Contract No.: EP-W-09-002
WA #: 032-RICO-02KD

Region 2 RAC2
Remedial Action Contract

Final Quality Assurance Project Plan

Matteo & Sons, Inc. site

Remedial Investigation/Feasibility Study

Thorofare, Gloucester County, New Jersey

September 19, 2011

565346

CDM

FINAL QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
MATTEO & SONS, INC. SITE
THOROFARE, GLOUCESTER COUNTY, NEW JERSEY

SEPTEMBER 19, 2011

Prepared for:
U.S. Environmental Protection Agency
290 Broadway, New York, NY 10007-1866

Prepared by:
CDM Federal Programs
14 Wall Street, Suite 1702
New York, NY 10005

EPA Work Assignment No.	: 032-RICO-02KD
EPA Region	: 2
Contract No.	: EP-W-09-002
CDM Federal Programs Corporation	
Document No.	: 3320-032-01010
Prepared by	: CDM
Project Manager	: Sharon Budney
Telephone Number	: (732) 590-4662
EPA Remedial Project Manager	: Larry Granite
Telephone Number	: (212) 637-4423
Date Prepared	: September 19, 2011

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Acronym List

ABS	absolute difference
AES	atomic emission spectrophotometry
ASC	analytical services coordinator
ASTM	American Society for Testing and Materials
BS	Bachelor of Science
CDM	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHMM	Certified Hazardous Materials Manager
CLP	contract laboratory program
COC	chain of custody
CIH	certified industrial hygenist
COCs	contaminants of concern
CQM	certified quality manager
CRQL	contract required quantitation limits
CVAA	cold vapor atomic absorption
DESA	Division of Environmental Science and Assessment
DO	dissolved oxygen
DQO	data quality objectives
DV	data validator
DMC	deuterated monitoring compound
EPA	United States Environmental Protection Agency
Equis	Environmental quality information systems
FASTAC	Field and Analytical Services Teaming Advisory Committee
FS	feasibility study
FSTL	FS Task Leader
FTL	field team leader
GIS	geographic information systems
HHRA	Human Health Risk Assessment
HSO	health and safety officer
ICP	inductively coupled plasma
IDW	investigation derived waste
L	liter
LCS	laboratory control samples
LEL	lower exposure limit
mg/kg	milligrams per kilogram
mL	milliliter
MS	mass spectrophotometer
MS/ MSD	matrix spikes /matrix spike duplicates
NA	not applicable
NOAA	National Oceanographic and Atmospheric Administration
NPL	National Priority List
NJDEP	New Jersey Department of Environmental Protection
%	percent
%R	percent recovery
PCB	polychlorinated biphenyls
PE	professional engineer
PID	photo-ionization detector

PM	project manager
PPE	personal protective equipment
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
%R	percent recovery
RAC 2	Remedial Action Contract
RAS	routine analytical services
RASE	Remedial Action Selection and Evaluation Report
RDCSCC	Residential Direct Contact Soil Cleanup Criteria
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPD	relative percent difference
RPM	remedial project manager
RQAC	regional QA coordinator
RTL	RI Task Leader
SCBA	self-contained breathing apparatus
SDG	sample delivery group
SIM	simultaneous ion monitoring
SLERA	screening level environmental risk assessment
SOP	standard operating procedure
SOW	scope of work
SSHO	site safety and health officer
SVOA	semivolatile-organic analysis
SVOC	semivolatile organic compound
TAL	target analyte list
TBD	to be determined
TCL	target compound list
TDS	total dissolved solids
TKN	total Kjedahl nitrogen
TSS	total suspended solids
TOC	total organic carbon
TSOP	Technical Standard Operating Procedure
UFP	Uniform Federal Policy
USFWS	United States Fish and Wildlife Service
VOA	volatile-organic analysis
VOC	volatile organic compound
VTSR	verified time of sample receipt
µg	microgram
µg/kg	microgram per kilogram
µg/L	microgram per liter

References

Berger. 2004a. *Final Remedial Investigation Report*. Matteo Iron and Metal, West Deptford, New Jersey. Louis Berger & Associates, Inc. May.

Berger. 2004b. *Final Aquatic Biota Study Report*. Matteo Iron and Metal, West Deptford, New Jersey. Louis Berger and Associates, Inc. December.

Berger. 2005. *Final Remedial Action Selection Evaluation Report*. Matteo Iron and Metal, West Deptford, New Jersey. Louis Berger and Associates, Inc. June.

Berger. 2006. *Final Remedial Investigation Report Addendum: Additional Well Installation and Sampling.* Matteo Iron and Metal, West Deptford, New Jersey. Louis Berger & Associates, Inc. April.

Weston. 2005. *Sampling Trip Report* - Matteo Iron and Metal Site. May 12.

Weston. 2006. *XRF Analysis Report*, Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey. March 22.

Introduction

CDM Federal Programs Corporation (CDM) received Work Assignment 032-RICO-02KD under the Remedial Action Contract (RAC 2) number EP-W-09-002, from the United States Environmental Protection Agency (EPA) Region 2, to perform a Remedial Investigation/Feasibility Study (RI/FS) at the Matteo & Sons, Inc. site (the site) located in Thorofare, West Deptford Township, Gloucester County, New Jersey. The purpose of this work assignment is to evaluate the nature and extent of groundwater, soil, surface water, and sediment contamination identified in the New Jersey Department of Environmental Protection (NJDEP) Final Remedial Investigation Report (Berger 2004a); and to propose and gather complimentary investigative data that, in conjunction with the NJDEP RI, is appropriate to evaluate the nature and extent of groundwater, soil, surface water, and sediment contamination. In addition, human health and ecological risks due to the site will be evaluated; remedies proposed in the Final Remedial Action Selection Evaluation Report (RASE) for NJDEP (Berger 2005) will be evaluated; and appropriate remedial alternatives for the identified contamination will be evaluated and presented in the Feasibility Study.

Purpose of QAPP

This document is the Final Quality Assurance Project Plan (QAPP) and covers the RI/FS which is intended to address data gaps and to address questions posed by the EPA Review Board to evaluate the appropriate remedial action. The principle question being addressed is:

- What is the current nature and extent of groundwater, soil, surface water, and sediment contamination that was previously identified in the NJDEP Final RI report?

This QAPP has been prepared in accordance with the Uniform Federal Policy (UFP)-QAPP manual (EPA 2005) and is compliant with EPA's QAPP guidance document EPA QA/R-5 (EPA 2002). This work assignment will be implemented in accordance with the quality procedures in CDM's Quality Assurance (QA) Manual (CDM 2007). This QAPP is the governing document for execution of the RI/FS field program.

Site Overview

The site description, regulatory history, historical investigations and progress of site remediation are detailed in Section 2 of the Final Revised Work Plan Volume I and on worksheets 9, 10 and 13 in this QAPP. Known contaminants of concern (COCs), lead and polychlorinated biphenyls (PCBs) were identified in previous investigations. Chlorinated solvents, primarily vinyl chloride, have also been detected in groundwater at the site. Other COCs may be present at the site, which was also used as an unregistered landfill.

The RI is designed to meet the following objectives:

- Define the extent of soil contamination in the open field and scrapyard areas
- Determine if dioxins and furans are present in the incineration area and in areas where ash was discarded (near MW-18)
- Define the vertical and horizontal extent of lead and PCB contamination in sediment in Hessian Run and Woodbury Creek
- Determine if dioxins and furans are present in sediment in Hessian Run and Woodbury Creek

- Determine if the source of volatile organic compounds (VOCs), including vinyl chloride, is located on site and if the VOCs or other site-related contaminants have migrated in the groundwater
- Update groundwater monitoring well data and evaluate the potential for natural attenuation of any VOCs detected in the groundwater
- Determine the interaction between municipal well #6 and site groundwater flow and determine the groundwater flow direction in the vicinity of MW-8
- Update analytical data for seeps and determine if contaminants from groundwater continue to discharge to surface water
- Perform an Human Health Risk Assessment (HHRA) and a Screening Level Environmental Risk Assessment (SLERA) for the identified contamination
- Obtain data to support the selection of an approach for site remediation, if necessary
- Obtain data to support a comprehensive record of decision (ROD)

Path Forward

In order to meet the RI/FS objectives, the following field tasks will be performed:

- A groundwater screening program.
- Monitoring well installation
- Surface and subsurface soil investigation activities
- One round of seep, shallow groundwater and surface water samples
- A sediment investigation in Hessian Run and Woodbury Creek.
- Monitoring and potable well sampling from 29 existing and 5 new wells

The sampling rationale, sampling design and data collection activities are included in detail in QAPP Worksheet 17 and Tables 1 through 4. Soils, sediment, seep/surface water and groundwater samples will be collected from the locations shown on Figures 1 through 6. CDM plans to implement these activities in accordance with standard procedures and EPA's Field and Analytical Services Teaming Advisory Committee (FASTAC) policy for obtaining analytical services. A full list of analyses to be performed is included on Table 1 and on QAPP worksheet 18.

QAPP Worksheet #1
Title and Approval Page

RAC2 CONTRACT
FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP)
for
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

US Environmental Protection Agency (EPA) Region 2

Prepared by: CDM Federal Programs Corporation (CDM)
14 Wall Street, Suite 1702
New York, NY 10005
(212) 785-9123

Date: September 19, 2011

CDM Project Manager: Sharon Budney

Signature Sharon Budney

CDM QA Manager: Jo Nell Mullins

Signature Jo Nell Mullins for

EPA Project Manager: Larry Granite

Signature _____

CDM RAC2 Program Manager: Jeanne Litwin

Signature Jeanne Litwin for

EPA Region 2 Hazardous Waste Support Section: Phil Cocuzza

Signature _____

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project:	Matteo & Sons, Inc. Site
Site Location:	Thorofare, Gloucester County, New Jersey
Operable Unit:	NA
Contractor Name:	CDM
Contractor Number:	EP-W-09-002
Contract Title:	Remedial Action Contract (RAC) 2, EPA Region 2
Work Assignment Number:	032-RICO-02KD
Regulatory Program:	CERCLA
Approval Entity:	EPA Region 2
Is QAPP Generic or Project Specific:	Project Specific
Dates of scoping sessions:	January 10, 2007 and January 27, 2007

Dates and Titles of QAPP Documents Written for Previous Site Work, if Applicable:
None Applicable

Organizational Partners (stakeholders) and Connection with Lead Organization:
New Jersey Department of Environmental Protection (NJDEP), United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA).

Data Users:
EPA and CDM

Required QAPP elements and required information that are not applicable to the project, and an explanation for their exclusions:
N/A

QAPP Worksheet #2
QAPP Identifying Information
(continued)

CROSSWALK

The following table provides a "cross-walk" between the QAPP elements outlined in the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP Manual), the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet. Any QAPP elements and required information that are applicable/not applicable to the project will be noted in the project-specific QAPPs.

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications - Special Personnel Training Requirements	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	 9 10
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria	11 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations	13

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
Project Management and Objectives		
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation - Project Schedule/Timeline	14 15 16 [*Figure 7*]
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements - Analytical Methods/SOP Requirements - Field Quality Control Sample Summary - Sampling SOPs - Project Sampling SOP References - Field Equipment Calibration, Maintenance, Testing, and Inspection	17 Tables 1 to 4 Figures 1 to 6 18 19 20 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References - Analytical Instrument Calibration - Analytical Instrument and Equipment Maintenance, Testing, and Inspection	23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	27 26
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples - Screening/Confirmatory Analysis Decision Tree	28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records - Analytical Services - Data Management SOPs	29 30

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual		Required Information		Crosswalk to QAPP Worksheet No.
Project Management and Objectives				
Assessment/Oversight				
4.1	Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	-	Assessments and Response Actions Planned Project Assessments Audit Checklists Assessment Findings and Corrective Action Responses	31 32
4.2	QA Management Reports	-	QA Management Reports	33
4.3	Final Project Report	-	Final Report(s)	33
Data Review				
5.1	Overview			NA
5.2	Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- - - -	Verification (Step I) Process Validation (Steps IIa and IIb) Process Validation (Steps IIa and IIb) Summary Usability Assessment	34 35 36 37
5.3	Streamlining Data Review 5.3.1 Data review steps to be streamlined 5.3.2 Criteria for streamlining data Review 5.3.3 Amounts and Types of Data appropriate for Streamlining			

QAPP Worksheet #3
Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
Abbey States	Project Officer	EPA	(212) 637-4350	(212) 637-3966	states.abbey@epa.gov
Larry Granite, CHMM	Remedial Project Manager (RPM)	EPA	(212) 637-4423	(212) 637- 3083	granite.larry@epa.gov
Phil Cocuzza	Hazardous Waste Support Section Chief	EPA	(732) 321-4478	(732) 321-6622	cocuzza.phil@epa.gov
William Sy	QA Officer	EPA	(732) 321-6648	(732) 321-6622	Sy.william@epa.gov
Nicole Bujalski	Project Geologist	EPA	(212) 637-4253	(212) 785-6114	bujalski.nicole@epa.gov
Jeanne Litwin	RAC 2 Program Manager	CDM	(212) 377-4524	(212) 785-6114	litwinj@cdm.com
Sharon Budney, CHMM	Project Manager	CDM	(732) 590-4662	(732) 225-6147	budneysl@cdm.com
Jeniffer Oxford or other assigned QAC	Regional QA Coordinator (RQAC)/ Project QA Officer	CDM	(212) 377-4536	(212) 785-6114	oxfordjm@cdm.com
Joseph Button, P.G.	RI Task Leader	CDM	(212) 377-4389	(212) 785-6114	buttonjs@cdm.com
Grace Chen, P.E.	FS Task Leader	CDM	(732) 590-4680	(732) 225-6147	cheng@cdm.com
Jeffrey Rakowski	Field Team Leader	CDM	(732) 590-4665	(732) 225-6147	rakowskijj@cdm.com
Shawn Oliveira, CIH	Health and Safety Officer	CDM	(406) 293-1547	-	oliveirast@cdm.com

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Organization: CDM

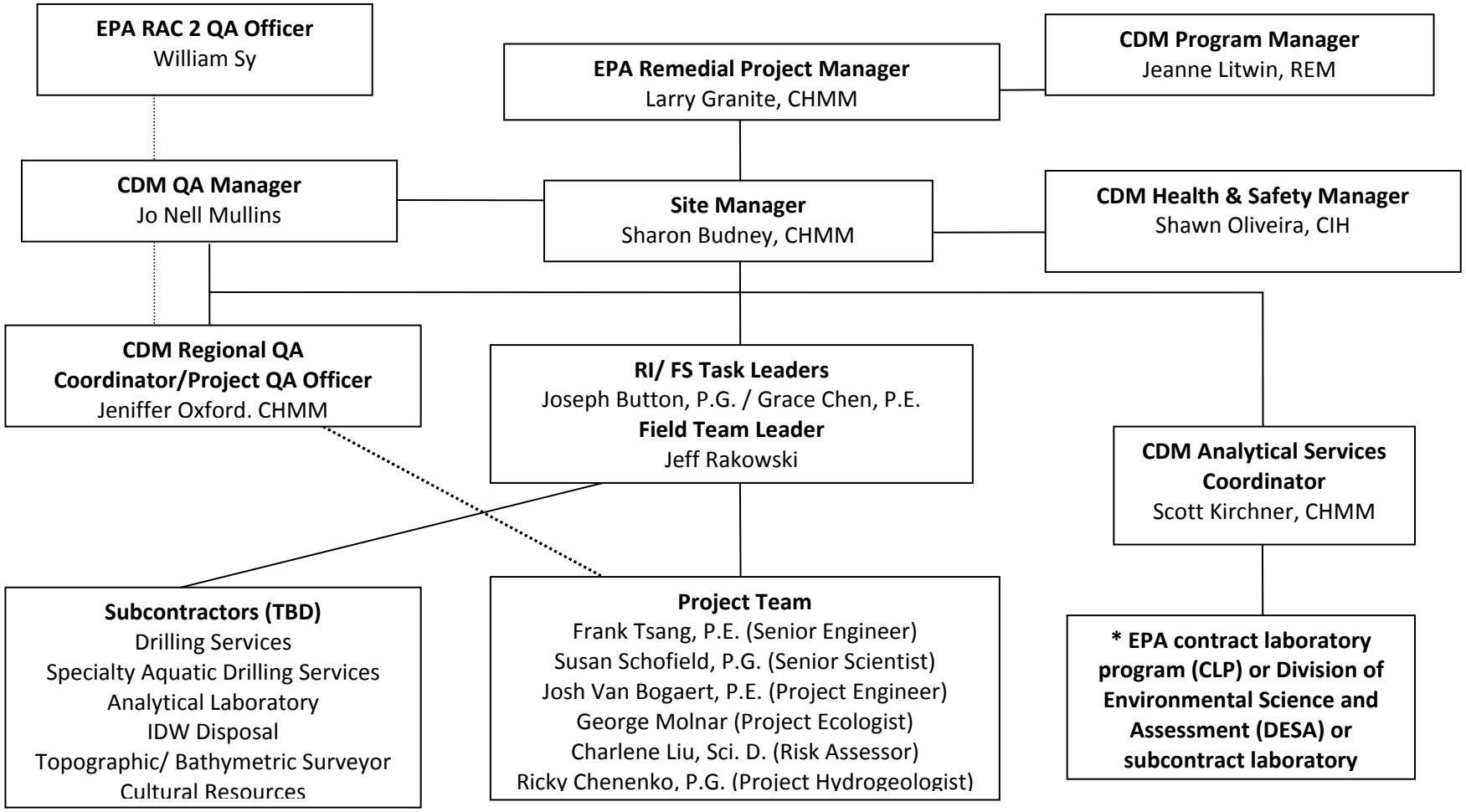
Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Sharon Budney, CHMM	Project Manager	(732) 590-4662		
Scott Kirchner, CHMM	ASC	(732) 225-7000		
Jo Nell Mullins	CDM QA Manger	(816) 412-3149		
Jeniffer Oxford, CHMM	RQAC	(212) 377-4536		
Frank Tsang, P.E.	Senior Engineer	(212) 377-4056		
Susan Schofield, P.G.	Senior Scientist	(203) 262-6633		
Joseph Button, P.G.	RI Task Leader	(212) 377-4389		
Grace Chen, P.E.	FS Task Leader	(732) 590-4680		
Jeffrey Rakowski	Field Team Leader	(732) 590-4665		
George Molnar	Project Ecologist	(732) 590-4677		
Ricky Chenenko, P.G.	Project Hydrogeologist	(732) 590-4645		
Charlene Liu, Sci. D.	Risk Assessor	(732) 590-4670		
Shawn Oliveira, C.I.H	Health and Safety Officer	(406) 293-1547		

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Organization: USEPA

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Abbey States	Project Officer	(212) 637-4350		
Larry Granite, CHMM	RPM	(212) 637-4423		
Phil Cocuzza	Hazardous Waste Support Section Chief	(732) 321-4478		
William Sy	QA Officer	(732) 321-6648		
Nicole Bujalski	Project Geologist	(212) 637-4253		

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Point of Contact with EPA RPM	CDM Project Manager (PM)	Sharon Budney	(732) 590-4662	All information about the project will be sent to Larry Granite by the CDM PM. Field changes will be discussed with the EPA RPM prior to implementation.
Manage Field Tasks	RI Task Leader (RITL)	Joseph Button	(212) 377-4389	Act as liaison to PM concerning investigation activities. Daily communication with project team and PM. Communicate implementation issues to Field Team Leader.
Facilitate Database Setup and Data Management Planning	Field Team Leader (FTL)	Jeffrey Rakowski	(732) 590-4665	Provide sample location, sample ID, and analysis information prior to sample collection. Provide information on sample and analytical reporting groups, and types of report tables required for project.
Maintain and Distribute Official Version of QAPP	CDM RQAC	Jennifer Oxford	(212) 785-9123	RQAC will maintain the official version of the QAPP, updating to include any revisions. The RITL and FTL will ensure the project team is made aware of all changes.
QAPP Changes in the Field	FTL	Jeffrey Rakowski	(732) 590-4665	Notify Task Manager immediately and promptly complete a Field Change Request (FCR) form and/or corrected worksheets. Send FCR forms to QAC.
	RITL	Joseph Button	(212) 377-4389	Notify EPA RPM, CDM PM and ASC of delays or changes to field work.
Completion of Daily Summary Reports	FTL	Jeffrey Rakowski	(732) 590-4665	Complete on a daily basis and submit to PM and FTM. PM will forward to EPA RPM upon request.
Booking of Analytical Services	FTL	Jeffrey Rakowski	(732) 590-4665	Submit request to ASC before the timeframe below.
	ASC or CLP Coordinator	Scott Kirchner	732-225-7000	Book Division of Environmental Science and Assessment (DESA) and Contract Laboratory Program (CLP) analytical services through Regional Sample Control Center (RSCC) 3 weeks prior to sampling.
Notification of Analytical Issues	ASC	Scott Kirchner	(732) 225-7000	Notify FTL of any sample collection/ shipment issues. Notify RSCC, DESA lab or subcontract labs to initiate corrective action.

QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Field Corrective Action	CDM RQAC, auditor, RITL, FTL, and Field Team	Jennifer Oxford	(212) 377-4536	PM, Task Manager, FTL, per CDM QA manual requirement corrective actions may also be identified by the field team. FTL initiates corrective action on identified field issues immediately or within QAM recommended timeframe.
Analytical Services Support	ASC	Scott Kirchner	(732) 225-7000	Act as liaison with RSCC for CLP laboratories, with John Birri for DESA, and with subcontract laboratory (ies).
Facilitate Data Management	FTL	Jeffrey Rakowski	(732) 590-4665	Provide electronic survey data, sample ID, locations and analyses. Transmit completed sample tracking information to data manager by the completion of each sampling case.
Reporting of Issues Relating to Analytical Data Quality (including ability to meet reporting limits, and usability of data)	ASC	Scott Kirchner	(732) 225-7000	Communicate to PM as appropriate
	Data Assessor	Scott Kirchner	(732) 225-7000	Communicate to PM as appropriate. Document situation and effect in a data quality report prepared prior to evaluation of remedial design report.
Release of Analytical Data	ASC	Scott Kirchner	(732) 225-7000	Receive and review data packages before data is used. Initiate data validation of subcontract laboratory data.
Site Health and Safety Issues	Site Health and Safety Officer	Jeffrey Rakowski	(732) 590-4665	Conduct Daily Health and Safety Meetings, make decisions regarding health and safety issues and upgrading PPE. Communicate to PM, Task Manager, Health and Safety Manager, and field staff as appropriate

QAPP Worksheet #7
Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Sharon Budney	PM	CDM	Oversee project and responds to EPA RPM. Manages subcontractors.	B.A. - Geology, Princeton University, 1991. Over 19 years experience conducting environmental investigations.
Susan Schofield	Senior Scientist	CDM	Provide technical guidance on RI program.	M.S. – Geology, New Mexico State University, 1982 B.S. – Geology, University of Nevada, 1978
Frank Tsang	Senior Engineer	CDM	Provide technical guidance on FS program.	B.S. Chemical Engineering M.S. Chemical Engineering; 33 years of experience in design and engineering
Jennifer Oxford	QA Coordinator/ Project Chemist	CDM	Oversee adherence to QA requirements	B.S., Natural Sciences, CHMM; Over 7 years experience in analytical chemistry; 19 years experience in environmental science.
Shawn Oliveira	Health and Safety Manager	CDM	Oversees adherence to Health and Safety requirements	B.S. Chemistry; M.S. Environmental Engineering; Certified Safety Professional (#18988); CIH; American Board of Industrial Hygiene; AHERA Project Designer; 10 years experience.
Joseph Button	RITL	CDM	Oversees Remedial Investigation Tasks Provide guidance on the drilling program and analyze the geologic data, responsible for implementing the field activities	B.A., Geology. Over 10 years experience conducting environmental investigations.
Grace Chen	FS Task Leader (FSTL)	CDM	Oversees Feasibility Study Tasks	M.S. - Environmental Engineering, University of Connecticut, 1998 B.S. - Environmental Engineering, Tsinghua University, 1993
Jeffrey Rakowski	FTL	CDM	Oversee all field investigation activities	B.A. - Geography, Montclair State University, 2003
Scott Kirchner	ASC, Database Manager	CDM	Communicate with EPA RSCC, DESA laboratory and subcontract laboratories; oversee data management, validation and data packages.	B.S. Chemistry, Environmental Science CHMM, 19 years experience.

QAPP Worksheet #7
Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Ricky Chenenko	Project Hydrogeologist	CDM	Oversee and provide guidance on the drilling program and analyze the geologic data	B.S. - Geological Sciences, State University of New York at Albany, 1983
George Molnar	Project Ecologist	CDM	Performs ecological risk assessment	M.S. Environmental Science B.S. Environmental Studies,16 years experience conducting ecological risk assessments and environmental investigations
Charlene Liu	Project Human Health Risk Assessor	CDM	Performs human health risk assessment	Sc.D. – Environmental Health Science, Tulane School of Public Health, 1998 M.S. – Geochemistry, Tulane University, 1994 B.S. – Geology, Nanjing University, 1986

Note:
1. An individual can fill as many roles as he or she is qualified.

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
All Field Activities	40-hour OSHA Training and Annual 8 hour refresher	40 hour - EPA or vendor;	various	All CDM and subcontractor personnel that will be onsite	CDM staff, subcontractors	CDM H&S database and on site
All Field Activities	Site Supervisor Training	H&S Manager	various	Site H&S officer	Site H&S officer	CDM H&S database and on site
Sample Collection	Trained in EPA CERCLA sampling methods, and field testing procedures	On-site training	various	All personnel that performs sample collection	All personnel that performs sample collection	CDM and Onsite
Sample Analysis	Trained in EPA analytical methods	Laboratory on-site and vendor training	various	Subcontract laboratory personnel - TBD	Laboratory personnel	Laboratory
Data Validation	Data validation RAS and non-RAS data	EPA	various	Data validators	DESA/EPA/CDM Data Validators	CDM DV staff files
Data Review/ Assessment	None, performed by experienced chemists	N/A	various	CDM chemists	All personnel used for project data review	CDM
QA Audits	EPA G-7 auditor training	CDM	various	CDM auditors	QAC and designated field auditors	CDM
Self Assessments (SA)	SA training	CDM Quality Assurance Coordinators (QACs)	various	project personnel	project personnel	CDM

Other tasks requiring specialized skills and training will be performed by appropriate subcontractors such as drilling, surveying, and well installing. Training, certification, and permit requirements will be outlined in separate scopes of work for each task and project.

QAPP Worksheet #9a
Project Scoping Session Participants Sheet

Projected Date(s) of Sampling: **Project Manager:** Sharon Budney	**Site Name:** Matteo & Sons, Inc. Site **Site Location:** Thorofare, Gloucester County, New Jersey
Date of Session: January 10, 2007 **Scoping Session Purpose:** Present CDM's technical approach for the Matteo & Sons, Inc. Site RI/FS Work Plan and get EPA's and NJDEP's input, comments, and questions	

Name	Affiliation	Phone #	E-mail Address	Project Role
Fernando Rosado	EPA	(212) 637-4346	rosado.fernando@epa.gov	Project Officer
Bob McKnight	EPA	(212) 637-4378	mcknight.bob@epa.gov	Section Chief
Lawrence Granite	EPA	(212) 637-4423	granite.larry@epa.gov	Remedial Project Manager
Damaris Urdaz	EPA	(212) 637-3140	urdaz.damaris@epa.gov	Attorney
Nick Magriples	EPA	(732) 906-6930	magriples.nick@epa.gov	On Scene Coordinator
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QAPP Worksheet #9a
Project Scoping Session Participants Sheet

Projected Date(s) of Sampling: **Project Manager:** Sharon Budney	**Site Name:** Matteo & Sons, Inc. Site **Site Location:** Thorofare, Gloucester County, New Jersey
Date of Session: January 10, 2007 **Scoping Session Purpose:** Present CDM's technical approach for the Matteo & Sons, Inc. Site RI/FS Work Plan and get EPA's and NJDEP's input, comments, and questions	

Name	Affiliation	Phone #	E-mail Address	Project Role
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Kershu Tan	CDM	(732) 590-4692	tank@cdm.com	Design Engineer

Comments/Decisions:

Human Health Risk Assessment
The group came to a consensus on the following points:

Current land-use scenario/receptors:
Land use: light industrial
Receptors: trespassers

Future Land-use scenario/receptors:
- Option 1: light industrial
  Receptors: site worker, construction workers, and trespassers
- Option 2: residential development
  Receptors: residents (adults and children) and construction workers
- Option 3: recreational use such as a park
  Receptors: recreational users

Fish consumption will be discussed in the work plan and human health risk assessment

Ecological Risk Assessment.
A screening evaluation will be preformed including:

1. Screening the results of the data gap investigation soil samples against benchmarks if results show potential for ecological risk from the screening, a further desk top evaluation (i.e. Step 3A) will be preformed.
2. Threatened / Endangered species investigation, only if new species have been added to the State and / or Federal list.
3. Additional sediment and surface water investigations may be needed, specifically to address PCB congener biomagnifications into bird or other high trophic receptors. This topic will be discussed in a conference call on January 29, 2007.

Cultural Resources Survey

1. Costs to conduct a Stage 1A cultural resources survey will be included in the work plan.

Potential Interim Remedy
CDM summarized the NJDEP Final RASE Report (June 2005). In addition, CDM provided an alternative interim remedy which included offsite disposal of the battery casings, blended waste, and sediments in Hessian Run. Data gaps in the sediment investigation include:

1. Need to define the vertical extent of contamination in the sediment, since NJDEP only collected samples to 3 feet and contamination was still present in some areas.
2. Determination if PCBs/dioxin/furans in sediment are of concern for high trophic level of ecological receptors. Additional sediment and surface water samples may be needed.
3. Investigate the need to collect sediment samples and fish tissue for PCB congeners

EPA elected to fully characterize the sediment prior to pursuing a remedy to avoid the potential need to mobilize twice to remove sediments.

Other Issues:

1. CDM will develop an approach to fill the data gaps in the sediment investigation and present these to the group via e-mail and for discussion in a follow up conference call. This call has been tentatively scheduled for January 29, 2007.
2. Kathleen Kunze, NJDEP, will locate the dioxin data NJDEP collected and provide it to CDM.
3. Diane Wehnerr, NOAA, and Clay Stern, USFWS, will determine if fish tissue data already exists on Delaware River Basin Commission's (DRBC's) website that can be used to potentially avoid recollecting fish samples during the data gap investigation.
4. CDM will develop an approach to screen for radiological contamination onsite based on the potential medical waste to have been disposed of in the landfills. This work will be optional.

QAPP Worksheet #9b
Project Scoping Session Participants Sheet

Projected Date(s) of Sampling: **Project Manager:** Sharon Budney	**Site Name:** Matteo & Sons, Inc. Site **Site Location:** Thorofare, Gloucester County, New Jersey

Date of Session: January 29, 2007
Scoping Session Purpose: Present CDM's technical approach for the sediment investigation at Matteo & Sons, Inc. Site RI/FS Work Plan and get EPA's and NJDEP's input, comments, and questions

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Susan Schofield	CDM	(203) 263-6633	schofieldse@cdm.com	Technical Advisor

Comments/Decisions:

Ecological Risk Assessment
A screening evaluation will be performed including:

- CDM will screen results of the sediment investigation against benchmarks. If results show potential for ecological risks from the screening, a further desk top evaluation (i.e., Step 3A) will be performed.

- Clay Stern, USFWS, will perform modeling of PCB congener biomagnification into higher trophic receptors utilizing the PCB congener results CDM collects. CDM will then incorporate the modeling results into the screening level ecological risk assessment.

Other Issues:

1. CDM will include contingencies to collect deeper sediment samples if results indicate the vertical extent of contamination is not defined. Therefore, CDM will not hold samples for analysis.

2. If the results of the screening level ecological risk assessment (SLERA) indicate the need for additional ecological investigation or risk assessment activities, and EPA agrees with the recommendation, a work plan letter will be prepared to outline the technical requirements to conduct further ecological instigation or risk assessment activities at the site. At this time, CDM does not plan to collect fish tissue or biota samples for the SLERA.

3. As agreed, CDM does not intend to resample any of the NJDEP sample depth/locations. CDM's investigation is meant to supplement the data by collecting deeper samples or extending transects to provide additional lateral coverage

QAPP Worksheet #10
Problem Definition

Problem Summary

The Matteo Site is located at 1708 U.S. Highway 130 in Thorofare, West Deptford Township, Gloucester County, New Jersey. Historically a farm and unregistered landfill, the site is currently used as a scrap metal recycling facility. The site is approximately 1.2 miles from the Delaware River, at the confluence of Woodbury Creek and Hessian Run. It is situated in the Woodbury-Hessian Run marshes, which are freshwater tidal marshlands. Numerous investigations have been completed at the site including the NJDEP RI. The site was listed on the National Priorities List (NPL) in September 2006.

The business operations and waste disposal practices at the site were mechanisms for past releases (primarily of lead and polychlorinated biphenyls (PCBs)) to soil, groundwater, sediment, and surface water. The lead contamination observed at the site is believed to originate from automotive batteries brought to the site and stripped of their lead contents for smelting. The empty battery casings were crushed and deposited directly into Hessian Run, as well as into associated wetlands, altering the shoreline. These casings appear to be an ongoing source of lead contamination observed at the site. The source of the PCB contamination is less clear. One possibility is widespread application of a PCB-containing agent for dust and weed control on the unpaved roadways and areas that supported the scrapyard and past waste disposal operations. A PCB-containing material may also have been among the waste buried at the site.

Lead and PCBs have been found at levels significantly above New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC) in onsite surface soils, and significantly above background levels in Hessian Run sediments. Lead is also a concern in surface water and groundwater at the site. Chlorinated solvents, primarily vinyl chloride, have also been detected in groundwater in three of the deep monitoring wells onsite.

Site Description

The Matteo site occupies two tax parcels (Lot 2, Block 128 and Lot 2, Block 325) as identified on the West Deptford Township Tax Map. The property, which had historically been a farm, consists of 80 acres of land located between the confluence of Woodbury Creek and Hessian Run to the west, Belmont Avenue to the east, and U.S. Highway 130 to the south. The site is currently used as a scrap metal recycling facility. The southeastern portion of the site (approximately 5 acres) is largely paved with asphalt, and contains several buildings which support the scrap metal recycling business. The remainder of the site (approximately 75 acres) is comprised predominantly of heavily vegetated undeveloped land which borders Woodbury Creek to the west, Hessian Run to the north, and a residential mobile home community to the south. Additionally, two utility lines (Colonial Oil and Public Service Electric & Gas) are located on the northwestern portion of the property. Figure 1 is an annotated USGS 7.5-minute quadrangle (Woodbury, New Jersey) showing the site location, local topography, drainage and cultural features. Figure 2 shows the layout of the site, including the scrapyard and the open field area.

QAPP Worksheet #10
Problem Definition

Site History

According to public records, between 1907 and 1947, the site was owned by Samuel and Bertha Wilkins, who used a portion of the property for farming activities, the remaining portion of the site was covered by woodlands. The Matteo family acquired the property in 1947. According to available records, the Matteo family, under various names (James Matteo and Sons, Inc., Matteo Trucking Company, Thorofare Trucking and Trash Company, and Matteo Iron and Metal), has operated an unregistered landfill and junkyard and a metals recycling facility at the site since 1961. In 1968, NJDEP identified an inactive incinerator at the site. In 1971, NJDEP approved Matteo's request to operate the incinerator to burn copper wire; Matteo then submitted a plan to operate a "sweating fire box" to melt lead battery terminals for lead reclamation. This lead melting operation continued until 1985. In 1972, NJDEP observed landfilling of crushed battery casings in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead melting operation, as there were several reports of battery casing incineration and subsequent onsite ash disposal. In addition to the incineration and landfilling operations, drums of waste were scattered throughout the property. In January 1984, NJDEP issued an Administrative Consent Order to Matteo Iron and Metal for solid waste violations and required Matteo to cease waste disposal at the site. Since 1986, a number of investigations were completed by NJDEP and EPA. In June 2005, NJDEP submitted the site for CERCLA removal action consideration. On September 27, 2006 the site was listed on the EPA NPL. The Matteo property, is mostly wooded, and is currently comprised of a metal recycling operation, a junkyard, and an inactive landfill

Project Description

CDM will be conducting an RI/FS to determine the nature and extent of contamination of the Matteo & Sons, Inc. Site. The following tasks will be performed to meet the objectives outlined on worksheet #11:

- A groundwater screening program.
- Monitoring well installation program.
- Surface and subsurface soil investigation activities.
- One round of seep, shallow groundwater and surface water samples.
- A sediment investigation in Hessian Run and Woodbury Creek.
- Monitoring and potable well sampling from 29 existing and 5 new wells

Project Decision Conditions

- Analytical data from surface and subsurface soil samples will be compared to site-specific screening criteria and used to delineate the extent of the soil contamination. If the results exceed the screening criteria, then the soils will be addressed in the FS.
- Analytical data from groundwater screening samples will be compared to site-specific screening criteria. If the deepest sample collected from a boring indicates vinyl chloride exceeding screening criteria, then the boring will be advanced deeper to delineate the extent of COC contamination as deemed necessary by the USEPA RPM.

- Analytical data from groundwater screening samples will be compared to site-specific screening criteria. If samples exceed screening criteria, then monitoring well locations will be modified to provide a network of wells to monitor the site groundwater conditions.

