrated on the Drawings and per the Permit-by-Rule per NJAC 7:14A-7.5.

PART 3 - EXECUTION

3.1 DEWATERING

A. Section 01 30 00 - Administrative Requirements

B. Section 02 86 00 - Paint Waste and Drum Handling

C. Utilize dewatering equipment as necessary to allow for Work to progress unrestricted.

D. Treat dewatering waters with Temporary Wastewater Treatment Equipment per Section 46 01 00. Comply with NJPDES Permit-by-Rule per NJAC 7:14A-7.5.

E. Minimize entrapment of sediment to the extent practicable through use of sumps, stone, or other means.

F. Locate dewatering components to allow continuous operations without interfering with other Work.

G. Operate dewatering equipment in accordance with manufacturer's instructions.

H. Operation of equipment unattended is prohibited.

3.2 SURFACE WATER CONTROL

A. Divert run-on:

1. Temporary diversion channels.
2. Temporary berms.
3. Hay bales.
4. Other means, as approved by the Owner's Representative.

B. Do not allow surface runoff to accumulate in active construction areas.

3.3 OPERATION AND MAINTENANCE

A. Operate dewatering equipment continuously as necessary.

B. Provide personnel trained in use and maintenance of the equipment.

C. Make required repairs and perform scheduled maintenance.

D. If dewatering equipment cannot control water within excavation, notify Owner's Representative:

1. Stop excavation work.
2. Coordinate with Owner's Representative regarding depth limit of excavation.

E. Do not discontinue dewatering operations without Owner's Representative's approval.

3.4 WATER DISPOSAL

A. Section 46 01 00 – Temporary Wastewater Treatment Equipment

B. Contain water within the larger excavation area (limits of attainment).

C. Alternatively, excavate future detention basin and use for storage/recharge of water, as shown on the Drawings.

D. Discharge water to rip rap lined recharge pit/detention basin area for infiltration to groundwater as shown on the Drawings.

E. Provide direct reading flow measurement, plus/minus 2% accuracy, of dewatering rate and recharge rate, and record average daily rate.

F. Measure groundwater levels at designated monitoring wells per the NJPDES Permit-by-Rule approval from the NJDEP, and execute actions as necessary in response to increases in groundwater levels, also per the NJPDES Permit-by-Rule approval from the NJDEP.

G. Discharge of silty, muddy or polluted water from construction or dewatering operations to a natural water course or wetland is strictly prohibited.

3.5 REMOVAL

A. Remove dewatering equipment and surface water controls after dewatering operations are complete.

B. Temporary equipment is the sole responsibility of the contractor.

END OF SECTION

SECTION 31 25 13 – Erosion and Sediment Controls

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silt fences.
2. Straw bales.
3. Temporary seeding and mulching.
4. Construction stabilized entrances.

B. Related Sections:

1. Section 01 35 43 – Environmental Protection
2. Section 31 10 00 – Site Clearing
3. Section 31 20 00 – Excavation, Fill and Grading
4. Section 31 23 19 – Dewatering
5. Section 32 92 19 – Seeding and Planting

1.2 REGULATORY REQUIREMENTS AND REFERENCES

A. Execute all work for this Section in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, most current version.

B. Perform work according to the Soil Erosion and Sediment Control Plan approved by the Hudson-Essex-Passaic Soil Conservation District.

PART 2 - PRODUCTS

2.1 SILT FENCE FABRIC

A. Silt fence fabric shall be woven and consist of monofilaments of polypropylene treated with ultraviolet light stabilizers. The fabric shall have sleeves through which either steel or two-inch square wood posts can be inserted.

B. Silt fence fabric shall be inert to chemicals commonly found in soils and to hydrocarbons.

C. Silt fence fabric shall be resistant to mildew, rot, insects, and rodent attack.

D. Silt fence fabric shall be supported by 14 gauge minimum, galvanized welded wire mesh or polymeric mesh.

2.2 SILT FENCE POSTS

A. Wood shall be composed of sound quality hardwood.

B. Wood posts shall be a minimum of 36 inches long.

C. Steel posts shall be standard T & V section weighing not less than one pound/linear foot.

2.3 STRAW BALES

A. Straw bales shall consist of un-decayed firmly-packed straw of nominal size 14 inches by 18 inches by 36 inches as prepared by any standard hay-bailing machine and firmly bound by at least two separate circuits of rope or band material which will withstand weathering for a minimum of three months.

2.4 PLANTING MATERIALS

A. Seed and Mulch; As specified in Section 32 92 19 – Seeding and Planting.

2.5 CONSTRUCTION STABILIZED ENTRANCES

A. Stabilized construction entrance shall conform to relevant requirements of the Standards for Soil Erosion and Sediment Control in New Jersey.

B. Existing stabilized construction entrance may be used in lieu of new construction.

C. Install stone tracking pads at site entrances as required. Be responsible for maintaining the tracking pads, removing accumulated sediment or other material when the stone becomes blinded and the pad becomes ineffective.

D. Keep all local roads free of dust, debris, and soil from transportation of materials for the Work and immediately clean any road surfaces not kept free of dust, debris, and soil.

PART 3 - EXECUTION

3.1 GENERAL

A. Section 01 30 00 – Administrative Requirements

B. Section 01 35 43 – Environmental Protection

3.2 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time and before disturbing soil.

B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.

C. Temporarily stabilize any disturbed area of affected erosion control devices on which activity has ceased and will not recur within 30 days.

1. During non-germinating periods, apply mulch at recommended rates.
2. Temporarily seed and mulch disturbed areas in accordance with "Standard for Temporary Vegetative Cover for Soil Stabilization" within the Standards for Soil Erosion and Sediment Control in New Jersey, current version.

D. Permanently stabilize disturbed areas which are at finished grade, within 10 days, in accordance with Section 32 92 19 – Seeding and Planting. If weather conditions do not permit permanent stabilization, provide temporary stabilization.

E. Stabilize any drainage channels and stockpiles immediately. If drainage channels are used prior to vegetation becoming established, use erosion control fabric.

F. Maintain erosion and sediment control devices in working order, including necessary repairs and removal and proper disposal of accumulated sediment, throughout the project duration.