QAPP Worksheet #10
Problem Definition

- Analytical data from monitoring well samples will be compared to site-specific screening criteria to determine the extent of groundwater contamination. If the results exceed the screening criteria, then the groundwater will be addressed in the FS.
- Analytical data from seep, surface water and sediment samples will be compared to site-specific screening criteria to determine the extent of the contamination in Hessian Run and Woodbury Creek. If the results exceed the screening criteria, then the surface water and sediment will be addressed in the FS.
- Analytical data from sediment samples will be compared to site-specific screening criteria and used to delineate the horizontal and vertical extent of PCB and lead contamination. If the deepest sediment samples at a location exceed screening criteria, then additional sediment cores will be advanced to collect additional (deeper) data as deemed necessary by the USEPA RPM.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Overall project objectives include:

The overall objectives of the RI/FS are to determine the nature and extent of contamination in soil, sediment, surface water, and groundwater at the Matteo site, in order to evaluate appropriate remedial alternatives. Specifically, the RI is designed to meet the following objectives:

- Refine the extent of soil contamination in the open field and scrapyard
- Determine if dioxins and furans are present in the incineration area and in areas where ash was discarded on the site (near MW-18)
- Define the vertical and horizontal extent of lead and PCB contamination in sediment
- Determine if dioxins and furans are present in the sediment
- Determine if the source of VOCs, including vinyl chloride, is located on Site and if the VOCs or other Site related contaminants have migrated in the groundwater
- Update groundwater monitoring well data and evaluate the potential for natural attenuation of any VOCs detected in the groundwater
- Determine the interaction between municipal well #6 and site groundwater flow and determine the groundwater flow direction in the vicinity of MW-8
- Update analytical data for surface water seeps and determine if contaminants from groundwater continue to discharge to surface water
- Perform an HHRA and a SLERA on the identified contamination
- Obtain data to support the selection of an approach for site remediation, if necessary
- Obtain data to support a comprehensive ROD

Who Will Use the Data?

EPA, NJDEP, and CDM will use the project data.

What Will the Data be Used For?

CDM has developed an investigation that will fill data gaps in the NJDEP RI to further define the nature and extent of soil, sediment, surface water, and groundwater contamination. The sampling results will generate data to support a data evaluation summary report, RI report, HHRA, SLERA, FS and a Record of Decision (ROD). Definitive-level data will be used to support the objectives of this RI/FS.

What Type of Data is Needed?
The sampling program will contain the following:

- A groundwater screening program using drive point technology such as Geoprobe. (see Table 1 for a summary of the numbers and types of samples, see Figure 1 for sampling locations)
- A monitoring well installation program to install 4 new deep monitoring wells and one shallow upgradient monitoring well. (locations and depths will be based on results of groundwater screening program)

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

- Surface and subsurface soil investigation activities. (see Table 1 for a summary of the numbers and types of samples, see Figure 2 and Figure 6 for sampling locations)
- One round of seep, shallow groundwater and surface water samples. (see Table 1 for a summary of the numbers and types of samples, see Figure 4 for sampling locations)
- A sediment investigation from Hessian Run and Woodbury Creek. (see Table 3 and Table 4 for a summary of the numbers and types of samples, see Figure 4 and Figure 5 for sampling locations)
- Monitoring and potable well sampling from 29 existing and 5 new wells (see Table 1 for a summary of the numbers and types of samples)

How "good" do the data need to be in order to support the environmental decision?

The project-specific action limits and quantitation limits for each sampled media are specified on Worksheet #15 for all contaminants of concern. Analytical data generated will be compared to these limits. EPA's FASTAC policy for obtaining laboratory resources will be utilized for sampling events. Data must meet the data quality objectives (DQOs) that have been specified for the site. Refer to Worksheets #12, 18 and 28. Survey data for the Coordinate System and additional DQOs for the survey data will be specified in the subcontract statement of work (SOW). Sufficient definitive laboratory data is required (i.e., greater than or equal to 90 percent complete, where completeness is defined as the percentage of samples that meet or exceed objective levels for precision, accuracy and sensitivity for the samples collected as described on Worksheets #12 and 28).

Where, when, and how should the data be collected?

Figures 1 through 6; Tables 1 through 4; and Worksheets # 14, 17, and 18 of this QAPP summarize the planned sampling and analysis program. This includes soil/sediment borings, groundwater screening, seep and surface water, monitoring wells, type of samples, and basic analysis iteration.

Who will collect and generate the data?

CDM sampling team and its subcontractors will collect all the soil and groundwater screening samples that will be shipped to DESA, CLP, and/or CDM's subcontract laboratories for analysis. Sample analysis will be performed in compliance with EPA's FASTAC policy. A drilling subcontractor will advance and sample the direct push groundwater sampling points, boreholes, collect soil samples, and install the proposed monitoring wells. A Vibracore subcontractor will complete the sediment sampling program in Hessian Run and Woodbury Creek and collect sediment samples. A licensed surveyor will survey all the well locations. CDM will survey the boring locations in Woodbury Creek and Hessian Run using GPS. A licensed surveyor will also perform a bathymetric survey of Hessian Run and Woodbury Creek in the vicinity of the site. A subcontractor will sample and dispose of investigation-derived waste (IDW).

How will the data be reported?

Samples analyzed by CLP will be validated by a contractor of the EPA or by EPA staff; EPA DESA staff will validate samples analyzed by the DESA laboratory; and

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

CDM will validate sample analyzed by its subcontract laboratories. DESA, CLP and subcontract validated analytical data will be forwarded to CDM in electronic and hard copy. Analytical data will be uploaded to the Environmental Quality Information Systems (EQuIS) database. The database query and reporting tools will be used to create a project data management system as specified by the project team for use in the RI/FS, SLERA, and HHRA. These reports will be submitted to EPA for review. CDM will use AutoCAD and 3-D Modeling software (GIS) to facilitate spatial analysis of data and to generate figures for reports and presentations.

How will the data be archived?

- Preliminary data (Form 1s) will be faxed or e-mailed to CDM within the specified turnaround time
- Data from subcontract laboratories will be received in electronic format specified in the contract and validated by subcontractor personnel
- Final CLP and subcontracted validated data will be submitted to CDM and the subcontractor in electronic format and hard copy consistent with CLP deliverables
- Electronic data will be input into the project's EQuIS database
- EPA will archive CLP laboratory raw data in its document control system.
- Hard copies of field data including field logs will be archived in the project files
- Hard copies of analytical data received by CDM will be archived in the project files for 10 years after contract expiration

QAPP Worksheet #12
Measurement Performance Criteria Tables

CDM Generic QAPP

See the CDM Generic QAPP for measurement and performance criteria for the following analyses.

Aqueous: TCl VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs, TAL Inorganics (including cyanide and mercury), alkalinity, ammonia, bromide, chloride, hardness, methane, ethane, ethene, nitrate/ nitrite, orthophosphate, sulfide, sulfate, pH, TKN, TOC, TSS and TDS. See Worksheet #28 for additional QC information

Soil/sediment: TCl VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs, TAL Inorganics (including cyanide and mercury), pH and grain size. See Worksheet #28 for additional QC information

Worksheet 12, measurement and performance criteria tables, are included for the following analyses which are not included in CDM's generic QAPP.

Aqueous: SPLP (Leachate sample) for TAL inorganic analysis. See Worksheet #28 for additional QC information

Soil/sediment: PCB congeners, dioxins and furans . See Worksheet #28 for additional QC information

QAPP Worksheet #12-a
Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	PCB Congeners
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria[1] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
QAPP Worksheet 17	EPA Method 1668A	Precision	RPD ≤ 40% if concentration ≥5 CRQL	Field duplicates	S & A
		Precision	≤ 20% RPD; ±QL for samples <10x QL	Laboratory duplicate	A
		Accuracy/Bias	70 -130 %recovery	Certified Reference Material; Calibration Verification Sample	A
		Accuracy/Bias Precision	60-140 %recovery RSD ≤ 40%	Initial Precision and Recovery	A
		Accuracy/Bias	Per laboratory SOP Warning 70-130%R; Accept 50-150 %recovery	LCS or Ongoing Precision and Recovery	A
		Accuracy/ Representativeness	4±2 degrees Celsius 10 degrees Celsius (DV)	Temperature Blank checks Data validation (DV)	S
		Comparability	Comparable units, and methods	Data Quality assessment	S & A
		Completeness	≥ 90% collection and analysis	Data Quality Assessment	S & A
		Sensitivity/ accuracy	≤ QLs (WS#15)	Field rinsate blanks/ Method blanks/ DV and DQA	S & A

Note:
1. The assigned laboratory will perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable laboratory SOP.

QAPP Worksheet #12-b
Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	PCDD/PCDF (Dioxins and Furans)
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria[1] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
QAPP Worksheet 17	USEPA Method 1613B	Precision	RPD ≤ 40% if concentration ≥5 CRQL	Field duplicates	S & A
		Precision	±20% of mean if concentration >10DL	Laboratory duplicate	A
		Accuracy/Bias Precision	70-130 %recovery (or per laboratory SOP) RPD ≤ 20% if >10 QL	LCS; MS/MSD MS/MSD	S & A
		Accuracy/ Representativeness	4±2 degrees Celsius 10 degrees Celsius (DV)	Temperature Blank checks Data validation (DV)	S
		Precision	15-50% RSD or per laboratory SOP	Initial precision and recovery	A
		Accuracy/Bias	Various % recovery per laboratory SOP		
		Accuracy/Bias	15-50% RSD or per laboratory SOP	Ongoing precision and recovery	A
		Accuracy/Bias	17-130% recovery	Surrogate standards	A
		Comparability	Comparable units, and methods	Evaluated during Data Quality Assessment	S & A
		Completeness	≥ 90% collection and analysis	Evaluated during Data Quality Assessment	S & A
		Sensitivity/ accuracy	≤ QLs (WS#15)	Field rinsate blanks/ Method blanks/ DV and DQA	S & A

Note:
The assigned laboratory will perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable laboratory SOP.

QAPP Worksheet #12-c
Measurement Performance Criteria Table

Matrix	Aqueous (SPLP leachate)
Analytical Group	SPLP Inorganic Metals
Concentration Level	Low/Medium

Sampling Procedure	Analytical Method	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
TSOP 1-4	ISM01.3 SW-846 1312 (extraction)	Precision	RPD ≤ 50%* ABS < 2xQL	Field Duplicates	S&A
		Precision	RPD ≤20% RPD ≤35% for Hg	Laboratory Duplicates**	A
		Accuracy/Bias	75-125% recovery	Matrix Spikes***	S&A
			80-120% recovery	Laboratory Control Sample	A
		Accuracy	< QLs	Equipment Rinsate Blank	S
		Accuracy	≤ 6 degrees Celsius	Temperature Blank	S
		Sensitivity	< QLs	Method Blank	A
		Completeness	≥ 90%	Data assessment	S&A
		Comparability	Similar Units and methods (µg/L)	Data Results Review	S&A

* The field duplicate RPD will be calculated for all results reported above QLs. RPDs will not be calculated where results are reported as non-detect. If one result is reported as non-detect and its duplicate is reported as a result above QL then the absolute difference (ABS) between the two results will be calculated. The ABS will then be compared to two times the QL. Note that field duplicates will not be collected for the TCLP extracts.

**Samples validated by EPA will be qualified in accordance with the EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP using 20% RPD and absolute difference criteria. Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for Duplicate Sample Criteria- - (include absolute difference criteria)

***Reference EPA CLP ISM01.3, Exhibit D of ICP-AES for Spike Sample Criteria

QAPP Worksheet # 13
Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
NJDEP RI Sampling Results	NJDEP, Final Remediation Report, December 2004. (Berger 2004a)	Surface soil, sediment, surface water, seep and shallow and deep groundwater samples.Collected from September 2000 through October 2002.	The NJDEP sampling data will be added to the project database and used in the RI where more recent data is unavailable.	Data is now 10 years old which limits how it can be used in the RI and associated risk assessments. The current investigation is designed to fill data gaps from this investigation.
NJDEP Supplemental RI Sampling Results	NJDEP, Final Remedial Investigation Report Addendum, April 2006. (Berger 2006)	94 soil samples collected for PCB and metals analysis. 6 deep groundwater samples for VOC analysis. Collected from October 2001 to June 2002.	The NJDEP sampling data will be added to the project database and used in this RI where more recent data is unavailable.	Data is now almost 10 years old which limits how it can be used in the RI and associated risk assessments. The current investigation is designed to fill data gaps from this investigation.
EPA Emergency Response Sampling	EPA Emergency Response Sampling, Sampling Trip Report, May 2005. (Weston 2005) XRF Analytical Report, March 2006. (Weston 2006)	80 surface soil for lead and PCBs (screening). 20 surface soil samples for PCBs/ metals. 78 surface soil samples for lead (screening) and 25surface soil samples in Willow Woods for lead analysis.	All data was used for planning purposes. The analytical laboratory data will be used in the RI when more recent data is unavailable.	Screening data collected using X-ray Fluorescence (XRF) and immunoassay kits is not appropriate for comparison against screening criteria and therefore will only be used in the RI when analytical data is unavailable.
NJDEP Aquatic Biota Study Sampling Results	NJDEP, Final Aquatic Biota Study Report, December 2004. (Berger 2004b)	Sedimet, surface water, tissue, sediment toxicity evaluations, and fish and benthic macroinvertebrate community sampling. Collected in August and September 2003.	All data was used for planning purposes. The analytical laboratory data will be used in the RI when more recent data is unavailable.	Data is now 7 years old which limits how it can be used in the RI and associated risk assessments. The current investigation is designed to fill sediment, surface water, soil and groundwater data gaps from this investigation.

QAPP Worksheet #14
Summary of Project Tasks

Project Tasks:
CDM will be conducting an RI/FS to determine the nature and extent of contamination at the Matteo & Sons, Inc. Site. The following tasks will be performed:

- A groundwater screening program.
- Monitoring well installation.
- Surface and subsurface soil investigation activities.
- One round of seep, shallow groundwater and surface water samples.
- A sediment investigation from Hessian Run and Woodbury Creek.
- Monitoring and potable well sampling from 29 existing and 5 new wells.

Sampling Tasks: For specific sampling locations and depths please see Figures 1 through 6, and Tables 1 through 4.

Analysis Tasks: The following sample analyses are anticipated for the Matteo site:

- **Groundwater Screening Samples**: TCL VOCs and dissolved TAL metals plus mercury with 24-hour turnaround time for VOCs and 48-hour turnaround time for metals.

- **Surface and Soil Boring Samples**: TCL VOCs, TCL semi-volatile organic compounds (SVOCs), pesticides, PCBs, TAL inorganics, dioxins, furans, total organic carbon (TOC), pH, grain size, bulk density, porosity, and soil moisture. Five samples will be analyzed for synthetic precipitation leaching procedure (SPLP) for all metals.

- **Seep /Shallow Groundwater Samples**: Trace level VOCs, TCL SVOCs, pesticides, PCBs, TAL inorganics (total and dissolved), alkalinity, ammonia, hardness, nitrate/nitrite, pH, total Kjeldahl nitrogen (TKN), sulfate, sulfide, chloride, TOC, total dissolved solids (TDS), total suspended solids (TSS), orthophosphate, and bromide.

- **Surface Water Samples**: Trace level VOCs, TCL SVOCs, pesticides, PCBs, TAL inorganics (total and dissolved), hardness, orthophosphate, bromide, and 5 samples for alkalinity, ammonia, nitrate, nitrite, TKN, sulfate, sulfide, chloride, pH, TOC, TDS, and TSS

- **Sediment Samples**: PCBs, TAL inorganics, dioxins, furans, and four samples for 209 PCB congeners. Fifteen percent of sediment samples will be analyzed for pH, grain size, bulk density, moisture content, percent solids, specific gravity, Atterberg limits, and TOC.

- **Monitoring Well Samples**: Trace level VOCs, TCL SVOCs, pesticides, PCBs, TAL inorganics (total and dissolved), MNA parameters (chloride, methane, ethane, ethene, (MEE) nitrate/nitrite, sulfate, sulfide, TOC, ferrous iron), water quality parameters (TSS, TDS, alkalinity, ammonia, hardness, and TKN), orthophosphate, and bromide

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Quality Control Tasks: QC samples will be collected and submitted to CLP laboratory for analysis. Summary of QC samples are presented on Worksheets #20 and #28.

Secondary Data:
Secondary data listed in Worksheet #13 was reviewed and used to plan sample locations. The NJDEP sampling data will be added to the project database and used in this RI where more recent data is unavailable.

Data Management Tasks:
Analytical data will be loaded into CDM's EQuIS database.

- Form 1 preliminary data will be e-mailed to CDM within the specified turn-around-time.
- Final laboratory validated data will be received by CDM in electronic format consistent with CLP deliverables. The ASC will review all analytical data.
- Electronic data will be uploaded into the CDM Database system.
- Electronic analytical data will be retrieved from EQuIS as needed for data evaluation or reporting.
- A copy of the database will be submitted to the EPA in the required Region 2 EDD format.

The sample handling and custody requirements, including field logs and generation of sample paperwork, sample labels and custody seals technical standard operating procedure (TSOP 1-2) discussed in Worksheets #26 and #27, will be followed. The CDM analytical services coordinator (ASC) is responsible for tracking samples from the point of field collection to submittal for laboratory analysis and the subsequent data validation and data management efforts. The laboratory QA requirements including laboratory audits and contract compliance screening will be followed according to procedures described below and in Worksheet #23. The ASC will receive non-routine analytical services (non-RAS) data from CDM subcontract laboratory and will track it through the data validation process. For non-RAS data, the ASC will submit the electronic "ANSETS Data Requirement" form to the EPA Regional Sample Control Center (RSCC) by the first day of each month for the previous month's sampling. RAS data will be validated by DESA or the EPA; EPA will be responsible for tracking and maintaining custody of the laboratory data packages through the data validation process. Data validation performed by CDM will be in accordance with the procedures described in Worksheets #35 and #36 of this QAPP. Once the data is validated, it will be input into CDM's database.

A project-specific electronic spreadsheet will be developed for sample planning will be developed and will include information such as location name, sample name, sample interval, matrix, analyses, and bottleware prior to field activities. This information will be used to populate FORMS II Lite or Scribe for label and Chain-of-Custody creation in the field. The sample planning spreadsheet will then be used in the field to track sample collection and document changes to sample locations or samples which are not collected due to field conditions. This tracking system will be used to ensure that no data is lost between sample collection and the data management process.

The following information is recorded in the database system:

I. Sample Number
II. Area of Concern
III. Sample Matrix
IV. SDG Number

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V. CLP Case No.
VI. CLP No.
VII. Analytical Parameter
VIII. Collection Date
IX. Shipment Date
X. Date Received from Laboratory
XI. Date Submitted for Data Validation
XII. Name of Data Validator
XIII. Date of Data Validation Completion
XIV. Database Entry Date
XV. Database QC Date
XVI. Comments (i.e., MS/D designation, duplicate samples).

Analytical data collected during the field effort will be entered into an EQuIS database management system. This data management system will also include location data. The database management system will provide data storage, retrieval, and analytical capabilities. The system will be used to support report preparation by providing data users the data they need to complete their work using spreadsheets, word processing, statistical, and graphics software.

To facilitate the use of the database, CDM will provide subcontract laboratories with the specifications for the EPA Region 2 EDD for analytical data electronic data deliverable (EDD). Once it is uploaded into the database, validated analytical data will be used in the data evaluation phase. A 100 percent quality control check will be performed to ensure accuracy on all hand-entered data (i.e., data qualifiers added by CDM validators on subcontract laboratory data, sample field notations).

Data tables that present the results of the sampling program will be prepared and compared to applicable screening criteria. Graphics and geographic information system (GIS) software will be used to present sample results and illustrate contaminants detected. As a quality control check, reports, tables, and graphical figures will be compared to source material from the database to check for errors and omissions. A quality control summary report will be prepared for the draft design. CDM will provide EPA and USACE with final analytical data as part of the Region 2 EDD requirement.
The EQuIS data base system from EarthSoft will be the primary data management system software. This software is managed on CDM's computer network in compliance with software licensing requirements. Access to the project database is limited to authorized personnel only via their computer. CDM will take reasonable care to protect the data and will perform periodic backups to prevent wholesale loss of project data. Control of the computer hardware and software will be as per CDM quality procedure (QP) 4.1.