3.3 SILT FENCES

A. Install silt fence to follow ground contours and in the locations shown on the Drawings down slope of any area before disturbance by construction activities.

B. Extend silt fence posts at least 2 ft into the ground and extend at least 2 ft above ground. Space fence posts 8 feet on center or closer.

C. Install silt fence fabric panels loosely with adjacent panels overlapped a minimum of 12 inches.

D. Embed silt fence material at least six inches beneath ground surface and extend upward at least 2 ft above the disturbed area ground surface. The top edge of the fabric shall be reinforced or shall have a one-inch tuck.

3.4 STRAW BALES

A. Install straw bales in a row with ends tightly abutting. Embed each bale in the soil a minimum of four inches and place so that the bale bindings are oriented horizontally.

B. Securely anchor bales in place by wood stakes, steel fence pickets, or rebars driven through the bale. Drive stakes flush with the bale and extend at least 12 inches beneath the bale into the underlying soil.

C. Staking or embedding of the bales is not required if used in paved areas.

3.5 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements

B. Remove and dispose of sediment when sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

F. Dispose of any and all accumulated materials in accordance with applicable laws and regulations at a facility approved by the Owner's Representative.

3.6 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements

END OF SECTION

SECTION 31 37 00 – Stone Riprap

PART 1 - GENERAL

1.1 SUMMARY

A. Stone riprap for stabilized construction entrances, pipe culverts, or as otherwise shown on the Drawings.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Section 31 25 13 – Erosion and Sediment Controls

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Product Data - Submit data for geotextile fabric.

C. Supplier's Certificate: Showing stone riprap meets or exceeds New Jersey Department of Transportation specifications per 901.03.01 and 901.08.

1.3 QUALITY ASSURANCE

A. Furnish stone riprap from single source throughout the Work.

B. Multiple sources must be approved prior to the start of Work.

C. Provide gradation data per ASTM D5519 to verify riprap size meets D50 specified on Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish materials in accordance with the New Jersey Department of Transportation specifications 901.03.01 and 901.08.

B. Provide stone meeting geologic classifications in New Jersey Department of Transportation specification 901.03.01.

C. Stone riprap minimum specific gravity of 2.50.

D. Stone riprap gradation as follows:

1. 50 percent by weight greater than or equal to the specified D50 diameter as indicated on the Drawings.
2. Maximum stone size no greater than 1.5 times the specified D50 diameter as indicated on the Drawings.
3. Breadth or thickness of a single stone not less than 1/3 its length.

2.2 SOURCE QUALITY CONTROL (AND TESTS)

A. Make stone available for inspection at producer's quarry prior to shipment.

B. Notify Owner’s Representative at least seven days before inspection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements

3.2 PLACEMENT

A. Place riprap where shown on the Drawings.

B. Utilize appropriate equipment to place riprap.

C. Place riprap so that stone sizes are well distributed, avoiding pockets of uniform or smaller stone size.

D. Place geotextile (Section 31 05 19) under riprap as required.

E. Compact stone as necessary.

F. Installed Thickness:

1. 2 times D50 with geotextile filter.
2. 3 times D50 without geotextile filter.

END OF SECTION

SECTION 31 50 00 – Excavation Support and Protection

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shoring, bracing, and sheeting or sheet piling in excavated areas.

B. Related Sections:

1. Section 31 10 00 - Site Clearing
2. Section 31 23 19 - Dewatering
3. Section 31 25 13 – Erosion and Sediment Controls

1.2 REFERENCES

A. Construction Standards for Excavations, 29 CFR Part 1926.650-652, the Occupational Safety and Health Administration.

B. Construction Safety and Health Regulations, U.S. Department of Labor, Occupational Safety and Health Administration.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Submit drawings, computations and substantiating data prepared, and signed and sealed by a Professional Engineer licensed in the State of New Jersey.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet Piling.

1. Steel sheet piling shall conform to the requirements of ASTM A328.

B. Timber Sheeting and shoring.

1. The timber, unless otherwise noted, may consist of any species which will satisfactorily stand driving and/or support excavation sidewall.

2. Timber shall be sawn or hewn with square corners and shall be free from worm holes, loose knots, wind shakes, decayed or unsound portions, or other defects which might impair its strength or tightness.

C. Trench Boxes

1. Trench Boxes shall conform to OSHA regulations.
2. The trench box (or shield) shall be sized for height, width and weight, appropriate for the trench width, height and soil conditions.

PART 3 - EXECUTION

A. Section 01 30 00 - Administrative Requirements

B. Use of sheeting and shoring shall be confirmed with the Owner's Representative prior to the start of any such installations.

C. Use sheeting and shoring only where excavation is below the water table, and has been approved in advance by the Owner's Representative.

D. The schedule and progress of the shoring, bracing, and sheeting work shall be coordinated with the dewatering, excavation, and backfilling work.

E. If, during the progress of the excavation, lateral movement of the adjacent ground or structures is discovered, corrective measures shall be taken immediately to prevent further movement.

F. Shoring, bracing, and sheeting or sheet piling necessary to complete the construction, protect personnel and structures, and prevent the loss of ground or caving of embankments as shown, specified or required, shall meet all applicable building and safety codes.

G. All sheeting, whether steel or timber or a trench box, shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work.

H. Construction shall be such as to permit excavation as required.

I. Interior dimension shall be such as to give sufficient clearance for construction forms and their inspection.

J. If the Owner's Representative is of the opinion that proper supports have not been provided, he may order additional supports put in at the expense of the Contractor. Compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports.

K. Care shall be taken to prevent voids outside of the sheeting. If voids are formed, they shall be immediately filled and rammed.

L. All parts of the sheeting shall be removed upon completion of the work for which it was provided.

M. Backfill the excavation and properly compact prior to removal of sheeting unless otherwise permitted by the Owner's Representative.

N. Sheeting may be left in place at the option of the Contractor if so permitted by the Owner's Representative and the cutoffs removed from the site.