After the CLP data has been validated, the package is returned to the EPA RPM. The original CLP data package with all associated forms are retained by EPA for

QAPP Worksheet #14
Summary of Project Tasks

archival. Non-CLP data packages received from the Laboratory Subcontractor will be validated by CDM's ASC or their designee. These packages are stored in electronic format on CDM's computer network where they are accessible to the project manger and other team members. Copies of the non-CLP data packages, in electronic format, will be submitted to USACE or EPA (as directed) during project close-out.

Documentation and Records:
Information regarding samples will be recorded in site field logs. Any changes that are made to the field logs shall be initialed and dated. Documents will be maintained in the project files and/or the RAC 2 document control system. Monitoring well purge water data forms will be completed for each sample collected. Chain-of-Custody (COC) and airbills will also be completed for each sampling event.

Field Change Requests:
In the event that anticipated conditions are different from those encountered once the field work is under way, it may be necessary to implement a deviation from the approved QAPP. When such changes are required, the proposed change will be documented on a FCR Form by the CDM project engineer and approved by CDM's PM. An e-mail copy of the FCR form will be sent to the EPA RPM and will serve as documentation of communication with EPA. A copy of the FCR Form is included in Appendix D. A copy of the FCR will be kept on site along with the approved QAPP. A copy of the FCR form will be distributed to the authorizing parties, the field staff, and the CDM QAC in order to keep all staff informed of the change and to allow QAC oversight of any changes.

When significant field changes occur, the QAPP will be revised. Modifications will be carried out via revised pages to the QAPP. Minor changes will be made through formal memoranda from the CDM PM to the EPA RPM and will be included as addenda to the QAPP. The complete sign-off procedure will be followed if, in the judgment of the CDM PM, major revisions to the QAPP are required. All revisions to the QAPP will be subject to CDM's internal review process. All such changes will be approved by EPA prior to their implementation.

QAPP Worksheet #15a
Reference Limits and Evaluation Table - Groundwater VOCs

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)****	Analytical Method					Achievable Laboratory Limits***
		Federal	New Jersey			MDLs	CRQL			*Project Selected Option*	MDLs
		EPA National Primary Drinking Water Standards (1)	NJDEP Groundwater Quality Standards Class IIA Water (2)				Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water		
1,1,1-Trichloroethane	71-55-6	200	30	30	10	N/A	NL	0.5	5	Low	N/A
1,1,2,2-Tetrachloroethane	79-34-5	NL	1	1	0.5	N/A	NL	0.5	5	Trace	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	NL	NL	NL	N/A	NL	0.5	5	Low	N/A
1,1,2-Trichloroethane	79-00-5	5	3	3	1	N/A	NL	0.5	5	Trace	N/A
1,1-Dichloroethane	75-34-3	NL	50	50	17	N/A	NL	0.5	5	Low	N/A
1,1-Dicholoroethene	75-35-4	7	1	1	0.5	N/A	NL	0.5	5	Trace	N/A
1,2,3-Trichlorobenzene	87-61-6	NL	NL	NL	NL	N/A	NL	0.5	5	Low	N/A
1,2,4-Trichlorobenzene	120-82-1	70	9	9	5	N/A	NL	N/A	5	Low	N/A
1,2-Dibromo-3-chloropropane	96-12-8	0.20	0.02	0.02	0.02	N/A	0.05	0.5	5	MA	N/A
1,2-Dibromoethane	106-93-4	0.05	0.03	0.03	0.03	N/A	0.05	0.5	5	MA	N/A
1,2-Dichlorobenzene	95-50-1	600	600	600	200	N/A	NL	0.5	5	Low	N/A
1,2-Dichloroethane	107-06-2	5	2	2.0	0.7	N/A	NL	0.5	5	Trace	N/A
1,2-Dichloropropane	78-87-5	5	0.5	0.5	0.5	N/A	NL	0.5	5	Trace	N/A
1,3-Dichlorobenzene	541-73-1	NL	600	600	200	N/A	NL	0.5	5	Low	N/A
1,4-Dichlorobenzene	106-46-7	75	75	75	25	N/A	NL	0.5	5	Low	N/A
1,4-Dioxane	123-91-1	NL	10	10	10	N/A	NL	NL	100	MA	N/A
2-Butanone	78-93-3	NL	300	300	100	N/A	NL	5	10	Low	N/A
2-Hexanone	591-78-6	NL	300	300	100	N/A	NL	5	10	Low	N/A
4-Methyl-2-pentanone	108-10-1	NL	NL	NL	NL	N/A	NL	5	10	Low	N/A
Acetone	67-64-1	NL	6,000	6,000	2,000	N/A	NL	5	10	Low	N/A
Benzene	71-43-2	5	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Bromochloromethane	74-97-5	NL	NL	NL	NL	N/A	NL	0.5	5	Low	N/A
Bromodichloromethane	75-27-4	80	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Bromoform	75-25-2	80	4	4	1.33	N/A	NL	0.5	5	Trace	N/A
Bromomethane	74-83-9	NL	10	10	5.00	N/A	NL	0.5	5	Low	N/A
Carbon Disulfide	75-15-0	NL	700	700	233	N/A	NL	0.5	5	Low	N/A
Carbon tetrachloride	56-23-5	5	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A

QAPP Worksheet #15a
Reference Limits and Evaluation Table - Groundwater VOCs

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)****	Analytical Method					Achievable Laboratory Limits***
		Federal	New Jersey			MDLs	CRQL			*Project Selected Option*	MDLs
		EPA National Primary Drinking Water Standards (1)	NJDEP Groundwater Quality Standards Class IIA Water (2)				Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water		
Chlorobenzene	108-90-7	100	50	50	17	N/A	NL	0.5	5	Low	N/A
Chloroethane	75-00-3	NL	5	5	2	N/A	NL	0.5	5	Low	N/A
Chloroform	67-66-3	80	70	70	23	N/A	NL	0.5	5	Low	N/A
Chloromethane	74-87-3	NL	NL	NL	NL	N/A	NL	0.5	5	Low	N/A
cis-1,2-Dichloroethene	156-59-2	70	70	70	23	N/A	NL	0.5	5	Low	N/A
cis-1,3-Dichloropropene	10061-01-5	NL	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Cyclohexane	110-82-7	NL	100	100	33	N/A	NL	0.5	5	Low	N/A
Dibromochloromethane	124-48-1	80	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Dichlorodifluoromethane	75-71-8	NL	1,000	1,000	333	N/A	NL	0.5	5	Low	N/A
Ethylbenzene	100-41-4	700	700	700	233	N/A	NL	0.5	5	Low	N/A
Isopropylbenzene	98-82-8	NL	700	700	233	N/A	NL	0.5	5	Low	N/A
m, p-Xylene *	1330-20-7	10,000	1,000	1,000	333	N/A	NL	0.5	5	Low	N/A
Methyl acetate	79-20-9	NL	7,000	7,000	2333	N/A	NL	0.5	5	Low	N/A
Methyl tert-butyl ether	1634-04-4	NL	70	70	23	N/A	NL	0.5	5	Low	N/A
Methylcyclohexane	108-87-2	NL	NL	0	0	N/A	NL	0.5	5	Low	N/A
Methylene chloride	75-09-2	5	3	3	1	N/A	NL	0.5	5	Trace	N/A
o-Xylene **	1330-20-7	10,000	1,000	1,000	333	N/A	NL	0.5	5	Low	N/A
Styrene	100-42-5	100	100	100	33	N/A	NL	0.5	5	Low	N/A
Tetrachloroethene	127-18-4	5	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Toluene	108-88-3	1,000	600	600	200	N/A	NL	0.5	5	Low	N/A
trans-1,2-Dichloroethene	156-60-5	100	100	100	33	N/A	NL	0.5	5	Low	N/A
trans-1,3-Dichloropropene	10061-02-6	NL	1	1.0	0.5	N/A	NL	0.5	5	Trace	N/A
Trichloroethene	79-01-6	5	1	1	0.5	N/A	NL	0.5	5	Trace	N/A
Trichlorofluoromethane	75-69-4	NL	2,000	2,000	667	N/A	NL	0.5	5	Low	N/A
Vinyl Chloride	75-01-4	2	1	1.00	0.50	N/A	NL	0.5	5	Trace	N/A

QAPP Worksheets #15a
Reference Limits and Evaluation Table - Groundwater VOCs

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html),
   EPA 816-F-03-016, June 2003. last updated May 2009.
2. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, amended July 2010.

The criteria used for the Project Action Limit is the lowest value of 1. and 2.

* m-xylene and p-xylene reported as one compound under S0M01.2. Xylene (total) was used for m,p-xylene criteria.

** Xylene (total) was used for o-xylene criteria.

*** *The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

**** *For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
µg/L = micrograms per liter
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series

QAPP Worksheet #15b
Reference Limits and Evaluation Table - Groundwater SVOCs

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey			MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Primary Drinking Water Standards (1)	Groundwater Quality Standards Class IIA Water (2)				Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water			
1,1'-Biphenyl	92-52-4	NL	400	400	133	N/A	NL	5	Low	N/A	N/A
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
2,2'-Oxybis (1-chloropropane)	108-60-1	NL	300	300	100	N/A	NL	5	Low	N/A	N/A
2,3,4,6-Tetrachlorophenol	58-90-2	NL	200	200	67	N/A	NL	5	Low	N/A	N/A
2,4,5-Trichlorophenol	95-95-4	NL	700	700	233	N/A	NL	5	Low	N/A	N/A
2,4,6-Trichlorophenol	88-06-2	NL	20	20	6.7	N/A	NL	5	Low	N/A	N/A
2,4-Dichlorophenol	120-83-2	NL	20	20	7	N/A	NL	N/A	Low	N/A	N/A
2,4-Dimethylphenol	105-67-9	NL	100	100	33	N/A	NL	5	Low	N/A	N/A
2,4-Dinitrophenol	51-28-5	NL	10	10	3.3	N/A	NL	10	Low	N/A	N/A
2,4-Dinitrotoluene	121-14-2	NL	10	10	3.3	N/A	NL	5	Low	N/A	N/A
2,6-Dinitrotoluene	606-20-2	NL	10	10	3.3	N/A	NL	5	Low	N/A	N/A
2-Chloronapthalene	91-58-7	NL	600	600	200	N/A	NL	5	Low	N/A	N/A
2-Chlorophenol	95-57-8	NL	40	40	13	N/A	NL	5	Low	N/A	N/A
2-Methylnapthalene	91-57-6	NL	30	30	10	N/A	0.1	5	Low	N/A	N/A
2-Methylphenol	95-48-7	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
2-Nitroaniline	88-74-4	NL	NL	NL	NL	N/A	NL	10	Low	N/A	N/A
2-Nitrophenol	88-75-5	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
3,3'-Dichlorobenzidine	91-94-1	NL	30	30	10	N/A	NL	5	Low	N/A	N/A
3-Nitroaniline	99-09-2	NL	NL	NL	NL	N/A	NL	10	Low	N/A	N/A
4,6-Dinitro-2-methylphenol	534-52-1	NL	1	1	1	N/A	NL	10	MA	N/A	N/A
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
4-Chloro-3-methylphenol	59-50-7	NL	100	100	33.3	N/A	NL	5	Low	N/A	N/A
4-Chloroaniline	106-47-8	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
4-Methylphenol	106-44-5	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
4-Nitroaniline	100-01-6	NL	NL	NL	NL	N/A	NL	10	Low	N/A	N/A
4-Nitrophenol	100-02-7	NL	NL	NL	NL	N/A	NL	10	Low	N/A	N/A
Acenaphthene	83-32-9	NL	400	400	133	N/A	0.1	5	Low	N/A	N/A
Acenaphthylene	208-96-8	NL	100	100	33.3	N/A	0.1	5	Low	N/A	N/A
Acetophenone	98-86-2	NL	700	700	233.3	N/A	NL	5	Low	N/A	N/A
Anthracene	120-12-7	NL	2,000	2000	667	N/A	0.1	5	Low	N/A	N/A
Atrazine	1912-24-9	3	3	3	3	N/A	NL	5	MA	N/A	N/A
Benzaldehyde	100-52-7	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
Benzo (a) anthracene	56-55-3	NL	0.1	0.1	0.1	N/A	0.1	5	SIM	N/A	N/A
Benzo (a) pyrene	50-32-8	0.2	0.1	0.1	0.1	N/A	0.1	5	SIM	N/A	N/A
Benzo (b) fluoroanthene	205-99-2	NL	0.2	0.2	0.1	N/A	0.1	5	SIM	N/A	N/A
Benzo (g,h,i) perylene	191-24-2	NL	100	100	33.3	N/A	0.1	5	Low	N/A	N/A
Benzo (k) fluoroanthene	207-08-9	NL	0.5	0.5	0.2	N/A	0.1	5	SIM	N/A	N/A
Bis (2-chloroethoxy) methane	111-91-1	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A

QAPP Worksheet #15b
Reference Limits and Evaluation Table - Groundwater SVOCs

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey			MDLs	CRQL		*Project Selected Option*		
		EPA National Primary Drinking Water Standards (1)	Groundwater Quality Standards Class IIA Water (2)				Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water		MDLs	QLs
Bis (2-ethylhexyl) phthalate	117-81-7	6	3	3	3	N/A	NL	5	MA	N/A	N/A
Bis-(2-chloroethyl) ether	111-44-4	NL	7	7	5	N/A	NL	5	Low	N/A	N/A
Butylbenzylphthalate	85-68-7	NL	100	100	33	N/A	NL	5	Low	N/A	N/A
Caprolactam	105-60-2	NL	3,500	3,500	1,167	N/A	NL	5	Low	N/A	N/A
Carbazole	86-74-8	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
Chrysene	218-01-9	NL	5	5	5.0	N/A	0.1	5	Low	N/A	N/A
Dibenzo (a,h)-anthracene	53-70-3	NL	0.3	0.3	0.1	N/A	0.1	5	SIM	N/A	N/A
Dibenzofuran	132-64-9	NL	NL	NL	NL	N/A	NL	5	Low	N/A	N/A
Diethylphthalate	84-66-2	NL	6,000	6,000	2,000	N/A	NL	5	Low	N/A	N/A
Dimethylphthalate	131-11-3	NL	100	100	33.3	N/A	NL	5	Low	N/A	N/A
Di-n-butylphthalate	84-74-2	NL	700	700	233	N/A	NL	5	Low	N/A	N/A
Di-n-octylphthalate	117-84-0	NL	100	100	33	N/A	NL	5	Low	N/A	N/A
Fluoranthene	206-44-0	NL	300	300	100	N/A	0.1	5	Low	N/A	N/A
Fluorene	86-73-7	NL	300	300	100	N/A	0.1	5	Low	N/A	N/A
Hexachlorobenzene	118-74-1	1	0.02	0.02	0.02	N/A	NL	5	MA	N/A	N/A
Hexachlorobutadiene	87-68-3	NL	1	1	1	N/A	NL	5	MA	N/A	N/A
Hexachlorocyclo-pentadiene	77-47-4	50	40	40	13	N/A	NL	5	Low	N/A	N/A
Hexachloroethane	67-72-1	NL	7	7	5	N/A	NL	5	Low	N/A	N/A
Indeno (1,2,3-cd)-pyrene	193-39-5	NL	0.2	0.2	0.1	N/A	0.1	5	SIM	N/A	N/A
Isophorone	78-59-1	NL	40	40	13	N/A	NL	5	Low	N/A	N/A
Napthalene	91-20-3	NL	300	300	100	N/A	0.1	5	Low	N/A	N/A
Nitrobenzene	98-95-3	NL	6	6	5	N/A	NL	5	Low	N/A	N/A
N-Nitroso-di-n propylamine	621-64-7	NL	10	10	5	N/A	NL	5	Low	N/A	N/A
N-Nitrosodiphenylamine	86-30-6	NL	7	7	5	N/A	NL	5	Low	N/A	N/A
Pentachlorophenol	87-86-5	1	0.3	0.3	0.2	N/A	0.2	10	SIM	N/A	N/A
Phenanthrene	85-01-8	NL	100	100	33.3	N/A	0.1	5	Low	N/A	N/A
Phenol	108-95-2	NL	2,000	2,000	667	N/A	NL	5	Low	N/A	N/A
Pyrene	129-00-0	NL	200	200	67	N/A	0.1	5	Low	N/A	N/A

QAPP Worksheet #15b
Reference Limits and Evaluation Table - Groundwater SVOCs

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html),
   EPA 816-F-03-016, June 2003. last updated May 2009.
2. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, amended July 2010.

The criteria used for the Project Action Limit is the lowest value of 1. and 2.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
µg/L = microgram per liter
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series

QAPP Worksheet #15c
Reference Limits and Evaluation Table - Groundwater Pesticides

Pesticides (All units: µg/L)	CAS Number	Project Action Limit		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method		Achievable Laboratory Limits*	
		Federal	New Jersey			MDLs	CRQL		
		EPA National Primary Drinking Water Standards (1)	NJDEP Groundwater Quality Standards Class IIA Water (2)				Analytical Method - SOM01.2 Water	MDLs	QLs
4,4'-DDD	72-54-8	NL	0.1	0.1	0.1	N/A	0.1	N/A	N/A
4,4'-DDE	72-55-9	NL	0.1	0.1	0.1	N/A	0.1	N/A	N/A
4,4'-DDT	50-29-3	NL	0.1	0.1	0.1	N/A	0.1	N/A	N/A
Aldrin	309-00-2	NL	0.04	0.04	0.04	N/A	0.05	N/A	N/A
alpha-BHC	319-84-6	NL	0.02	0.02	0.02	N/A	0.05	N/A	N/A
alpha-Chlordane	5103-71-9	2	0.04	0.04	0.04	N/A	0.05	N/A	N/A
beta-BHC	319-85-7	NL	0.04	0.04	0.04	N/A	0.05	N/A	N/A
delta-BHC	319-86-8	NL	NL	NL	NL	N/A	0.05	N/A	N/A
Dieldrin	60-57-1	NL	0.03	0.03	0.03	N/A	0.1	N/A	N/A
Endosulfan I	959-98-8	NL	40	40	13	N/A	0.05	N/A	N/A
Endosulfan II	33213-65-9	NL	40	40	13	N/A	0.1	N/A	N/A
Endosulfan sulfate	1031-07-8	NL	40	40	13	N/A	0.1	N/A	N/A
Endrin	72-20-8	2	2	2	0.7	N/A	0.1	N/A	N/A
Endrin aldehyde	7421-93-4	NL	NL	NL	NL	N/A	0.1	N/A	N/A
Endrin ketone	53494-70-5	NL	NL	NL	NL	N/A	0.1	N/A	N/A
gamma-BHC (Lindane)	58-89-9	0.2	0.03	0.03	0.03	N/A	0.05	N/A	N/A
gamma-Chlordane	5103-74-2	2	0.5	0.5	0.2	N/A	0.05	N/A	N/A
Heptachlor	76-44-8	0.4	0.05	0.05	0.04	N/A	0.05	N/A	N/A
Heptachlor epoxide	1024-57-3	0.2	0.2	0.2	0.2	N/A	0.05	N/A	N/A
Methoxychlor	72-43-5	40	40	40	13	N/A	0.5	N/A	N/A
Toxaphene	8001-35-2	3	2	2	2	N/A	5	N/A	N/A

QAPP Worksheet #15c
Reference Limits and Evaluation Table - Groundwater Pesticides

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html),
   EPA 816-F-03-016, June 2003. last updated May 2009.
2. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, amended July 2010.