O. The excavation at the end wall of open-ended trench boxes shall be sloped to prevent cave-in from the end.

P. Trench boxes shall be installed in a manner to restrict lateral or other hazardous movement of the box, such as sudden lateral movement of the trench side walls.

Q. Do not occupy the trench box when being installed, removed, or moved within the trench.

R. Excavations of earth materials to a level not greater than 2 feet (0.61 m) below the bottom of the shield shall be permitted. This level of excavation is permitted only if the shield is designed to resist the forces calculated for the full depth of the trench and if there are no indications of a possible loss of soil from behind or below the bottom of the shield while the trench is open.

S. Where the Contractor elects not to remove shoring and bracing material, if acceptable to the Owner's Representative, all such material shall be removed to the extent that the top of the material shall be a minimum of 5 feet below the proposed finished grade.

T. Removal of shoring and bracing shall be carried out in a manner such that no structure shall be disturbed or damaged during or after removal.

U. Protection of structures during the removal of shoring and bracing shall be the sole responsibility of the Contractor and any disturbance or damage shall be rectified at no expense to the Owner.

V. Installation and removal methods of shoring and bracing shall meet, or exceed, the minimum requirements of the applicable codes and safety precautions as outlined in such codes, and shall be enforced by the Contractor.

END OF SECTION

SECTION 32 12 16 – Asphalt Paving

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt materials.
2. Subbase.
3. Asphalt paving.

B. Related Sections:

1. Section 31 10 00 – Site Clearing
2. Section 31 20 00 – Excavation, Fill and Grading
3. Section 31 25 13 – Erosion and Sediment Controls

1.2 REFERENCE STANDARDS

A. New Jersey Standard Specifications for Road and Bridge Construction, most current version.

B. American Society for Testing and Materials (ASTM):

1. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
2. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Product Data:

1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate:

1. Certify products meet or exceed New Jersey Standard Specifications for Road and Bridge Construction, most current version.

1.4 QUALITY ASSURANCE

A. Mixing Plant:

1. Conform to New Jersey Standard Specifications for Road and Bridge Construction, most current version.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with New Jersey Department of Transportation standards.

1.5 QUALIFICATIONS

A. Installer:

1. Company specializing in performing work of this section with minimum ten years documented experience.

1.6 AMBIENT CONDITIONS

A. Do not place asphalt mixture between November 1 and March 1 unless approved by the Owner's Representative.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees Fahrenheit or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 ASPHALT PAVING

A. Performance / Design Criteria:

1. Design for light duty commercial vehicles.

B. Asphalt Materials:

1. Top course conforming to the New Jersey Standard Specifications for Road and Bridge Construction, most current version, Hot-Mix Asphalt (HMA), 12.5M64 top course.
2. Binder course conforming to the New Jersey Standard Specifications for Road and Bridge Construction, most current version, Section 902.02 Hot-Mix Asphalt (HMA) 37.5M64 course.
3. Subbase course conforming to the New Jersey Standard Specifications for Road and Bridge Construction, most current version, Type 2 subbase course compacted to 95% of dry density as determined by Modified Proctor Analysis.
4. Tack Coat: Prime coat and tack coat materials conforming to Section 902 of the New Jersey Standard Specifications for Road and Bridge Construction, most current version.

2.2 SOURCE QUALITY CONTROL

A. Submit proposed mix design for review prior to beginning of Work.

B. Supplier verified as meeting requirements of New Jersey Department of Transportation.

C. Test samples in accordance with New Jersey Standard Specifications for Road and Bridge Construction, most current version.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subbase is dry and ready to support paving and imposed loads.

D. Verify grades and elevations of base are correct.

E. Verify infrastructure, if any, is installed in correct position and elevation.

F. Verify limits of new paving.

3.2 DEMOLITION

A. Saw cut and notch existing paving as indicated on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects, as necessary, in existing paving to provide uniform surface for new paving.

3.3 INSTALLATION

A. Subbase:

1. Confirm subbase material and compaction is suitable for base course.
2. Prepare aggregate subbase as shown on the Drawings and in accordance with Section 302 of the New Jersey Standard Specifications for Road and Bridge Construction.
3. Construct the bituminous concrete binder course as shown on the Drawings and in accordance with Section 302 of the New Jersey Standard Specifications for Road and Bridge Construction.

B. Primer:

1. Apply primer in accordance with Section 302 of the New Jersey Standard Specifications for Road and Bridge Construction.

C. Tack Coat:

1. Apply tack coat, as needed, to the bituminous concrete binder course in accordance with Section 902 of the New Jersey Standard Specifications for Road and Bridge Construction, most current version.

D. Asphalt Paving:

1. Install Work in accordance Section 902 of the New Jersey Standard Specifications for Road and Bridge Construction.
2. Place bituminous concrete top course as shown on the Drawings and in accordance with Section 902 of the New Jersey Standard Specifications for Road and Bridge Construction.
3. Place asphalt within 24 hours of applying primer or tack coat.
4. Place binder course to thickness indicated on the Drawings.
5. Place top course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
6. Place top course to thickness indicated on Drawings.
7. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
8. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.4 FIELD QUALITY CONTROL

A. Take samples and perform tests in accordance with New Jersey Standard Specifications for Road and Bridge Construction, most current version.

B. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

C. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

D. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 1000 square yards compacted paving.

3.5 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements

B. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 140 degrees Fahrenheit.

C. Do not allow traffic on newly paved areas prior to approval by the Owner’s Representative.

END OF SECTION

SECTION 32 15 40 – Crushed Stone Surfacing

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary cul-de-sac at the end of Van Dunk Lane, to permit access for emergency vehicles and local residents during construction.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Section 31 25 13 – Soil Erosion and Sediment Controls
3. Section 32 12 16 – Asphalt Paving

1.2 REFERENCE STANDARDS

A. New Jersey Standard Specifications for Road and Bridge Construction, most current version

B. American Society for Testing and Materials (ASTM):

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Samples:

1. Submit, in air-tight containers, 10 lb sample of all imported materials to testing laboratory specified by Owner's Representative, when requested.