The criteria used for the Project Action Limit is the lowest value of 1. and 2.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

EPA = United States Environmental Protection Agency
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
µg/L = micrograms per liter
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series

QAPP Worksheet #15d
Reference Limits and Evaluation Table - Groundwater Aroclors

Aroclors (All units: µg/L)	CAS Number	Project Action Limit		Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method		Achievable Laboratory Limits*	
		Federal	New Jersey				CRQL		
		EPA National Primary Drinking Water Standards (1)	NJDEP Groundwater Quality Standards Class IIA Water (2)			MDLs	Analytical Method - SOM01.2 Water	MDLs	QLs
Aroclor-1016	12674-11-2	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1221	11104-28-2	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1232	11141-16-5	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1242	53469-21-9	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1248	12672-29-6	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1254	11097-69-1	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1260	11096-82-5	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1262	37324-23-5	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A
Aroclor-1268	11100-14-4	0.5	0.5	0.5	0.5	N/A	1	N/A	N/A

Notes:

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated May 2009.

2. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, amended July 2010.

The criteria used for the Project Action Limit is the lowest value of 1. and 2.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

EPA = United States Environmental Protection Agency

CAS = Chemical abstract service

CRQL = Contract Required Quantitation Limit

MDL = method detection limit

µg/L = microgram per liter

N/A = Not Applicable

NJDEP = New Jersey Department of Environmental Protection

NL = Not Listed or chemical name listed but no value available

PAL= Project Action Limit

SIM = selective ion monitoring

TOGS = Technical and Operational Guidance Series

QAPP Worksheet #15e
Reference Limits and Evaluation Table - Groundwater Inorganics (Metals and Cyanide)

Inorganics (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method				Achievable Laboratory Limits*	
		Federal		New Jersey			MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Primary Drinking Water Standards (1)	EPA National Secondary Water Quality Standards (2)	NJDEP Specific Groundwater Quality Criteria - Class IIA (3)				Analytical Method - ISM0 1.2 ICP-AES	Analytical Method - ISM01.2 ICP-MS			
Aluminum	7429-90-5	NL	200	200	200	67	N/A	200	20	MS	N/A	N/A
Antimony	7440-36-0	6	NL	6	6	2	N/A	60	2	MS	N/A	N/A
Arsenic	7440-38-2	10	NL	3	3	1	N/A	10	1	MS	N/A	N/A
Barium	7440-39-3	2,000	NL	6,000	2,000	667	N/A	200	10	AES	N/A	N/A
Beryllium	7440-41-7	NL	NL	1	1	1	N/A	5	1	MS	N/A	N/A
Cadmium	7440-43-9	5	NL	4	4	1	N/A	5	1	MS	N/A	N/A
Calcium	7440-70-2	NL	NL	NL	NL	NL	N/A	5000	500	AES	N/A	N/A
Chromium, Total	7440-47-3	100	NL	70	70	23	N/A	10	2	AES	N/A	N/A
Cobalt	7440-48-4	NL	NL	100	100	33	N/A	50	1	AES	N/A	N/A
Copper	7440-50-8	1,300	1,000	1,300	1,000	333	N/A	25	2	AES	N/A	N/A
Iron	7439-89-6	NL	300	300	300	100	N/A	100	200	AES	N/A	N/A
Lead	7439-92-1	15	NL	5	5	2	N/A	10	1	MS	N/A	N/A
Magnesium	7439-95-4	NL	NL	NL	NL	NL	N/A	5000	500	AES	N/A	N/A
Manganese	7439-96-5	NL	50	50	50	17	N/A	15	1	AES	N/A	N/A
Mercury	7439-97-6	2	NL	2	2	0.7	N/A	0.2	NL	AES	N/A	N/A
Nickel	7440-02-0	NL	NL	100	100	33	N/A	40	1	MS	N/A	N/A
Potassium	7440-09-7	NL	NL	NL	NL	NL	N/A	5000	500	AES	N/A	N/A
Selenium	7782-49-2	50	NL	40	40	13	N/A	35	5	MS	N/A	N/A
Silver	7440-22-4	NL	100	40	40	13	N/A	10	1	AES	N/A	N/A
Sodium	7440-23-5	NL	NL	50,000	50,000	16,667	N/A	5000	500	AES	N/A	N/A
Thallium	7440-28-0	2	NL	2	2	1.0	N/A	25	1	MS	N/A	N/A
Vanadium	7440-62-2	NL	NL	NL	NL	NL	N/A	50	5	AES	N/A	N/A
Zinc	7440-66-6	NL	5,000	2,000	2,000	667	N/A	60	2	AES	N/A	N/A

Notes:

1. EPA National Primary Drinking Water Standards (web page http://www.epa.gov/safewater/contaminants/index.html), EPA 816-F-03-016, June 2003. last updated May 2009.
2. EPA National Secondary Water Quality Standards (web page http://edocket.access.gpo.gov/cfr_2002/julqtr/40cfr143.3.htm) 2002.
3. New Jersey Ground Water Quality Standards Class IIA (NJAC 7:9C), July 7, 2008, downloaded August 4, 2010

The criteria used for the Project Action Limit is the lowest value of 1., 2. and 3.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

AES = atomic emission spectroscopy
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
MS = mass spectroscopy
N/A = Not Applicable
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
NJDEP = New Jersey Department of Environmental Protection
SIM = selective ion monitoring
TOGS = Technical and Operational Guidance Series
µg/L = microgram per liter

QAPP Worksheet #15f
Reference Limits and Evaluation Table
Groundwater and Surface Water - Other Parameters

Analyte	CAS Number	Project Action Limit (mg/L)	Project Quantitation Limit Goal (mg/L)	Analytical Method		Achievable Laboratory Limits (DESA)	
				MDLs	Method QLs (mg/L)	MDLs	QLs
Alkalinity (as carbonate/ bicarbonate)	471-34-1	N/A	N/A	N/A	N/A	0.11	1
Ammonia	7664-41-7	N/A	N/A	N/A	NA	0.01	0.05
Bromide	--	N/A	N/A	N/A	NA	TBD	TBD
Hardness	--	N/A	N/A	N/A	NA	TBD	TBD
Orthophosphate	--	N/A	N/A	N/A	NA	TBD	TBD
TSS	--	N/A	N/A	N/A	NA	NA	10
TDS	--	N/A	N/A	N/A	NA	NA	NA
TKN	--	N/A	N/A	N/A	NA	0.07	0.1
Nitrate	14797-55-8	N/A	N/A	N/A	NA	0.01	0.05
Nitrite	14797-65-0	N/A	N/A	N/A	NA	0.01	0.05
Sulfate	14808-79-8	N/A	N/A	N/A	NA	1.34	5
Sulfide	--	N/A	N/A	N/A	NA	0.009	0.05
Methane	74-82-8	N/A	N/A	N/A	NA	TBD	TBD
Ethane	74-84-0	N/A	N/A	N/A	NA	TBD	TBD
Ethene	74-85-1	N/A	N/A	N/A	NA	TBD	TBD
TOC	N/A	N/A	N/A	N/A	NA	0.19	1
ORP	N/A	N/A	N/A	N/A	NA	N/A	N/A
pH	N/A	N/A	N/A	N/A	NA	N/A	±0.5 pH units
Electrical Conductivity(EC)	N/A	N/A	N/A	N/A	NA	N/A	N/A
Temperature	N/A	N/A	N/A	N/A	NA	± thermometer limits	N/A
Ferrous iron	7439-89-6	N/A	N/A	N/A	0.03	N/A	N/A

Acronyms:

CAS - Chemical Abstract Service
CRQL - Contract Required Quantitation Limit
DESA - Division of Environmental Science and Assessment
MDL - method detection limit
N/A - Not applicable
PQLG - Project Quantitation Limit Goal
QL - quantitation limit
SOW – Statement of Work
TBD - To Be Determined
µg/L - microgram per liter
NL – not listed

QAPP Worksheet #15g
Reference Limits and Evaluation Table - Surface Water VOCs

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method					Achievable Laboratory Limits***	
		Federal	New Jersey				MDLs	CRQL			*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water			
1,1,1-Trichloroethane	71-55-6	NL	NL	120	120	*40*	N/A	NL	0.5	5	Trace	N/A	N/A
1,1,2,2-Tetrachloroethane	79-34-5	NL	NL	4.7	4.7	*1.57*	N/A	NL	0.5	5	Trace	N/A	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
1,1,2-Trichloroethane	79-00-5	NL	NL	13	13	*4*	N/A	NL	0.5	5	Trace	N/A	N/A
1,1-Dichloroethane	75-34-3	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
1,1-Dicholoroethene	75-35-4	NL	NL	4.7	4.7	*2*	N/A	NL	0.5	5	Trace	N/A	N/A
1,2,3-Trichlorobenzene	87-61-6	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
1,2,4-Trichlorobenzene	120-82-1	NL	NL	21	21	*7*	N/A	NL	0.5	5	Trace	N/A	N/A
1,2-Dibromo-3-chloropropane	96-12-8	NL	NL	NL	NL	*NL*	N/A	0.05	0.5	5	Trace	N/A	N/A
1,2-Dibromoethane	106-93-4	NL	NL	NL	NL	*NL*	N/A	0.05	0.5	5	Trace	N/A	N/A
1,2-Dichlorobenzene	95-50-1	NL	NL	2000	2000	*667*	N/A	NL	0.5	5	Trace	N/A	N/A
1,2-Dichloroethane	107-06-2	NL	NL	0.29	0.29	*0.29*	N/A	NL	0.5	5	MA	N/A	N/A
1,2-Dichloropropane	78-87-5	NL	NL	0.5	0.5	*0.50*	N/A	NL	0.5	5	Trace	N/A	N/A
1,3-Dichlorobenzene	541-73-1	NL	NL	2200	2200	*733*	N/A	NL	0.5	5	Trace	N/A	N/A
1,4-Dichlorobenzene	106-46-7	NL	NL	550	550	*183*	N/A	NL	0.5	5	Trace	N/A	N/A
1,4-Dioxane	123-91-1	NL	NL	NL	NL	*NL*	N/A	NL	NL	100	Trace	N/A	N/A
2-Butanone	78-93-3	NL	NL	NL	NL	*NL*	N/A	NL	5	10	Trace	N/A	N/A
2-Hexanone	591-78-6	NL	NL	NL	NL	*NL*	N/A	NL	5	10	Trace	N/A	N/A
4-Methyl-2-pentanone	108-10-1	NL	NL	NL	NL	*NL*	N/A	NL	5	10	Trace	N/A	N/A
Acetone	67-64-1	NL	NL	NL	NL	*NL*	N/A	NL	5	10	Trace	N/A	N/A
Benzene	71-43-2	NL	NL	0.15	0.15	*0.15*	N/A	NL	0.5	5	MA	N/A	N/A
Bromochloromethane	74-97-5	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Bromodichloromethane	75-27-4	NL	NL	0.55	0.55	*0.50*	N/A	NL	0.5	5	Trace	N/A	N/A
Bromoform	75-25-2	NL	NL	4.3	4.3	*1.43*	N/A	NL	0.5	5	Trace	N/A	N/A
Bromomethane	74-83-9	NL	NL	47	47	*16*	N/A	NL	0.5	5	Trace	N/A	N/A
Carbon Disulfide	75-15-0	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A

QAPP Worksheet #15g
Reference Limits and Evaluation Table - Surface Water VOCs

Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit (PAL)			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method					Achievable Laboratory Limits***	
		Federal	New Jersey				MDLs	CRQL			*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Trace Water by SIM	Analytical Method - SOM01.2 Trace Water	Analytical Method - SOM01.2 Low Water			
Carbon tetrachloride	56-23-5	NL	NL	0.33	0.33	*0.33*	N/A	NL	0.5	5	MA	N/A	N/A
Chlorobenzene	108-90-7	NL	NL	210	210	*70*	N/A	NL	0.5	5	Trace	N/A	N/A
Chloroethane	75-00-3	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Chloroform	67-66-3	NL	NL	68	68	*23*	N/A	NL	0.5	5	Trace	N/A	N/A
Chloromethane	74-87-3	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
cis-1,2-Dichloroethene	156-59-2	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
cis-1,3-Dichloropropene	10061-01-5	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Cyclohexane	110-82-7	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Dibromochloromethane	124-48-1	NL	NL	0.4	0.4	*0.40*	N/A	NL	0.5	5	MA	N/A	N/A
Dichlorodifluoromethane	75-71-8	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Ethylbenzene	100-41-4	NL	NL	530	530	*177*	N/A	NL	0.5	5	Trace	N/A	N/A
Isopropylbenzene	98-82-8	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
m, p-Xylene *	1330-20-7	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Methyl acetate	79-20-9	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Methyl tert-butyl ether	1634-04-4	NL	NL	70	70	*23*	N/A	NL	0.5	5	Trace	N/A	N/A
Methylcyclohexane	108-87-2	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Methylene chloride	75-09-2	NL	NL	2.5	2.5	*0.83*	N/A	NL	0.5	5	Trace	N/A	N/A
o-Xylene **	1330-20-7	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Styrene	100-42-5	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Tetrachloroethene	127-18-4	NL	NL	0.34	0.34	*0.34*	N/A	NL	0.5	5	MA	N/A	N/A
Toluene	108-88-3	NL	NL	1300	1300	*433*	N/A	NL	0.5	5	Trace	N/A	N/A
trans-1,2-Dichloroethene	156-60-5	NL	NL	590	590	*197*	N/A	NL	0.5	5	Trace	N/A	N/A
trans-1,3-Dichloropropene	10061-02-6	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Trichloroethene	79-01-6	NL	NL	1	1	*0.50*	N/A	NL	0.5	5	Trace	N/A	N/A
Trichlorofluoromethane	75-69-4	NL	NL	NL	NL	*NL*	N/A	NL	0.5	5	Trace	N/A	N/A
Vinyl Chloride	75-01-4	NL	NL	0.082	0.082	*0.08*	N/A	NL	0.5	5	MA	N/A	N/A

1. EPA National Recommended Water Quality Criteria. (web page http://www.epa.gov/waterscience/criteria/wqctable/). 2009. Criteria based on Freshwater CCC (chronic) values.

2. NJDEP Surface Water Quality Standards. (web page http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). April 2011.

The criteria used for the Project Action Limit is the lowest value of 1 and 2.

* m-xylene and p-xylene reported as one compound under S0M01.2.

** Xylene (total) was used for o-xylene criteria when the criteria is not listed.

*** *The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

**** *For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
MA = modified analyses
MDL = method detection limit
N/A = Not Applicable
µg/L = micrograms per liter

QAPP Worksheet #15h
Reference Limits and Evaluation Table - Surface Water SVOCs

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water			
1,1'-Biphenyl	92-52-4	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	NL	0.97	0.97	0.97	N/A	NL	5	Low	N/A	N/A
2,2'-Oxybis (1-chloropropane)	108-60-1	NL	NL	1400	1400	467	N/A	NL	5	Low	N/A	N/A
2,3,4,6-Tetrachlorophenol	58-90-2	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
2,4,5-Trichlorophenol	95-95-4	NL	NL	1800	1800	600	N/A	NL	5	Low	N/A	N/A
2,4,6-Trichlorophenol	88-06-2	NL	NL	0.58	0.58	0.58	N/A	NL	5	Low	N/A	N/A
2,4-Dichlorophenol	120-83-2	NL	NL	77	77	26	N/A	NL	5	Low	N/A	N/A
2,4-Dimethylphenol	105-67-9	NL	NL	380	380	127	N/A	NL	5	Low	N/A	N/A
2,4-Dinitrophenol	51-28-5	NL	NL	69	69	23	N/A	NL	10	Low	N/A	N/A
2,4-Dinitrotoluene	121-14-2	NL	NL	0.11	0.11	0.11	N/A	NL	5	Low	N/A	N/A
2,6-Dinitrotoluene	606-20-2	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
2-Chloronapthalene	91-58-7	NL	NL	1000	1000	333	N/A	NL	5	Low	N/A	N/A
2-Chlorophenol	95-57-8	NL	NL	81	81	27	N/A	NL	5	Low	N/A	N/A
2-Methylnapthalene	91-57-6	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A
2-Methylphenol	95-48-7	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
2-Nitroaniline	88-74-4	NL	NL	NL	NL	10	N/A	NL	10	Low	N/A	N/A
2-Nitrophenol	88-75-5	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
3,3'-Dichlorobenzidine	91-94-1	NL	NL	0.021	0.021	0.021	N/A	NL	5	Low	N/A	N/A
3-Nitroaniline	99-09-2	NL	NL	NL	NL	10	N/A	NL	10	Low	N/A	N/A
4,6-Dinitro-2-methylphenol	534-52-1	NL	NL	13	13	10	N/A	NL	10	Low	N/A	N/A
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
4-Chloro-3-methylphenol	59-50-7	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
4-Chloroaniline	106-47-8	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
4-Methylphenol	106-44-5	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
4-Nitroaniline	100-01-6	NL	NL	NL	NL	10	N/A	NL	10	Low	N/A	N/A
4-Nitrophenol	100-02-7	NL	NL	NL	NL	10	N/A	NL	10	Low	N/A	N/A
Acenaphthene	83-32-9	NL	NL	670	670	223	N/A	0.1	5	Low	N/A	N/A
Acenaphthylene	208-96-8	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A
Acetophenone	98-86-2	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Anthracene	120-12-7	NL	NL	8300	8300	2767	N/A	0.1	5	Low	N/A	N/A
Atrazine	1912-24-9	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A

QAPP Worksheet #15h
Reference Limits and Evaluation Table - Surface Water SVOCs

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	Project Quantitation Limit Goal (PQLG)**	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Low Water by SIM	Analytical Method - SOM01.2 Low Water			
Benzaldehyde	100-52-7	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Benzo (a) anthracene	56-55-3	NL	NL	0.038	0.038	0.038	N/A	0.1	5	SIM	N/A	N/A
Benzo (a) pyrene	50-32-8	NL	NL	0.0038	0.0038	0.0038	N/A	0.1	5	SIM	N/A	N/A
Benzo (b) fluoroanthene	205-99-2	NL	NL	0.038	0.038	0.038	N/A	0.1	5	SIM	N/A	N/A
Benzo (g,h,i) perylene	191-24-2	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A
Benzo (k) fluoroanthene	207-08-9	NL	NL	0.38	0.38	0.1	N/A	0.1	5	SIM	N/A	N/A
Bis (2-chloroethoxy) methane	111-91-1	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Bis (2-ethylhexyl) phthalate	117-81-7	NL	NL	1.2	1.2	1	N/A	NL	5	MA	N/A	N/A
bis-(2-chloroethyl) ether	111-44-4	NL	NL	0.03	0.03	0.03	N/A	NL	5	MA	N/A	N/A
Butylbenzylphthalate	85-68-7	NL	NL	150	150	50	N/A	NL	5	Low	N/A	N/A
Caprolactam	105-60-2	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Carbazole	86-74-8	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Chrysene	218-01-9	NL	NL	3.8	3.8	1.27	N/A	0.1	5	MA	N/A	N/A
Dibenzo (a,h)-anthracene	53-70-3	NL	NL	0.0038	0.0038	0.004	N/A	0.1	5	MA	N/A	N/A
Dibenzofuran	132-64-9	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Diethylphthalate	84-66-2	NL	NL	17000	17000	5667	N/A	NL	5	Low	N/A	N/A
Dimethylphthalate	131-11-3	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Di-n-butylphthalate	84-74-2	NL	NL	2000	2000	667	N/A	NL	5	Low	N/A	N/A
Di-n-octylphthalate	117-84-0	NL	NL	NL	NL	5	N/A	NL	5	Low	N/A	N/A
Fluoranthene	206-44-0	NL	NL	130	130	43	N/A	0.1	5	Low	N/A	N/A
Fluorene	86-73-7	NL	NL	1100	1100	367	N/A	0.1	5	Low	N/A	N/A
Hexachlorobenzene	118-74-1	NL	NL	0.00028	0.00028	0.003	N/A	NL	5	Low	N/A	N/A
Hexachlorobutadiene	87-68-3	NL	NL	0.44	0.44	0.44	N/A	NL	5	Low	N/A	N/A
Hexachlorocyclo-pentadiene	77-47-4	NL	NL	40	40	13	N/A	NL	5	Low	N/A	N/A
Hexachloroethane	67-72-1	NL	NL	1.4	1.4	1.4	N/A	NL	5	Low	N/A	N/A
Indeno (1,2,3-cd)-pyrene	193-39-5	NL	NL	0.038	0.038	0.038	N/A	0.1	5	SIM	N/A	N/A
Isophorone	78-59-1	NL	NL	35	35	12	N/A	NL	5	Low	N/A	N/A
Napthalene	91-20-3	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A
Nitrobenzene	98-95-3	NL	NL	17	17	6	N/A	NL	5	Low	N/A	N/A
N-Nitroso-di-n propylamine	621-64-7	NL	NL	0.005	0.005	0.005	N/A	NL	5	Low	N/A	N/A
N-Nitrosodiphenylamine	86-30-6	NL	NL	3.3	3.3	3.3	N/A	NL	5	Low	N/A	N/A
Pentachlorophenol	87-86-5	15	NL	0.27	0.27	0.27	N/A	0.2	10	SIM	N/A	N/A
Phenanthrene	85-01-8	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A
Phenol	108-95-2	NL	NL	10000	10000	3333	N/A	NL	5	Low	N/A	N/A
Pyrene	129-00-0	NL	NL	NL	NL	5	N/A	0.1	5	Low	N/A	N/A

QAPP Worksheet #15h
Reference Limits and Evaluation Table - Surface Water SVOCs

1. EPA National Recommended Water Quality Criteria. (web page http://www.epa.gov/waterscience/criteria/wqctable/). 2009

2. NJDEP Surface Water Quality Standards. (web page http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). January 2010.

The criteria used for the Project Action Limit is the lowest value of 1 and 2.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.

See Appendix C for DESA information regarding this worksheet.

EPA = United States Environmental Protection Agency

CAS = Chemical abstract service

CRQL = Contract Required Quantitation Limit

MDL = method detection limit

µg/L = microgram per liter

N/A = Not Applicable

NJDEP = New Jersey Department of Environmental Protection

NL = Not Listed or chemical name listed but no value available

PAL= Project Action Limit

SIM = selective ion monitoring

QAPP Worksheet #15i
Reference Limits and Evaluation Table - Surface Water Aroclors

Aroclors (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Water	MDLs	QLs
Aroclor-1016	12674-11-2	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1221	11104-28-2	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1232	11141-16-5	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1242	53469-21-9	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1248	12672-29-6	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1254	11097-69-1	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1260	11096-82-5	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1262	37324-23-5	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A
Aroclor-1268	11100-14-4	0.014	0.014	0.000064	0.014	*0.014*	N/A	1	N/A	N/A

Notes:

1. EPA National Recommended Water Quality Criteria. (web page http://www.epa.gov/waterscience/criteria/wqctable/). 2009

2. NJDEP Surface Water Quality Standards. (web page http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). April 2011.
The human health values are not acheivable by the current UPA procedures. The PQLGs and PALs are based on the NJDEP fresh water criteria instead of the human health criteria.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service
EPA = United States Environmental Protection Agency
CRQL = Contract Required Quantitation Limit
MA = modified analyses
MDL = method detection limit
PAL= Project Action Limit
µg/L = micrograms per liter
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed

QAPP Worksheet #15j
Reference Limits and Evaluation Table - Surface Water Pesticides

Pesticides (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Water	MDLs	QLs
4,4'-DDD	72-54-8	NL	NL	0.00031	0.00031	0.00031	N/A	0.1	N/A	N/A
4,4'-DDE	72-55-9	NL	NL	0.00022	0.00022	0.00022	N/A	0.1	N/A	N/A
4,4'-DDT	50-29-3	0.001	0.001	0.00022	0.00022	0.00022	N/A	0.1	N/A	N/A
Aldrin	309-00-2	NL	NL	0.000049	0.000049	0.000049	N/A	0.05	N/A	N/A
alpha-BHC	319-84-6	NL	NL	0.0026	0.0026	0.0026	N/A	0.05	N/A	N/A
alpha-Chlordane	5103-71-9	NL	NL	NL	NL	*NL*	N/A	0.05	N/A	N/A
beta-BHC	319-85-7	NL	NL	0.0091	0.0091	0.0091	N/A	0.05	N/A	N/A
delta-BHC	319-86-8	NL	NL	NL	NL	*NL*	N/A	0.05	N/A	N/A
Dieldrin	60-57-1	0.056	0.056	0.000052	0.000052	0.000052	N/A	0.1	N/A	N/A
Endosulfan I	959-98-8	0.056	0.056	62	0.056	0.056	N/A	0.05	N/A	N/A
Endosulfan II	33213-65-9	0.056	0.056	62	0.056	0.056	N/A	0.1	N/A	N/A
Endosulfan sulfate	1031-07-8	NL	NL	62	62	*20*	N/A	0.1	N/A	N/A
Endrin	72-20-8	0.036	0.036	0.059	0.036	0.036	N/A	0.1	N/A	N/A
Endrin aldehyde	7421-93-4	NL	NL	0.059	0.059	0.059	N/A	0.1	N/A	N/A
Endrin ketone	53494-70-5	NL	NL	NL	NL	*NL*	N/A	0.1	N/A	N/A
gamma-BHC (Lindane)	58-89-9	NL	NL	0.98	0.98	*0.05*	N/A	0.05	N/A	N/A
gamma-Chlordane	5103-74-2	NL	NL	NL	NL	*NL*	N/A	0.05	N/A	N/A
Heptachlor	76-44-8	0.0038	0.0038	0.000079	0.000079	0.000079	N/A	0.05	N/A	N/A

QAPP Worksheet #15j
Reference Limits and Evaluation Table - Surface Water Pesticides

Pesticides (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - SOM01.2 Water	MDLs	QLs
Heptachlor epoxide	1024-57-3	0.0038	0.0038	0.000039	0.000039	*0.000039*	N/A	0.05	N/A	N/A
Methoxychlor	72-43-5	NL	0.03	40	0.03	*0.03*	N/A	0.5	N/A	N/A
Toxaphene	8001-35-2	0.0002	0.0002	0.00028	0.0002	*0.0002*	N/A	5	N/A	N/A

Notes:

1. EPA National Recommended Water Quality Criteria. (web page http://www.epa.gov/waterscience/criteria/wqctable/). 2009

2. NJDEP Surface Water Quality Standards. (web page http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). April 2011.

The criteria used for the Project Action Limit is the lowest value of 1 and 2.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service

CRQL = Contract Required Quantitation Limit

EPA = United States Environmental Protection Agency

MA = modified analyses

MDL = method detection limit

QAPP Worksheet #15k
Reference Limits and Evaluation Table - Surface Water Inorganics (Metals and Cyanide)

Inorganics (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - ISM01.2 ICP-AES	Analytical Method - ISM01.2 ICP-MS			
Aluminum	7429-90-5	NL	NL	NL	NL	*20*	N/A	200	20	AES	N/A	N/A
Antimony	7440-36-0	NL	NL	5.6	5.6	*2*	N/A	60	2	MS	N/A	N/A
Arsenic	7440-38-2	150	150	0.017	0.017	*0.01*	N/A	10	1	MA	N/A	N/A
Barium	7440-39-3	NL	NL	2000	2000	*666.67*	N/A	200	10	AES	N/A	N/A
Beryllium	7440-41-7	NL	NL	6	6	*2*	N/A	5	1	MS	N/A	N/A
Cadmium	7440-43-9	0.25	0.176 (b)	3.4	0.176	*0.176*	N/A	5	1	MA	N/A	N/A
Calcium	7440-70-2	NL	NL	NL	NL	*NL*	N/A	5000	500	AES	N/A	N/A
Chromium	7440-47-3	74	NL	92	74	*30.67*	N/A	10	2	AES	N/A	N/A
Cobalt	7440-48-4	NL	NL	NL	NL	*NL*	N/A	50	1	AES	N/A	N/A
Copper	7440-50-8	9	8.471 (b)	1300	9	*5*	N/A	25	2	MS	N/A	N/A
Cyanide	57-12-5	5.2 (b)	5.2 (b)	140	140	*46.67*	N/A	100	200	AES	N/A	N/A
Iron	7439-89-6	NL	NL	NL	NL	*NL*	N/A	100	200	AES	N/A	N/A
Lead	7439-92-1	2.5	5.4	5	2.5	*1*	N/A	10	1	MS	N/A	N/A
Magnesium	7439-95-4	NL	NL	NL	NL	*NL*	N/A	5000	500	AES	N/A	N/A
Manganese	7439-96-5	NL	NL	NL	NL	*NL*	N/A	15	1	AES	N/A	N/A
Mercury	7439-97-6	0.77	0.77	0.05	0.05	*0.05*	N/A	0.2	NL	MA	N/A	N/A
Nickel	7440-02-0	52	44.130 (b)	500	52	*20*	N/A	40	1	MS	N/A	N/A
Potassium	7440-09-7	NL	NL	NL	NL	*NL*	N/A	5000	500	AES	N/A	N/A

QAPP Worksheet #15k
Reference Limits and Evaluation Table - Surface Water Inorganics (Metals and Cyanide)

Inorganics (All units: µg/L)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method				Achievable Laboratory Limits*	
		Federal	New Jersey				MDLs	CRQL		*Project Selected Option*	MDLs	QLs
		EPA National Recommended Water Quality Criteria (1)	NJDEP Surface Water Quality Criteria for Fresh Water (Chronic) (2)	NJDEP Surface Water Quality Criteria for Fresh Water (Human Health) (2)				Analytical Method - ISM01.2 ICP-AES	Analytical Method - ISM01.2 ICP-MS			
Selenium	7782-49-2	5	5	170	5	*5*	N/A	35	5	MS	N/A	N/A
Silver	7440-22-4	NL	NL	170	170	*56.67*	N/A	10	1	AES	N/A	N/A
Sodium	7440-23-5	NL	NL	NL	NL	*NL*	N/A	5000	500	AES	N/A	N/A
Thallium	7440-28-0	NL	NL	0.24	0.24	*0.24*	N/A	25	1	MA	N/A	N/A
Vanadium	7440-62-2	NL	NL	NL	NL	*NL*	N/A	50	5	AES	N/A	N/A
Zinc	7440-66-6	120	113.826 (b)	7400	120	*40*	N/A	60	2	MS	N/A	N/A

Notes:

1. EPA National Recommended Water Quality Criteria. (web page http://www.epa.gov/waterscience/criteria/wqctable/). 2009

2. NJDEP Surface Water Quality Standards. (web page http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). April 2011.

(b)The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column.

The criteria used for the Project Action Limit is the lowest value of 1 and 2.

**The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

AES = atomic emission spectroscopy

CAS = Chemical abstract service

CRQL = Contract Required Quantitation Limit

EPA = United States Environmental Protection Agency

L = liter

MA = modified analyses

MDL = method detection limit

QAPP Worksheet #15l
Reference Limits and Evaluation Table - Soil VOCs

Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit					Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method				Achievable Laboratory Limits***	
		Federal			New Jersey						CRQL				
		EPA EcoSSLs (1)	EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)				MDLs	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Medium Soil	*Project-Specific Option*	MDLs	QLs
1,1,1-Trichloroethane	71-55-6	NL	637,450 ns	NL	290,000	200	NL	200	*67*	N/A	5	250	Low	N/A	N/A
1,1,2,2-Tetrachloroethane	79-34-5	NL	560 c	NL	1,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	909,640 ns	NL	NL	NL	NL	909,640	*303213*	N/A	5	250	Low	N/A	N/A
1,1,2-Trichloroethane	79-00-5	NL	160 n	NL	2,000	10	NL	10	*5*	N/A	5	250	Low	N/A	N/A
1,1-Dichloroethane	75-34-3	NL	3,300 c	NL	8,000	200	NL	200	*67*	N/A	5	250	Low	N/A	N/A
1,1-Dicholoroethene	75-35-4	NL	24,000 n	NL	11,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,2,3-Trichlorobenzene	87-61-6	NL	4,900 n	20,000	NL	NL	20,000	4,900	*1633*	N/A	5	250	Low	N/A	N/A
1,2,4-Trichlorobenzene	120-82-1	NL	6,200 n	20,000	73,000	400	20,000	400	*133*	N/A	5	250	Low	N/A	N/A
1,2-Dibromo-3-chloropropane	96-12-8	NL	5.4 c	NL	80	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,2-Dibromoethane	106-93-4	NL	34 c	NL	8	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,2-Dichlorobenzene	95-50-1	NL	190,000 n	NL	5,300,000	11,000	NL	11,000	*3667*	N/A	5	250	Low	N/A	N/A
1,2-Dichloroethane	107-06-2	NL	430 c	NL	900	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,2-Dichloropropane	78-87-5	NL	940 c	NL	2,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
1,3-Dichlorobenzene	541-73-1	NL	NL	NL	5,300,000	12,000	NL	12,000	*4000*	N/A	5	250	Low	N/A	N/A
1,4-Dichlorobenzene	106-46-7	NL	2,400 c	20,000	5,000	1,000	20,000	1,000	*333*	N/A	5	250	Low	N/A	N/A
1,4-Dioxane	123-91-1	NL	4,900 c	NL	NL	NL	NL	4,900	*1633*	N/A	100	5,000	Low	N/A	N/A
2-Butanone	78-93-3	NL	2,800,000 n	NL	3,100,000	600	NL	600	*200*	N/A	10	500	Low	N/A	N/A
2-Hexanone	591-78-6	NL	21,000 n	NL	NL	NL	NL	21,000	*7000*	N/A	10	500	Low	N/A	N/A
4-Methyl-2-pentanone	108-10-1	NL	2,191,304 ns	NL	NL	NL	NL	2,191,304	*730435*	N/A	10	500	Low	N/A	N/A
Acetone	67-64-1	NL	6,100,000 n	NL	NL	12,000	NL	12,000	*4000*	N/A	10	500	Low	N/A	N/A
Benzene	71-43-2	NL	1,100 c	NL	2,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Bromochloromethane	74-97-5	NL	16,000 n	NL	NL	NL	NL	NL	*NL*	N/A	5	250	Low	N/A	N/A
Bromodichloromethane	75-27-4	NL	270 c	NL	1,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Bromoform	75-25-2	NL	62,000 c	NL	81,000	20	NL	20	*7*	N/A	5	250	Low	N/A	N/A
Bromomethane	74-83-9	NL	730 n	NL	25,000	30	NL	30	*10*	N/A	5	250	Low	N/A	N/A
Carbon Disulfide	75-15-0	NL	82,000 n	NL	7,800,000	4,000	NL	4,000	*1333*	N/A	5	250	Low	N/A	N/A
Carbon tetrachloride	56-23-5	NL	610 c	NL	600	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Chlorobenzene	108-90-7	NL	29,000 n	40,000	510,000	400	40,000	400	*133*	N/A	5	250	Low	N/A	N/A
Chloroethane	75-00-3	NL	1,500,000 n	NL	220,000	NL	NL	220,000	*73333*	N/A	5	250	Low	N/A	N/A
Chloroform	67-66-3	NL	290 c	NL	600	200	NL	200	*67*	N/A	5	250	Low	N/A	N/A
Chloromethane	74-87-3	NL	12,000 n	NL	4,000	NL	NL	4,000	*1333*	N/A	5	250	Low	N/A	N/A
cis-1,2-Dichloroethene	156-59-2	NL	16,000 n	NL	230,000	200	NL	200	*67*	N/A	5	250	Low	N/A	N/A
cis-1,3-Dichloropropene +	10061-01-5	NL	NL c	NL	2,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A

QAPP Worksheet #15l
Reference Limits and Evaluation Table - Soil VOCs

Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit					Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method				Achievable Laboratory Limits***	
		Federal			New Jersey					MDLs	CRQL		*Project-Specific Option*	MDLs	QLs
		EPA EcoSSLs (1)	EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)					Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Medium Soil			
Cyclohexane	110-82-7	NL	117,000 ns	NL	NL	NL	NL	117,000	*39000*	N/A	5	250	Low	N/A	N/A
Dibromochloromethane	124-48-1	NL	680 c	NL	3,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Dichlorodifluoromethane	75-71-8	NL	9,400 n	NL	490,000	25,000	NL	9,400	*3,133*	N/A	5	250	Low	N/A	N/A
Ethylbenzene	100-41-4	NL	5,400 cs	NL	7,800,000	8,000	NL	5,400	*1800*	N/A	5	250	Low	N/A	N/A
Isopropylbenzene	98-82-8	NL	259,098 ns	NL	NL	NL	NL	259,098	*86366*	N/A	5	250	Low	N/A	N/A
m, p-Xylene *	1330-20-7	NL	63,000 n	NL	12,000,000	12,000	NL	12,000	*4000*	N/A	5	250	Low	N/A	N/A
Methyl acetate	79-20-9	NL	7,800,000 n	NL	78,000,000	14,000	NL	14,000	*4667*	N/A	5	250	Low	N/A	N/A
Methyl tert-butyl ether	1634-04-4	NL	43,000 c	NL	110,000	200	NL	200	*67*	N/A	5	250	Low	N/A	N/A
Methylcyclohexane	108-87-2	NL	NL	NL	NL	NL	NL	NL	*NL*	N/A	5	250	Low	N/A	N/A
Methylene chloride	75-09-2	NL	11,000 c	NL	34,000	7	NL	7	*5*	N/A	5	250	Low	N/A	N/A
o-Xylene **	1330-20-7	NL	69,000 n	NL	12,000,000	12,000	NL	12,000	*4000*	N/A	5	250	Low	N/A	N/A
Styrene	100-42-5	NL	822,434 ns	300,000	90,000	2,000	300,000	2,000	*667*	N/A	5	250	Low	N/A	N/A
Tetrachloroethene	127-18-4	NL	550 c	NL	2,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Toluene	108-88-3	NL	723,996 ns	200,000	6,300,000	4,000	200,000	4,000	*1333*	N/A	5	250	Low	N/A	N/A
trans-1,2-Dichloroethene	156-60-5	NL	15,000 n	NL	300,000	400	NL	400	*133*	N/A	5	250	Low	N/A	N/A
trans-1,3-Dichloropropene +	10061-02-6	NL	1,700 c	NL	2,000	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A
Trichloroethene	79-01-6	NL	2,500 n	NL	7,000	7	NL	7	*5*	N/A	5	250	Low	N/A	N/A
Trichlorofluoromethane	75-69-4	NL	79,000 n	NL	23,000,000	22,000	NL	22,000	*7333*	N/A	5	250	Low	N/A	N/A
Vinyl Chloride	75-01-4	NL	60 c	NL	700	5	NL	5	*5*	N/A	5	250	Low	N/A	N/A

1. EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1,
(web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
4. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 11/2009);
http://www.state.nj.us/dep/srp/guidance/rs/, downloaded June 8, 2011.
5. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation (last revised Decewmber 2008)

Soil screening criteria listed in notes 1 and 3 were used to develop the Ecological Action Limit; soil screening criteria listed in notes 2, 4 and 5 were used to develop the Project Action Limit.