C. Materials Source:

1. Submit name and location of all imported materials suppliers.

D. Material Quality:

1. Submit affidavit from supplier for crushed stone surface course documenting material is suitable for unrestricted use and is defined as clean fill per NJAC 7:26E-1.8.
2. Submit analytical data confirming quality of material meets requirements as clean fill as defined by the NJDEP in "Fill Material Guidance for SRP Sites".
3. If crushed stone surface course is from a virgin source, submit documentation verifying the basis for determination of a virgin source.

E. Material Properties:

1. Submit data on physical properties of crushed stone surface course per Section 2.

F. Testing Laboratory:

1. Per Section 31 20 00 – Excavation, Fill and Grading.

1.4 QUALITY ASSURANCE

A. Conform to New Jersey Standard Specifications for Road and Bridge Construction, most current version.

B. Obtain materials from same source throughout.

PART 2 - PRODUCTS

2.1 CRUSHED STONE SURFACING

A. Crushed Stone Surface Course:

1. Conform to the subbase requirements per New Jersey Standard Specifications for Road and Bridge Construction, most current version.
2. Soil Aggregate, I-3 (Table 901.11-1 Standard Soil Aggregate Gradation)

Gradation Designations, percentage by weight passing square mesh sieves					
	1-1/2"	3/4"	No. 4	No. 50	No. 200
I-3	100	60-90	40-80	10-35	0-8

PART 3 - EXECUTION

3.1 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements

B. Prepare material in accordance with New Jersey Standard Specifications for Road and Bridge Construction, most current version.

C. Verify utilities locations prior to start of Work.

D. Verify grades and elevations are correct.

E. Do not place stone surface course when subsurface is unstable or frozen.

F. Verify sub-base is stable, proof roll or add crushed stone surface course or geotextile as necessary to stabilize sub-base.

3.2 INSTALLATION

A. Install stone as indicated on the Drawings and in accordance with the methods detailed in Section 301 of the New Jersey Standard Specifications for Road and Bridge Construction, most current version.

B. Place in 8-inch minimum lifts and compact within a tolerance of ±1/2-inch of required elevation.

C. Place a minimum of two lifts.

D. Compact to 95% of maximum dry density, Proctor Compaction test.

E. If compaction is not sufficient, continue compaction or take corrective action to achieve required density.

F. Surface course for travel way shall consist only of aggregate (I-3) specified in this section.

END OF SECTION

SECTION 32 31 13 - Chain Link Fences and Gates

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts.
4. Manual gates and related hardware.
5. 8’ height.
6. Traffic gates suitable for two way traffic, minimum 20’.
7. Dimensions as shown on drawings.
8. Temporary fence.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading

1.2 SUMMARY

A. American Society for Testing and Materials (ASTM):

1. ASTM A123/A123M - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.
4. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
5. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
6. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
7. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
8. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

B. Chain Link Fence Manufacturers Institute (CLFMI):

1. CLFMI - Product Manual.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Shop Drawings:

1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data:

1. Submit data on fabric, posts, accessories, fittings and hardware.

D. Manufacturer's Installation Instructions:

1. Submit installation requirements, (post foundation anchor bolt templates, etc.).

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements

B. Project Record Documents: Accurately record actual locations of property perimeter fence and include in record survey.

1.5 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform work in accordance with manufacturer’s instructions.

C. Verify that field measurements are as indicated on shop drawings.

1.6 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer:

1. Company specializing in performing work of this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure, dry place.

PART 2 - PRODUCTS

2.1 PERMANENT FENCE

A. Materials:

1. Materials and Components: Conform to CLFMI Product Manual.
2. Framing (Steel); ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, coating conforming to ASTM F1043 Type A on pipe exterior and interior.
3. Fabric Wire (Steel); ASTM A392 Class 1 zinc coated steel wire.
4. Concrete; ASTM C94/C94M, Option A Ready-Mixed Concrete. Normal Portland Cement, 2,500 psi strength at 28 days.

B. Components:

1. Line Posts; 2½-inch nominal diameter.
2. Terminal, Corner, Rail, Brace, and Gate Posts; 3-inch nominal diameter.
3. Fabric; 2-inch diamond mesh interwoven wire, 9 gauge, top selvedge twisted tight, bottom selvedge knuckle end closed.
4. Tie Wire; Aluminum alloy steel wire.

C. Accessories:

1. Caps; Cast steel galvanized, sized to post diameter, set screw retainer.
2. Fittings; Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.
3. Gate Hardware; Fork latch with gravity drop.

D. Gates:

1. Gate Types, Opening Widths and Directions of Operation; As indicated on Drawings.
2. Factory assembled gates.
3. Design gates for operation by one person.
4. Swing Gates; Fabricate gates to permit 180 degree swing.
5. Gates Construction; ASTM F900 with welded corners. Use of corner fittings is not permitted.

E. Finishes:

1. Components and Fabric; Galvanized to ASTM A123/A123M for components; ASTM A153/A153M for hardware; ASTM A392 for fabric; 2.0 oz/sq ft coating.
2. Hardware; Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.
3. Accessories; Same finish as fabric.

2.2 TEMPORARY FENCE

A. Chain link.

B. 8’ high.

C. 1-3/8” diameter galvanized steel frame.

D. 11 gauge fabric with 2-1/4” mesh, 10’ panel widths.

E. Panel width may vary to suit dimensions, but 10’ or less.

F. One vertical and one horizontal brace per panel, 1-3/8” diameter galvanized steel.

G. Aluminum tie wires.

H. 1-3/8” diameter galvanized steel stands, or equal (i.e., spike anchors permitted where not in bedrock).

I. Welded construction.

J. Galvanized steel clamps, nuts, and bolts.

PART 3 - EXECUTION

3.1 INSTALLATION – PERMANENT FENCE

A. Fence:

1. Perform One-Call for utility markouts.
2. Install framework, fabric, accessories and gates in accordance with manufacturer’s instructions.
3. Set intermediate, terminal, gate, posts plumb, in concrete footings with top of footing 2 inches above finish grade.
4. Brace each gate and corner post to adjacent line post with horizontal center brace rail Install brace rail one bay from end and gate posts.
5. Install top rail through line post tops.
6. Install center and bottom brace rail on corner gate leaves.
7. Place fabric on outside of posts and rails.
8. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
9. Position bottom of fabric 2 inches above finished grade.

10. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
11. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
12. Install bottom tension wires stretched taut between terminal posts.
13. Support gates from gate posts. Do not attach hinged side of gate from building wall.
14. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches, and drop bolt.
15. Connect to existing fence at existing terminal post, where applicable.

B. Field Concrete:

1. Install all concrete in accordance with the details shown in the Design Drawings and as specified below.
2. No additional water, except for the amount indicated by the design mix, shall be added to the concrete without the prior permission of the Engineer.
3. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials. Ensure surrounding material is moist and compact.
4. Footing Depth Below Finish Grade: ASTM F567, 3 feet for standard fence posts and 3.5 feet for gate posts.
5. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
6. Slope top of concrete for water runoff.
7. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
8. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

C. Erection Tolerances:

1. Maximum Variation from Plumb: ¼-inch.
2. Maximum Offset from Indicated Position: 1-inch.
3. Components shall not infringe on adjacent property lines.

3.2 INSTALLATION - TEMPORARY

A. Temporary Fence:

1. Confirm locations with Owner's Representative.
2. Place temporary fence per manufacturer's instructions.
3. Secure individual panels per manufacturer's instructions.
4. Secure ends of temporary fence to permanent fence.
5. Install plumb and square, as applicable.
6. Place panels so that gaps are not present; install clamps between adjacent panels.
7. Place stands in stable areas, adjust grade if necessary and possible.
8. Provide additional weight (e.g., sand bags) on stands as necessary to secure and stabilize fence.
9. Remove when necessary for final, permanent fence installation.

END OF SECTION

SECTION 32 92 19 – Seeding and Planting

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparation of Topsoil.
2. Spreading Topsoil.
3. Fertilizing.
4. Planting.
5. Hydroseeding.
6. Mulching.
7. Maintenance.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
2. ANSI Z60.1 - Nursery Stock.

B. New Jersey Department of Transportation Standard Specifications, most current version.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

B. Plants: Living trees, plants, and ground cover specified in this Section.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Product Data:

1. Submit data for plant material sources, seed mix, fertilizer, mulch, and other accessories.

C. Submit minimum 10 ounce sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements

B. Operation and Maintenance Data:

1. Include maintenance instructions, pruning objectives, application frequency, cutting method, etc.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Tree Pruning; ANSI A300 Pruning Standards for Woody Plants.

C. Perform Work in accordance with New Jersey Department of Transportation standards.

1.7 QUALIFICATIONS

A. Seed Supplier:

1. Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer:

1. Company specializing in performing work of this section with minimum three years documented experience.

C. Tree Pruner:

1. Company specializing in performing work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

D. Protect and maintain plant life until planted.

E. Deliver plant life materials immediately prior to placement. Keep plants moist.

F. Plant material damaged as a result of delivery, storage or handling will be rejected.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements

B. Seeding and planting shall be performed between March 15 to May 31, or from August 15 to October 1.

C. Do not install plant life when wind velocity exceeds 30 mph.

1.10 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements

B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition.

1.11 WARRANTY

A. Repair or replace plantings that fail within the warranty period.

B. Warranty periods:

1. Trees, 12 months from planting.
2. Shrubs or other herbaceous material, 12 months from planting.
3. Seed or ground cover, first full growing season.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials in accordance with NJDOT Specifications, Section 917.

B. Description:

1. Temporary Seeding; Perennial rye grass, per NJDOT Specification 917.05.01.
2. Permanent Seeding; Perennial rye grass, Blackwell switchgrass, Virginia wild rye, Red top, equal parts.

C. Seeding only for areas not otherwise restored as riparian zone or freshwater wetlands. See riparian zone and freshwater wetlands planning plans for other requirements.

2.2 PLANT MATERIAL

A. Provide as shown on the Drawings.

B. Label each plant delivered to the site.

C. All plant materials shall be healthy and of the size and type shown on the Drawings.

D. Plant materials shall be free of disease or any deleterious substances.

E. Plant materials shall be of the sizes and quantities shown on the Drawings.

F. Provide from a qualified nursery and in proper containers, covered tree balls, and well watered.

2.3 ACCESSORIES

A. Mulching Material:

1. Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.

B. Fertilizer:

1. NJDOT Specifications, most recent version, Section 917.03. Use fertilizer for establishing turf that has a commercial designation of 10-20-10, or use any 1-2-1 ratio fertilizer containing a minimum of 5 percent nitrogen, 10 percent available phosphoric acid, and 5 percent soluble potash.

C. Lime:

1. NJDOT Specifications, most recent version, Section 917.04, agricultural limestone containing a minimum 85 percent calcium and magnesium carbonates equivalent to more than 40 percent calcium and magnesium oxides.

D. Water:

1. Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric:

1. Biodegradable, three-dimensional matting, SC150 as manufactured by North American Green, or approved equivalent.

F. Stakes:

1. Softwood lumber, chisel pointed.

G. String:

1. Inorganic fiber.

2.4 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

C. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil suitable for seeding, fertilizing and mulching. Do not grade smooth. Leave undulations and low areas for potential future vernal pool formation.

B. Remove foreign materials, weeds, and undesirable plants and their roots.

C. Scarify subsoil to depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds three times wider than plant root system.

3.3 PLACING TOPSOIL

A. Reuse any available topsoil previously stripped and stockpiled from Site and provide and place, at no additional cost to Owner, any additional topsoil required from off-site as may be necessary to provide grades required or shown on the Drawings.

B. Spread topsoil to a minimum depth of 6-inches. Place topsoil over any other area disturbed during construction.

C. To achieve proper finish grades, topsoil shall be rough spread by means of a dozer, scraper pan, or other approved methods.

D. Place topsoil during dry weather and on dry unfrozen subgrade.

E. Remove vegetative matter and foreign non-organic material from topsoil while spreading.

3.4 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after final seedbed preparation of topsoil.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

G. Apply Fertilizer in strict conformance with the New Jersey fertilizer law (P.L. 1970, C. 66 supplementing Title 58) including fertilizer content, distance from water bodies (minimum of 25 feet), and certified applicators, among other provisions.

3.5 PLANTING

A. Set plants vertical.

B. Remove non-biodegradable root containers.

C. Set plants in pits or beds, partly filled with prepared plant mix, at minimum depth of 6 inches under each plant. Remove burlap, ropes, and wires, from top half of root ball.

D. Place bare root plant materials so roots lie in natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

E. Saturate soil with water when pit or bed is half full of topsoil and again when full.

3.6 HYDROSEEDING

A. Apply seeded slurry with hydraulic seeder at rate of:

1. Temporary Seed; 40 pounds per acre of perennial rye grass.
2. Permanent Seed; Equal parts of seed mix. Ensure seed purity of 90%, germination rate of 85%, and a maximum of 0.05% weed seed. Reseeding will be performed where required to establish cover.

B. After application, apply water with fine spray immediately after each area has been hydroseeded.

C. Perform Work in accordance with NJDOT Specifications.

3.7 SEED PROTECTION

A. Apply mulch in accordance with NJDOT Specifications.

B. Cover seeded slopes where grade is 4-inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36-inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum six inches.

G. Restrict foot and vehicular traffic from seeded areas after planting to end of established period. Provide, at no additional cost to Owner, protection of all existing seeded and/or grassed areas adjacent to Site.

H. Be responsible for erosion. Replace topsoil in washed-out areas and then re-seed, re-fertilize, and re-mulch at no additional cost to Owner.

I. Replace and re-seed any seeded areas lost by “winterkill” or any other causes during following Spring following procedures described in this Section, at no additional cost to Owner.

3.8 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes.

B. Tree Support Method per Tree Caliper:

1. 1 Inch: One stake with one tie.
2. 1 to 2 Inches: Two stakes with two ties.
3. 2 to 4 Inches: Three guy wires.
4. Over 4 Inches: Four guy wires.

3.9 MAINTENANCE

A. Maintain and care for all seeded areas including watering and fertilizing until a solid turf is established to satisfaction of Owner’s Representative. Vegetation will not be considered established until a minimum of 80% coverage is attained, in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey.

B. Apply water to prevent grass and soil from drying out.

C. Immediately reseed areas showing bare spots.

D. Repair washouts or gullies.

E. Protect seeded areas with warning signs during maintenance period.

3.10 TREE PRUNING

A. When pruning trees is permitted, lightly prune trees according to ANSI A300 Maintenance Pruning Type: Crown Cleaning.

3.11 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements

B. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.12 SCHEDULE

A. Perform work once final grading is complete, topsoil has been placed, and all intrusive Work is complete.

END OF SECTION

SECTION 33 24 13 – Gas Monitoring Wells

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gas monitoring wells.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures
2. Section 01 35 43 – Environmental Protection
3. Section 31 20 00 – Excavation, Fill and Grading
4. Section 33 29 00 – Groundwater Monitoring Well Extensions and Abandonment

1.2 REFERENCE STANDARDS

A. New Jersey Administrative Code (NJAC) 7:9D – Well Construction and Maintenance; Sealing of Abandoned Wells.

B. ASTM D1785, Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.

C. ASTM F480, Specification for Thermoplastic Well Casing Pipe and Coupling Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80.

D. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures

B. Submit all materials of construction for approval prior to installation.

C. Submit copies of all well permits.

PART 2 - PRODUCTS

2.1 WELL MATERIALS

A. Furnish cement bentonite grout according to NJAC 7:9D.

B. Water used for well abandonment and grout mixing shall be potable.

C. Schedule 80 PVC, flush joint, threaded casing per ASTM Specification D1785 and ASTM Specification F480.

D. Schedule 80 PVC, 0.010 slot, flush joint well screen as manufactured by Johnson Well Screen or approved equal.

E. Washed coarse sand compatible with 0.010 well screen slot size.

F. Protective black steel casing per ASTM Specification A53, with locking steel cap.

G. Provide prefabricated well cap with hose barb for sampling and PVC labcock shut off valve as show on the Drawings.

PART 3 - EXECUTION

3.1 EXECUTION

A. Perform all work by, or under the supervision of, a well driller licensed in the State of New Jersey.

B. Permits and all applicable well records shall be applied for and received in advance of performing the work.

C. Perform work in full accordance with NJAC 7:9D Well Construction and Maintenance; Sealing of Abandoned Wells.

D. Provide completed NJDEP Forms A and B upon completion of well installations.

E. Place wells where shown on the Drawings.

F. Place well screen in the unsaturated zone. Drill to top of zone of saturation in overburden to field verify. Place well screen 12” above zone of saturation.

G. If water table is shallow and does not suit dimensions shown on the Drawings, consult with Owner’s Representative prior to installation.

END OF SECTION

SECTION 33 29 00 – Groundwater Monitoring Well Extensions and Abandonment

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Groundwater monitoring well abandonment.
2. Groundwater monitoring well extensions.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures
2. Section 01 35 43 – Environmental Protection
3. Section 31 20 00 – Excavation, Fill and Grading

1.2 REFERENCE STANDARDS

A. New Jersey Administrative Code (NJAC) 7:9D – Well Construction and Maintenance; Sealing of Abandoned Wells.

B. ASTM D1785, Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.

C. ASTM F480, Specification for Thermoplastic Well Casing Pipe and Coupling Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80.

D. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures

B. Submit cement bentonite grout for well abandonment.

C. Submit materials for casing extensions.

D. Submit copies of all permits for well abandonment.

PART 2 - PRODUCTS

2.1 GROUT

A. Furnish cement bentonite grout according to NJAC 7:9D.

B. Use cement bentonite grout for the sealing of abandoned wells or grouting around well extensions.

2.2 WATER

A. Use potable water for well abandonment and grout mixing.

2.3 WELL CASING AND FITTINGS

A. Schedule 80 PVC per ASTM Specifications D-1785 and F480 flush joint, threaded pipe and fittings. Sizes as shown on the Drawings.

B. Protective black steel casing per ASTM Specification A53, standard weight designation.

C. Fernco (or approved equal) flexible coupling style 1056.

PART 3 - EXECUTION

3.1 EXECUTION

A. Perform all work by, or under the supervision of, a well driller licensed in the State of New Jersey.

B. Permits and all applicable well records shall be applied for and received in advance of performing the work.

C. Perform work in full accordance with NJAC 7:9D Well Construction and Maintenance; Sealing of Abandoned Wells.

D. Weld steel protective casing where extension required. Place concrete collar around protective steel casing to adequately support casing. Provide locking protective cap.

E. Extend Schedule 80 flush joint casing using Fernco coupling. Fill annular space with bentonite seal and cement/bentonite grout as shown on the Drawings.

F. Solvent are strictly prohibited for any application.

G. At a minimum for abandonment:

1. Clear the well of obstructions, if any.
2. If the well casing is overdrilled:
    a. Drill to remove the entire well casing, screen, and gravel pack.
    b. Maintain borehole at the original depth of the well until borehole is properly sealed with cement bentonite grout.
3. If the well casing is extracted:
    a. Seal borehole with cement bentonite grout from the bottom of the borehole to the ground surface.
4. If the well casing is perforated or ripped:
    a. Remove casing to two feet below the ground surface and fill borehole with cement bentonite grout.
    b. Protect top of the borehole and/or the top of the well casing from surface contamination at all times.
    c. Place grout under pressure via tremie method.
    d. Place additional grout as required if grout settles, to completing fill the borehole.

H. Prepare a complete well abandonment report on a form acceptable to the NJDEP, per NJAC 7:9D-3.1. File report with NJDEP and Owner's Representative.

END OF SECTION

SECTION 33 42 11 - Stormwater Gravity Piping

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, tools and appurtenances required to install storm water gravity piping as described in this Section and as depicted on the Drawings.

B. Section Includes:

1. Stormwater drainage piping.
2. Bedding and cover materials.

C. Related Sections:

1. Section 01 81 13 – Sustainability Requirements
2. Section 31 20 00 – Excavation, Fill and Grading
3. Section 31 23 19 – Dewatering
4. Section 31 25 13 – Erosion and Sediment Controls
5. Section 31 37 00 – Stone Riprap
6. Section 31 50 00 – Excavation Support and Protection

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.

B. American Society for Testing and Materials (ASTM):

1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
3. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
4. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
5. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Product Data:

1. Submit data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions:

1. Submit special procedures required to install Products specified.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with relevant ASTM standards.

1.5 DELIVERY, STORAGE AND HANDLING

A. Carefully handle all pipes and fittings when loading and unloading. Lift by hoists or lower on skidways in a manner to avoid shock.

B. Where required, due to weight of material and for the safety and protection of workmen, materials, equipment, property, and the work, use derricks, ropes, or other suitable equipment for lowering pipe into trenches. Take particular care to avoid damaging the pipe.

C. Protect all pipes and fittings from damage by sharp objects through all phases of work.

D. If any defective pipe is discovered, clearly mark as rejected and remove from the project site.

PART 2 - PRODUCTS

2.1 STORMWATER DRAINAGE PIPING

A. Plastic Piping:

1. Pipe:

a. Material; PVC.
b. Comply with ASTM D3034, SDR 35.
c. Style; Bell and spigot with rubber-ring sealed gasket joint.

2. Fittings; PVC.

3. Joints;

a. Comply with ASTM F477.
b. Gaskets; Elastomeric.

B. Corrugated Steel Piping:

1. Pipe:

a. Comply with AASHTO M36.
b. Coating; Inside and outside with bituminous coating.
c. Corrugated polyethylene may be substituted with appropriate supporting, technical information including calculations, details, and drawings.

2. Fittings; Corrugated steel.

3. Coupling Bands:

a. Material; Galvanized steel.
b. Size; 0.052 inch thick by 10 inches wide.
c. Connection; Two neoprene O-ring gaskets, and two galvanized-steel bolts.

C. Do not, under any condition, use solvent welds for pipe joining.

D. Use the same material as the pipe and manufactured by the same manufacturer for all fittings, couplings, etc.

E. Provide wire mesh at the exposed end of all pipes.

2.2 SOIL AND MISCELLANEOUS MATERIALS

A. Subsoil; No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

B. Pipe Bedding:

1. Sand bedding free of any sharp objects which could puncture or otherwise cause damage to piping. Provide certified clean sand, subangular or rounded, and a maximum particle size of 3/8-inch, and maximum of 10% passing 200 sieve, in conformance with NJDOT Specification 909.01.02.
2. Fine Aggregate, certified clean, and conform to NJDOT Specification 909.01.03.
3. Stone bedding shall be certified clean and conform to Section 901.03 of the NJDOT Specifications, coarse aggregate size No. 8.

C. Soil Backfill; as specified in Section 31 20 00 – Excavation, Fill and Grading.

D. Outlet Protection; as specified in Section 31 37 00 – Stone Riprap.

E. Anti-seep Collar, high density polyethylene:

1. High density polyethylene
2. Stainless steel pipe bands

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

C. Dewater excavations, if necessary, in accordance with Section 31 23 19 – Dewatering to maintain dry conditions to preserve final grades at bottom of excavation.

D. Provide sheeting and shoring, if necessary, as specified in Section 31 50 00 – Excavation Support and Protection.

E. Construct the sediment basin outlet structure according to the Construction Drawings. Fabricate outlet structure prior to installation.

3.3 INSTALLATION

A. All pipes shall be laid to the lines and grades shown in the Drawings.

B. Install pipe, fittings, and accessories in accordance with ASTM D2321.

C. Seal joints watertight. No solvent welding of PVC is permissible.

D. Install anti-seep collars in accordance with manufacturer's directions.

E. Place pipe on minimum six (6) inch deep bedding.

F. Install bedding at sides and over top of pipe. Install top cover to minimum compacted thickness of twelve (12) inches before earthmoving equipment may access trench. Fully compact pipe bedding around pipe to properly support pipe.

G. All suitable excavated material shall be utilized for backfill. Remove and replace with approved compacted fill any subgrade material that is designated by the Owner's Representative as unsuitable.

H. Stockpile excavated material in area designated on site and remove from site excess material not being used.

I. Install stone riprap aprons to dimensions specified in the Drawings.

J. Do not displace or damage pipe when compacting.

K. The interior of the pipe shall be kept free of silt, soil or debris during construction.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements

B. See Section 31 20 00 – Excavation, Fill and Grading for compaction test requirements.

END OF SECTION

SECTION 34 78 14 – Portable Axle Scale

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, equipment, materials, tools, and appurtenances required to complete the work of furnishing and installing a portable electronic axle scale weighing system designed to operate at a temporary on-site location.

B. Related Sections:

1. Section 31 20 00 – Excavation, Fill and Grading
2. Section 31 23 19 – Dewatering

1.2 REFERENCES

A. Specifications, Tolerances, and Technical Requirements for Weighing and Measuring Devices, (Handbook 44 (H-44)) as published by the National Institute of Standards and Technology (NIST).

1.3 DELIVERY, STORAGE, AND HANDLING

A. Fabricate the weighing system and deliver to the site in accordance with these specifications and manufacturer's instructions. Equipment shall be received and installed by a factory authorized company/personnel.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Shop Drawings:

1. Indicate plan layout showing physical dimensions, all components of the scale, including but not limited to, scale location, scale assembly, and all appurtenances.

C. Records of scale calibrations after each calibration.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Scale Manufacturer shall specify and supply a NTEP certified, local digital indicator.

2.2 AXLE SCALE SPECIFICATION

A. The scale shall be a portable, two module axle scale constructed of steel or aluminum.

B. The scale shall have a minimum capacity to handle up to 60,000 pounds per axle.

C. Provide interconnecting cables and digital readout.

D. Scale shall be pre-calibrated by the manufacturer.

E. Minimum 7’ scale platforms with ramps.

F. Maintain height at minimum practicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements

3.2 INSTALLATION

A. The portable scale is to be positioned on compact level ground or other flat surface.

1. Use existing paved, level area or provide temporary paving.
2. Position in a location convenient for transportation vehicles
3. Re-positioning shall not incur additional costs for the Owner

B. Locate the scale in a position to accommodate truck ingress and egress from the Site with no interruption to remedial activities or other traffic.

3.3 OPERATION

A. Be capable of fully operating truck scale prior to commencement of export of any materials from the site. Manufacturer to provide instruction manuals, training, and assistance as required by Contractor.

END OF SECTION

SECTION 46 01 00 - Temporary Wastewater Treatment Equipment

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary wastewater treatment plant to treat extracted water from the dewatering process during excavation below the groundwater table.
2. Minimum capacity 50 gallons per minute (gpm).

B. Related Sections:

1. Section 31 23 19 – Dewatering
2. Section 31 25 13 – Erosion and Sediment Controls
3. Section 31 50 00 – Excavation Support and Protection

1.2 REFERENCES

A. NJAC 7:14A-7.5, Permit-by-Rule for dewatering.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures

B. Plan for water treatment:

1. Equipment.
2. Piping, valves, controls.
3. Capacity.
4. Intended use of Owner supplied equipment.
5. Discharge arrangement.
6. Carbon breakthrough testing based on benzene.

PART 2 - PRODUCTS

2.1 OWNER PROVIDED EQUIPMENT

A. Equipment available from Owner for use by Contractor:

1. Two, 2,000 pound GAC pressure vessels:

    a. Non-code.
    b. 100 gpm.
    c. 50 psi.
    d. 3” connections.
    e. Air relief valve.
    f. Not supplied with carbon.

2. Two, Hayward, carbon steel bag filters:

    a. 4-bag filter housings.
    b. 100 gpm.
    c. 100 psi.
    d. 3” connections.
    e. Not supplied with bag filters.

3. Two, Hayward, cartridge filters:

    a. 100 gpm.
    b. 150 psi.
    c. 3” connections.
    d. Not supplied with cartridges.

4. One tandem axle, deck-over landscape trailer:

    a. GVWR 12,000 pounds.
    b. 2 - 5/16” coupler.
    c. Non-road worthy.

B. Equipment currently at the Peters Mine Pit site.

2.2 TEMPORARY WASTEWATER TREATMENT SYSTEM

A. Capable of being used at the Peters Mine Pit or O’Connor Disposal Area Sites.

B. Portable.

C. Design criteria minimum 50 gpm at 50 psi.

D. Valves:

1. Isolation.
2. Check.
3. Control.
4. Sample port after lead carbon unit.
5. Other valves as necessary.

E. Piping:

1. Suitable for design flow and pressure.
2. Camlock fittings or equivalent for portable operation.
3. Rigid or flexible.

F. Controls:

1. Pressure.
2. Flow.
3. Immediate shutdown capability.
4. Not intended for unattended use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Setup and test (clean water) temporary wastewater treatment system prior to start of any dewatering. Confirm all equipment, valves, controls, and piping are in proper functioning order without any leaks.

B. Confirm setup locations with Owner's Representative

1. Locations where a leak could result in uncontrolled release are not acceptable.
2. Provide secondary containment, if treatment unit is located outside of area of attainment.

3.2 OPERATION AND MAINTENANCE

A. Section 31 23 19 – Dewatering

B. Operate system according to Manufacturer's recommendations and Plan for Water Treatment.

C. Retain mobile treatment system in vicinity of Work in the event that it is required. The system shall be readily accessible.

D. Treat any dewatering waters with the treatment system described in this Section.

E. Treat all dewatering waters with filtration first to protect carbon filters and carbon filtration second.

F. Operation of filters may be series or parallel. Treatment must be stopped if at least one filter unit is not in operation. Direct discharge from dewatering pumps to carbon units is prohibited.

G. Test for carbon breakthrough based on approved Plan for Water Treatment. Take samples after lead carbon unit.

H. Monitor dewatering practices and pressure gauges on treatment system. Adjust flow rates as needed.

I. Clean system according to Manufacturer's requirements. Monitor system performance and make adjustments accordingly.

END OF SECTION