* m-xylene and p-xylene reported as one compound under S0M01.2.

** Xylene (total) was used for o-xylene criteria when the criteria is not listed.

*** *The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

**** *For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

+ 1,3-dichloropropene criteria was used for cis- and trans-1,3-dichloropropene criteria.

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
N/A = Not Applicable
n = based on noncancer hazard index criteria
s = criteria calculated based on saturated concentration
m = ceiling limit are used as a criteria
µg/L\kg = micrograms per kilogram
PAL= Project Action Limit
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed or chemical name listed but no value available
PAL= Project Action Limit
+ 1,3-dichloropropene criteria was used for cis- and trans-1,3-dichloropropene criteria.

QAPP Worksheet #15m
Reference Limits and Evaluation Table - Soil SVOCs

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit									Analytical Method					Achievable Laboratory Limits*	
		Federal				New Jersey		Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	MDLs		CRQL		*Project-Specific Option*	MDLs	QLs
		EPA EcoSSLs (1)		EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)					Analytical Method - SOM01.2 Low SIM	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Med. Soil			
1,1'-Biphenyl	92-52-4	NL		5,100 n	NL	3,100,000	90,000	NL	5,100	*1,700*	N/A	NL	170	5,000	Low	N/A	N/A
1,2,4,5-Tetrachlorobenzene	95-94-3	NL		1,800 n	NL	NL	NL	NL	1,800	*600*	N/A	NL	170	5,000	Low	N/A	N/A
2,2'-Oxybis (1-chloropropane)	108-60-1	NL		4,600 c	NL	23,000	NL	NL	4,600	*1,533*	N/A	NL	170	5,000	Low	N/A	N/A
2,3,4,6-Tetrachlorophenol	58-90-2	NL		180,000 n	NL	NL	NL	NL	180,000	*60,000*	N/A	NL	170	5,000	Low	N/A	N/A
2,4,5-Trichlorophenol	95-95-4	NL		610,000 n	9,000	6,100,000	44,000	9,000	44,000	*3,000*	N/A	NL	170	5,000	Low	N/A	N/A
2,4,6-Trichlorophenol	88-06-2	NL		6,100 n	4,000	19,000	200	4,000	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
2,4-Dichlorophenol	120-83-2	NL		18,000 n	NL	180,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
2,4-Dimethylphenol	105-67-9	NL		120,000 n	NL	1,200,000	700	NL	700	*233*	N/A	NL	170	5,000	Low	N/A	N/A
2,4-Dinitrophenol	51-28-5	NL		12,000 n	20,000	120,000	300	20,000	300	*300*	N/A	NL	330	10,000	MA	N/A	N/A
2,4-Dinitrotoluene	121-14-2	NL		1,600 c	NL	700	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
2,6-Dinitrotoluene	606-20-2	NL		6,100 n	NL	700	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
2-Chloronapthalene	91-58-7	NL		630,000 n	NL	NL	NL	NL	630,000	*210,000*	N/A	NL	170	5,000	Low	N/A	N/A
2-Chlorophenol	95-57-8	NL		39,000 n	NL	310,000	500	NL	500	*170*	N/A	NL	170	5,000	Low	N/A	N/A
2-Methylnapthalene	91-57-6	NL		31,000 n	NL	230,000	5,000	NL	5,000	*1,667*	N/A	3.3	170	5,000	Low	N/A	N/A
2-Methylphenol	95-48-7	NL		310,000 n	NL	310,000	NL	NL	310,000	*103,333*	N/A	NL	170	5,000	Low	N/A	N/A
2-Nitroaniline	88-74-4	NL		61,000 n	NL	39,000	NL	NL	39,000	*13,000*	N/A	NL	330	10,000	Low	N/A	N/A
2-Nitrophenol	88-75-5	NL		NL	NL	NL	NL	NL	NL	*NL*	N/A	NL	170	5,000	Low	N/A	N/A
3,3'-Dichlorobenzidine	91-94-1	NL		1,100 c	NL	1,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
3-Nitroaniline	99-09-2	NL		NL	NL	NL	NL	NL	NL	*NL*	N/A	NL	330	10,000	Low	N/A	N/A
4,6-Dinitro-2-methylphenol	534-52-1	NL		490 n	NL	6,000	300	NL	300	*300*	N/A	NL	330	10,000	MA	N/A	N/A
4-Bromophenyl-phenylether	101-55-3	NL		NL	NL	NL	NL	NL	NL	*NL*	N/A	NL	170	5,000	Low	N/A	N/A
4-Chloro-3-methylphenol	59-50-7	NL		610,000 n	NL	NL	NL	NL	610,000	*203,333*	N/A	NL	170	5,000	Low	N/A	N/A
4-Chloroaniline	106-47-8	NL		2,400 c	NL	NL	NL	NL	2,400	*800*	N/A	NL	170	5,000	Low	N/A	N/A
4-Chlorophenyl-phenyl ether	7005-72-3	NL		NL	NL	NL	NL	NL	NL	*NL*	N/A	NL	170	5,000	Low	N/A	N/A
4-Methylphenol	106-44-5	NL		31,000 n	NL	31,000	NL	NL	31,000	*10,333*	N/A	NL	170	5,000	Low	N/A	N/A
4-Nitroaniline	100-01-6	NL		24,000 c	NL	NL	NL	NL	24,000	*8,000*	N/A	NL	330	10,000	Low	N/A	N/A
4-Nitrophenol	100-02-7	NL		NL	7,000	NL	NL	7,000	NL	*2,333*	N/A	NL	330	10,000	Low	N/A	N/A
Acenaphthene	83-32-9	29,000	f	340,000 n	20,000	NL	74,000	20,000	74,000	*6,667*	N/A	3.3	170	5,000	Low	N/A	N/A
Acenaphthylene	208-96-8	29,000	f	340,000 n	NL	NL	NL	29,000	340,000	*9,667*	N/A	3.3	170	5,000	Low	N/A	N/A
Acetophenone	98-86-2	NL		780,000 n	NL	NL	2,000	NL	2,000	*667*	N/A	NL	170	5,000	Low	N/A	N/A
Anthracene	120-12-7	29,000	f	1,700,000 n	NL	17,000,000	NL	29,000	1,700,000	*9,667*	N/A	3.3	170	5,000	Low	N/A	N/A
Atrazine	1912-24-9	NL		2,100 c	NL	210,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Benzaldehyde	100-52-7	NL		780,000 n	NL	6,100,000	NL	NL	780,000	*260,000*	N/A	NL	170	5,000	Low	N/A	N/A
Benzo (a) anthracene	56-55-3	1,100	g	150 c	NL	600	NL	1,100	150	*150*	N/A	3.3	170	5,000	SIM	N/A	N/A

QAPP Worksheet #15m
Reference Limits and Evaluation Table - Soil SVOCs

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Project Action Limit						Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method					Achievable Laboratory Limits*	
		Federal				New Jersey							CRQL				
		EPA EcoSSLs (1)		EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Non-Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)				MDLs	Analytical Method - SOM01.2 Low SIM	Analytical Method - SOM01.2 Low Soil	Analytical Method - SOM01.2 Med. Soil	*Project-Specific Option*	MDLs	QLs
Benzo (a) pyrene	50-32-8	1,100	g	15 c	NL	200	NL	1,100	15	*15*	N/A	3.3	170	5,000	Sim	N/A	N/A
Benzo (b) fluoroanthene	205-99-2	NL		150 c	NL	600	NL	NL	150	*150*	N/A	3.3	170	5,000	Sim	N/A	N/A
Benzo (g,h,i) perylene	191-24-2	1,100	g	NL	NL	380,000,000	NL	1,100	380,000,000	*367*	N/A	3.3	170	5,000	Low	N/A	N/A
Benzo (k) fluoroanthene	207-08-9	NL		1,500 c	NL	6,000	NL	NL	1,500	*500*	N/A	3.3	170	5,000	Low	N/A	N/A
Bis (2-chloroethoxy) methane	111-91-1	NL		18,000 n	NL	NL	NL	NL	18,000	*6,000*	N/A	NL	170	5,000	Low	N/A	N/A
Bis (2-ethylhexyl) phthalate	117-81-7	NL		35,000 c	NL	35,000	NL	NL	35,000	*11,667*	N/A	NL	170	5,000	Low	N/A	N/A
bis-(2-chloroethyl) ether	111-44-4	NL		210 c	NL	400	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Butylbenzylphthalate	85-68-7	NL		260,000 c	NL	1,200,000	NL	NL	260,000	*86,667*	N/A	NL	170	5,000	Low	N/A	N/A
Caprolactam	105-60-2	NL		3,100,000 n	NL	31,000,000	8,000	NL	8,000	*2,667*	N/A	NL	170	5,000	Low	N/A	N/A
Carbazole	86-74-8	NL		NL	NL	24,000	NL	NL	24,000	*8,000*	N/A	NL	170	5,000	Low	N/A	N/A
Chrysene	218-01-9	1,100	g	15,000 c	NL	62,000	NL	1,100	15,000	*367*	N/A	3.3	170	5,000	Low	N/A	N/A
Dibenzo (a,h)-anthracene	53-70-3	1,100	g	15 c	NL	200	NL	1,100	15	*15*	N/A	3.3	170	5,000	Sim	N/A	N/A
Dibenzofuran	132-64-9	NL		7,800 n	NL	NL	NL	NL	7,800	*2,600*	N/A	NL	170	5,000	Low	N/A	N/A
Diethylphthalate	84-66-2	NL		4,900,000 n	100,000	49,000,000	57,000	100,000	57,000	*19,000*	N/A	NL	170	5,000	Low	N/A	N/A
Dimethylphthalate	131-11-3	NL		NL	NL	NL	NL	NL	NL	*NL*	N/A	NL	170	5,000	Low	N/A	N/A
Di-n-butylphthalate	84-74-2	NL		610,000 n	200,000	6,100,000	NL	200,000	610,000	*66,667*	N/A	NL	170	5,000	Low	N/A	N/A
Di-n-octylphthalate	117-84-0	NL		NL	NL	2,400,000	NL	NL	2,400,000	*800,000*	N/A	NL	170	5,000	Low	N/A	N/A
Fluoranthene	206-44-0	1,100	g	230,000 n	NL	2,300,000	NL	1,100	230,000	*367*	N/A	3.3	170	5,000	Low	N/A	N/A
Fluorene	86-73-7	29,000	f	230,000 n	NL	2,300,000	110,000	29,000	110,000	*9,667*	N/A	3.3	170	5,000	Low	N/A	N/A
Hexachlorobenzene	118-74-1	NL		300 c	NL	300	NL	NL	300	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Hexachlorobutadiene	87-68-3	NL		6,100 n	NL	6,000	NL	NL	6,000	*2,000*	N/A	NL	170	5,000	Low	N/A	N/A
Hexachlorocyclo-pentadiene	77-47-4	NL		37,000 n	10,000	45,000	NL	10,000	37,000	*3,333*	N/A	NL	170	5,000	Low	N/A	N/A
Hexachloroethane	67-72-1	NL		6,100 n	NL	35,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Indeno (1,2,3-cd)-pyrene	193-39-5	1,100	g	150 c	NL	600	NL	1,100	150	*150*	N/A	3.3	170	5,000	Low	N/A	N/A
Isophorone	78-59-1	NL		510,000 c	NL	510,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Napthalene	91-20-3	29,000	f	3,600 c	NL	6,000	16,000	29,000	3,600	*1,200*	N/A	3.3	170	5,000	Low	N/A	N/A
Nitrobenzene	98-95-3	NL		4,800 c	NL	31,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
N-Nitroso-di-n propylamine	621-64-7	NL		69 c	NL	200	200	NL	69	*69*	N/A	NL	170	5,000	MA	N/A	N/A
N-Nitrosodiphenylamine	86-30-6	NL		99,000 c	NL	99,000	200	NL	200	*170*	N/A	NL	170	5,000	Low	N/A	N/A
Pentachlorophenol	87-86-5	2,100		890 c	3,000	3,000	300	2,100	300	*300*	N/A	6.7	330	10,000	Sim	N/A	N/A
Phenanthrene	85-01-8	29,000	f	NL	NL	NL	NL	29,000	0	*29,000*	N/A	3.3	170	5,000	Low	N/A	N/A
Phenol	108-95-2	NL		1,800,000 n	30,000	18,000,000	5,000	30,000	5,000	*1,667*	N/A	NL	170	5,000	Low	N/A	N/A
Pyrene	129-00-0	1,100	g	170,000 n	NL	1,700,000	NL	1,100	170,000	*367*	N/A	3.3	170	5,000	Low	N/A	N/A

QAPP Worksheet #15m
Reference Limits and Evaluation Table - Soil SVOCs

Notes:

1. EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1, (web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints. Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
4. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 11/2009); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded June 8, 2011.
5. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation (last revised Decewmber 2008)

Soil screening criteria listed in notes 1 and 3 were used to develop the Ecological Action Limit; soil screening criteria listed in notes 2, 4 and 5 were used to develop the Project Action Limit.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
PAL= Project Action Limit
µg/kg = micrograms per kilogram
c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria
f - value for low molecular weight polyaromatic hydrocarbons
g - value for high molecular weight polyaromatic hydrocarbons

QAPP Worksheet #15o
Reference Limits and Evaluation Table - Soil Aroclors (PCBs)

Aroclors (All units: µg/kg)	CAS Number	Project Action Limit								Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal						New Jersey					MDLs	CRQL		
		EPA EcoSSLs (1)		EPA Regional Screening Level (2)		Soil PRGs (3)		NJDEP Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)					Analytical Method - SOM01.2 Soil	MDLs	QLs
Aroclor-1016	12674-11-2	NL		390	n	371	a	1,000	NL	371	390	*482*	N/A	33	N/A	N/A
Aroclor-1221	11104-28-2	NL		140	c	371	a	1,000	NL	371	140	*182*	N/A	33	N/A	N/A
Aroclor-1232	11141-16-5	NL		140	c	371	a	1,000	NL	371	140	*182*	N/A	33	N/A	N/A
Aroclor-1242	53469-21-9	NL		220	c	371	a	1,000	NL	371	220	*286*	N/A	33	N/A	N/A
Aroclor-1248	12672-29-6	NL		220	c	371	a	1,000	NL	371	220	*286*	N/A	33	N/A	N/A
Aroclor-1254	11097-69-1	NL		110	n	371	a	1,000	NL	371	110	*143*	N/A	33	N/A	N/A
Aroclor-1260	11096-82-5	NL		220	c	371	a	1,000	NL	371	220	*286*	N/A	33	N/A	N/A
Aroclor-1262	37324-23-5	NL		NL		371	a	1,000	NL	371	1,000	*482*	N/A	33	N/A	N/A
Aroclor-1268	11100-14-4	NL		NL		371	a	1,000	NL	371	1,000	*482*	N/A	33	N/A	N/A

Notes:

1. EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/

2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1,
(web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.

3. Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.

4. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 11/2009);
http://www.state.nj.us/dep/srp/guidance/rs/, downloaded June 8, 2011.

5. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation (last revised Decewmber 2008)

Soil screening criteria listed in notes 1 and 3 were used to develop the Ecological Action Limit; soil screening criteria listed in notes 2, 4 and 5 were used to develop the Project Action Limit.

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*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service
EPA = United States Environmental Protection Agency
CRQL = Contract Required Quantitation Limit
MDL = method detection limit
NA = Chemical name listed but no value available
PAL= Project Action Limit
µg/kg = micrograms per kilogram
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria
a - value for PCBs

QAPP Worksheet #15p
Reference Limits and Evaluation Table - Soil Pesticides

Pesticides (All units: µg/kg)	CAS Number	Project Action Limit						Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal			New Jersey						MDLs	CRQL		
		EPA EcoSSLs (1)	EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)						Analytical Method - SOM01.2 Soil	MDLs	QLs
4,4'-DDD	72-54-8	21 a	2,000 c	NL	3,000	NL		21	2,000	*7*	N/A	3.3	N/A	N/A
4,4'-DDE	72-55-9	21 a	1,400 c	NL	2,000	NL		21	1,400	*7*	N/A	3.3	N/A	N/A
4,4'-DDT	50-29-3	21 a	1,700 c	NL	2,000	NL		21	1,700	*7*	N/A	3.3	N/A	N/A
Aldrin	309-00-2	NL	29 c	NL	40	NL		NL	29	*10*	N/A	1.7	N/A	N/A
alpha-BHC	319-84-6	NL	77 c	NL	100	2		NL	2	*2*	N/A	1.7	N/A	N/A
alpha-Chlordane	5103-71-9	NL	NL	NL	200	NL		NL	200	*67*	N/A	1.7	N/A	N/A
beta-BHC	319-85-7	NL	270 c	NL	400	2		NL	2	*2*	N/A	1.7	N/A	N/A
delta-BHC	319-86-8	NL	NL	NL	NL	2		NL	2	*2*	N/A	1.7	N/A	N/A
Dieldrin	60-57-1	4.9	30 c	NL	40	NL		5	30	*3*	N/A	3.3	N/A	N/A
Endosulfan I	959-98-8	NL	NL	NL	NL	2,000		NL	2,000	*667*	N/A	1.7	N/A	N/A
Endosulfan II	33213-65-9	NL	NL	NL	NL	2,000		NL	2,000	*667*	N/A	3.3	N/A	N/A
Endosulfan sulfate	1031-07-8	NL	NL	NL	470,000	1,000		NL	1,000	*333*	N/A	3.3	N/A	N/A
Endrin	72-20-8	NL	1,800 n	NL	23,000	600		NL	600	*200*	N/A	3.3	N/A	N/A
Endrin aldehyde	7421-93-4	NL	NL	NL	NL	600		NL	600	*200*	N/A	3.3	N/A	N/A
Endrin ketone	53494-70-5	NL	NL	NL	NL	600		NL	600	*200*	N/A	3.3	N/A	N/A
gamma-BHC (Lindane)	58-89-9	NL	520 c	NL	400	2		NL	2	*2*	N/A	1.7	N/A	N/A
gamma-Chlordane	5103-74-2	NL	NL	NL	200	NL		NL	200	*67*	N/A	1.7	N/A	N/A
Heptachlor	76-44-8	NL	110 c	NL	100	NL		NL	100	*33*	N/A	1.7	N/A	N/A
Heptachlor epoxide	1024-57-3	NL	53 c	NL	70	NL		NL	53	*18*	N/A	1.7	N/A	N/A
Methoxychlor	72-43-5	NL	31,000 n	NL	390,000	NL		NL	31,000	*10333*	N/A	17	N/A	N/A
Toxaphene	8001-35-2	NL	440 c	NL	600	NL		NL	440	*147*	N/A	170	N/A	N/A

1. EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1, (web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints. Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
4. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 11/2009); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded June 8, 2011.
5. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation (last revised Decewmber 2008)

Soil screening criteria listed in notes 1 and 3 were used to develop the Ecological Action Limit; soil screening criteria listed in notes 2, 4 and 5 were used to develop the Project Action Limit.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
N/A = Not Applicable
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria

QAPP Worksheet #15q
Reference Limits and Evaluation Table -Soil Inorganics (Metals) and SPLP Inorganics

Inorganics (All units: mg/kg)	CAS Number	Project Action Limit					Ecological Action Limit	Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal			New Jersey					MDLs	CRQL		
		EPA EcoSSLs (1)	EPA Regional Screening Level (2)	Soil PRGs (3)	NJDEP Residential Direct Contact Soil Remediation Standard (4)	NJDEP Default Impact to Groundwater Soil Remediation Standard (5)					Analytical Method - ISM01.2 ICP-AES and MS for Soil	MDLs	QLs
Aluminum	7429-90-5	NL	7700 n	NL	78,000	3,900	NL	3,900	*1300*	N/A	20	N/A	N/A
Antimony	7440-36-0	0.27	3.1 n	5	31	6	0.27	3	*3*	N/A	1	N/A	N/A
Arsenic	7440-38-2	18	0.39 c	9.9	19	19	10	NL	*3*	N/A	1	N/A	N/A
Barium	7440-39-3	330	1500 n	283	16,000	1,300	283	1,300	*94*	N/A	20	N/A	N/A
Beryllium	7440-41-7	21	16 n	10	16	0.5	10	1	*0.50*	N/A	0.5	N/A	N/A
Cadmium	7440-43-9	0.36	7 n	4	78	1	0.36	1	*0.50*	N/A	0.5	N/A	N/A
Calcium	7440-70-2	NL	NL	NL	NL	NL	NL	NL	*NL*	N/A	500	N/A	N/A
Chromium [+]	7440-47-3	26	12000 n	0.4	NL	NL	0.36	12,000	*0.12*	N/A	1	N/A	N/A
Cobalt	7440-48-4	NL	2.3 n	20	1,600	59	20	2	*2*	N/A	0.5	N/A	N/A
Copper	7440-50-8	28	310 n	60	3,100	7,300	28	310	*9*	N/A	2.5	N/A	N/A
Cyanide	57-12-5	NL	160 n	NL	1,600	13	NL	13	*4*	N/A	0.5	N/A	N/A
Iron	7439-89-6	NL	5500 n	NL	NL	NL	NL	5,500	*1833*	N/A	10	N/A	N/A
Lead	7439-92-1	11	40 n	40.5	400	59	11	40	*4*	N/A	1	N/A	N/A
Magnesium	7439-95-4	NL	NL	NL	NL	NL	NL	NL	*NL*	N/A	500	N/A	N/A
Manganese	7439-96-5	220	NL	NL	11,000	42	220	42	*14*	N/A	1.5	N/A	N/A
Mercury	7439-97-6	NL	2.3 n	0.00051	23	0	0.001	0.1	*NL*	N/A	0.1	N/A	N/A
Nickel	7440-02-0	38	150 n	30	1,600	31	30	31	*10*	N/A	4	N/A	N/A
Potassium	7440-09-7	NL	NL	NL	NL	NL	NL	NL	*NL*	N/A	500	N/A	N/A
Selenium	7782-49-2	0.52	39 n	0.21	390	7	0.21	7	*3.50*	N/A	3.5	N/A	N/A
Silver	7440-22-4	4.2	39 n	NL	390	1	4	1	*1*	N/A	1	N/A	N/A
Sodium	7440-23-5	NL	NL	NL	NL	NL	NL	NL	*NL*	N/A	500	N/A	N/A
Thallium	7440-28-0	NL	0.078 n	1	5	3	1	0	*3*	N/A	2.5	N/A	N/A
Vanadium	7440-62-2	7.8	39 n	2	78	NL	2	39	*1*	N/A	2.5	N/A	N/A
Zinc	7440-66-6	46	2300 n	8.5	23,000	600	9	600	*3*	N/A	6	N/A	N/A

QAPP Worksheet #15q
Reference Limits and Evaluation Table -Soil Inorganics (Metals) and SPLP Inorganics

Notes:

1. EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1, (web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints. Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
4. NJDEP Residential Direct Contact Health Based Criteria and Soil Remediation Standards (Last Revised 11/2009); http://www.state.nj.us/dep/srp/guidance/rs/, downloaded June 8, 2011.
5. NJDEP Guidance Document, Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation (last revised Decewmber 2008)

Soil screening criteria listed in notes 1 and 3 were used to develop the Ecological Action Limit; soil screening criteria listed in notes 2, 4 and 5 were used to develop the Project Action Limit.

**The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

AES = atomic emission spectroscopy
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
EPA = United States Environmental Protection Agency
MDL = method detection limit
MS = MAss spectroscopy
NA = Chemical name listed but no value available

c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria

mg/kg = micrograms per kilogram

QAPP Worksheet #15r
Reference Limits and Evaluation Table -Soil and Sediment Dioxins and Furans

Analyte units = ng/kg (nanogram per kilogram)	CAS Number	Project Action Limit[1]	Project Quantitation Limit Goals[2] (ng/kg)	Method 1613B Achievable Laboratory Limits[3]	
				MDLs (ng/kg) [4]	QLs (ng/kg) [4]
2378-TCDD	1746-01-6	TBD	1	0.031	0.05
12378-PeCDD	40321-76-4	TBD	5	0.13	0.1
123678-HxCDD	57653-85-7	TBD	5	0.19	0.1
123478-HxCDD	39227-28-6	TBD	5	0.18	0.1
123789-HxCDD	19408-74-3	TBD	5	0.17	0.1
1234678-HpCDD	35822-46-9	TBD	5	0.17	0.1
OCDD	3268-87-9	TBD	10	0.83	0.5
2378-TCDF	51207-31-9	TBD	1	0.015	0.05
12378-PeCDF	57117-41-6	TBD	5	0.095	0.1
23478-PeCDF	57117-31-4	TBD	5	0.096	0.1
123678-HxCDF	57117-44-9	TBD	5	0.091	0.1
123789-HxCDF	72918-21-9	TBD	5	0.12	0.1
123478-HxCDF	70648-26-9	TBD	5	0.093	0.1
234678-HxCDF	60851-34-5	TBD	5	0.12	0.1
1234678-HpCDF	67562-39-4	TBD	5	0.099	0.1
1234789-HpCDF	55673-89-7	TBD	5	0.088	0.1
OCDF	39001-02-0	TBD	10	0.28	0.5

Notes:

1. Project-specific screening levels have not been approved by the USEPA for this project for the individual PCDD/PCDF Congeners.

2. The PQLGs are target reporting limit goals based on minimum levels published in Table 2 of USEPA Method1613B.

3. Specific MDLs for solids are not given in USEPA Method 1613B, but the QLs listed are the minimum levels published in Table 2 of USEPA Method 1613B and CLP method DLM0.2, Exhibit C, Section 1. The actual detection limits are usually dependent on the level of interference rather than instrument limitations.

4. The MDLs listed are the statistically-derived MDLs. The QLs listed are obtained from Axys Analytical Services.

QAPP Worksheet #15s
Reference Limits and Evaluation Table - Sediment Aroclors (PCBs)

Aroclors (All units: µg/kg)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal		New Jersey			MDLs	CRQL		
		EPA Freshwater Sediment Screening Benchmark (1)	EPA Regional Screening Level (2)	NJDEP Guidance for Sediment Quality (3)				Analytical Method - SOM01.2 Soil	MDLs	QLs
Aroclor-1016	12674-11-2	NL	390 n	7	7	*7*	N/A	33	N/A	N/A
Aroclor-1221	11104-28-2	NL	140 c	NL	140	*47*	N/A	33	N/A	N/A
Aroclor-1232	11141-16-5	NL	140 c	NL	140	*47*	N/A	33	N/A	N/A
Aroclor-1242	53469-21-9	NL	220 c	NL	220	*73*	N/A	33	N/A	N/A
Aroclor-1248	12672-29-6	NL	220 c	30	30	*30*	N/A	33	N/A	N/A
Aroclor-1254	11097-69-1	NL	110 n	60	60	*33*	N/A	33	N/A	N/A
Aroclor-1260	11096-82-5	NL	220 c	5	5	*5*	N/A	33	N/A	N/A
Aroclor-1262	37324-23-5	NL	NL	NL	NL	*NL*	N/A	33	N/A	N/A
Aroclor-1268	11100-14-4	NL	NL	NL	NL	*NL*	N/A	33	N/A	N/A

Notes:

1. EPA Freshwater Sediment Screening Benchmarks . (webpage http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fwsed/screenbench.htm). March 2010.
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1, (web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. NJDEP Freshwater Sediment Screening Guidelines. (webpage http://www.state.nj.us/dep/srp/regs/sediment/table_01.htm). May 2011.

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CAS = Chemical abstract service
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CRQL = Contract Required Quantitation Limit
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µg/kg = micrograms per kilogram
NYSDEC = New York State Department of Environmental Conservation
NJDEP = New Jersey Department of Environmental Protection
NL = Not Listed
c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria
a - value for PCBs

QAPP Worksheet #15t
Reference Limits and Evaluation Table - Sediment Inorganics (Metals)

Inorganics (All units: mg/kg)	CAS Number	Project Action Limit				Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal			New Jersey			MDLs	CRQL		
		EPA Freshwater Sediment Screening Benchmark (1)	EPA Regional Screening Level (2)		NJDEP Guidance for Sediment Quality (3)				Analytical Method - ISM01.2 ICP-AES and MS for Soil	MDLs	QLs
Aluminum	7429-90-5	NL	7,700	n	25,500	7,700	*2,566.67*	N/A	20	N/A	N/A
Antimony	7440-36-0	2	3.10	n	NL	2	*2*	N/A	2	N/A	N/A
Arsenic	7440-38-2	9.80	0.39	c	6	0.39	*0.39*	N/A	0.5	N/A	N/A
Barium	7440-39-3	NL	1,500	n	NL	1,500	*500*	N/A	20	N/A	N/A
Beryllium	7440-41-7	NL	16	n	NL	16	*5.33*	N/A	0.5	N/A	N/A
Cadmium	7440-43-9	0.99	7	n	0.60	0.60	*0.50*	N/A	0.5	N/A	N/A
Calcium	7440-70-2	NL	NL		NL	NL	*NL*	N/A	500	N/A	N/A
Chromium [+]	7440-47-3	43.40	12,000	n	26	26	*8.67*	N/A	1	N/A	N/A
Cobalt	7440-48-4	50	2.30	n	508	2.30	*2.30*	N/A	0.5	N/A	N/A
Copper	7440-50-8	31.60	310	n	16	16	*5.33*	N/A	2.5	N/A	N/A
Cyanide	57-12-5	0.10	160	n	0.00018	0.00018	*0.00018*	N/A	0.5	N/A	N/A
Iron	7439-89-6	20,000	5,500	n	NL	5,500	*1,833.33*	N/A	10	N/A	N/A
Lead	7439-92-1	35.80	40	n	31	31	*10.33*	N/A	1	N/A	N/A
Magnesium	7439-95-4	NL	NL		NL	NL	*NL*	N/A	500	N/A	N/A
Manganese	7439-96-5	460	NL		63,015	460	*153.33*	N/A	1.5	N/A	N/A
Mercury	7439-97-6	0.18	2.30	n	0.20	0.18	*0.10*	N/A	0.1	N/A	N/A
Nickel	7440-02-0	22.70	150	n	16	16	*5.33*	N/A	4	N/A	N/A
Potassium	7440-09-7	NL	NL		NL	NL	*NL*	N/A	500	N/A	N/A
Selenium	7782-49-2	2	39	n	NL	2	*2.00*	N/A	2.5	N/A	N/A
Silver	7440-22-4	1	39	n	1	1	*1*	N/A	1	N/A	N/A

QAPP Worksheet #15t
Reference Limits and Evaluation Table - Sediment Inorganics (Metals)

Inorganics (All units: mg/kg)	CAS Number	Project Action Limit			Project Action Limit (PAL)	*Project Quantitation Limit Goal (PQLG)***	Analytical Method		Achievable Laboratory Limits*	
		Federal		New Jersey			MDLs	CRQL		
		EPA Freshwater Sediment Screening Benchmark (1)	EPA Regional Screening Level (2)	NJDEP Guidance for Sediment Quality (3)				Analytical Method - ISM01.2 ICP-AES for Soil	MDLs	QLs
Sodium	7440-23-5	NL	NL	NL	NL	*NL*	N/A	500	N/A	N/A
Thallium	7440-28-0	NL	0.078 n	NL	0.078	0.078	N/A	2.5	N/A	N/A
Vanadium	7440-62-2	NL	39 n	NL	39	*0.55*	N/A	2.5	N/A	N/A
Zinc	7440-66-6	121	2,300 n	120	120	*40*	N/A	6	N/A	N/A

Notes:

1. EPA Freshwater Sediment Screening Benchmarks . (webpage http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fwsed/screenbench.htm). March 2010.
2. EPA Regional Screening Levels (RSL) for residential soil based on carcinogenic target risk of 10-6 and noncancer hazard index of 0.1, (web page http://www.epa.gov/region9/superfund/prg/index.html). May 2011.
3. NJDEP Freshwater Sediment Screening Guidelines. (webpage http://www.state.nj.us/dep/srp/regs/sediment/table_01.htm). May 2011.

** The laboratory is TBD. CDM will implement the EPA Region 2 FASTAC policy for obtaining analytical services.*

*** For the highlighted cells CDM will utilize the existing CLP modified analyses (MA). If no MAs exist to meet the required limits, the nominal CRQLs will be applied.*

See Appendix C for DESA information regarding this worksheet.

AES = atomic emission spectroscopy
CAS = Chemical abstract service
CRQL = Contract Required Quantitation Limit
DAF = dilution attenuation factor
EPA = United States Environmental Protection Agency
MDL = method detection limit
MS = MAss spectroscopy
+ chromium III criteria was used for chromium criteria.
NA = Chemical name listed but no value available
NJDEP = New Jersey Department of Environmental Protection
NYSDEC = New York State Department of Environmental Conservation
PAL= Project Action Limit
SSL = soil screening levels
µg/kg = micrograms per kilogram
c = based on carcinogenic target risk criteria
n = based on noncancer hazard index criteria

QAPP Worksheet #15u
Reference Limits and Evaluation Table - Sediment PCB Congeners

Analyte Units = picogram per gram [pg/g]	CAS Number	Project Action Limit[1]	Project Quantitation Limit Goal	Analytical Method[2]		Achievable Laboratory Limits[3]	
				CBC01.2		Method 1668A	
				MDLs	Method CRQLs[2]	MDLs	QLs
All individual Congeners PCB-1 through PCB-209	List is provided in method	TBD	Equal to the laboratory achievable QLs for each congener	NA	2.0 ng/kg	See summary in method	0.1 to 0.2 pg/g

Notes:

1. Project-specific screening levels have not been approved by the USEPA for this project.

2. Method does not include MDLs which will be determined by the selected laboratory.

3. Achievable QLs listed are based on typical Axys Analytical Services laboratory detection limits expected to range from 0.1 to 2.0 pg/g, with exceptions (particularly co-eluting congeners). The assigned laboratory will report PCB congeners to sample specific detection limits, which may be different depending upon the samples.

4. Laboratory results will be reported in dry weight. Actual QLs may be higher and are dependent on the sample moisture content and matrix effects.

QAPP Worksheet #16
Project Schedule Timeline Table

See Figure 9

QAPP Worksheet # 17
Sampling Design and Rationale

The field program will include the following tasks:

- Mobilization **(Worksheet 17a)**
- Site Reconnaissance **(Worksheet 17b)**
- Hydrogeological Assessment **(Worksheet 17c)**
- Soil Boring, Drilling, and Testing **(Worksheet 17d)**
- Environmental Sampling **(Worksheet 17e)**
- Decontamination Procedures **(Worksheet 17f)**

QAPP Worksheet # 17a
Sampling Design and Rationale
Mobilization

Site Preparation
All site workers will become familiar with the history of the site, and locations where field investigation activities will take place. CDM plans to use existing road rights-of-way, open space, and clearings to the maximum extent possible to access sampling locations. However, it will be necessary to clear some areas of vegetation and trees in order to access sampling locations. The drilling subcontractor will be responsible for clearing vegetation. CDM will direct and oversee any necessary clearing activities conducted by the drilling subcontractor.

Access Support
Access to public areas and private property will be needed to execute the field investigation. EPA will be responsible for obtaining site access, and CDM will assist EPA with site access. Access support is anticipated for groundwater screening, sediment and surface water sampling, monitoring well installation and sampling at offsite locations. CDM will provide a list of property owners (public and private) to be accessed during the field activities. The list will include the mailing address and telephone number of the property owners. Once EPA has established that access has been granted, field work can begin. CDM will contact and coordinate with property owners and local officials (for work in public areas) to schedule sampling activities. Per EPA direction, CDM will give one week (seven days) advance verbal notice to the facility/property owners before field activities on their properties are initiated.

Field Planning Meetings
Prior to field activities, each field team member will review all project plans and participate in a field planning meeting, conducted by the CDM PM, to become familiar with the history of the Site, health and safety requirements, field procedures, and related QC requirements. Field personnel will also attend an onsite tailgate kick-off meeting immediately prior to the commencement of each stage or step of field activities. All new field personnel will receive comparable briefing if they were not at the initial field planning meeting and/or the tailgate kick-off meeting. Local authorities such as the police and fire departments will be notified prior to the start of field activities.

Field Equipment and Supplies
Equipment and field supply mobilization, governed by CDM's Quality Procedures (QP) section 2.1, *Procuring Measurement and Test Equipment* and section 5.3, *Inspection of Items*, will entail ordering, renting, and purchasing all equipment and supplies needed for each part of the RI field investigation. This will also include staging and transferring all equipment and supplies to and from the site. Measurement and Test Equipment forms will be completed for rental or purchase of equipment (instruments) that will be utilized to collect field measurements. The field equipment will be inspected for acceptability, and instruments calibrated as required prior to use. This task also involves the construction of a decontamination area for sampling equipment and personnel. A separate decontamination pad will be constructed by the drilling subcontractor for drilling equipment.

Investigation Derived Waste (IDW)
IDW procedures are covered in Worksheet #17c and #17e.

Field Procedures for these Activities are detailed in:
■ TSOP 5-1 Control of Measurement and Test Equipment

QAPP Worksheet # 17b
Sampling Design and Rationale
Site Reconnaissance

Site Reconnaissance
The following reconnaissance activities are required to support the field activities:

- Soil Boring and Groundwater screening location reconnaissance
- Seep, Surface Water and Sediment sample location reconnaissance
- Cultural Resources survey
- Elevation, Location, and Bathymetry survey
- Walkover Radiological screening survey (Optional)

Soil Boring and Groundwater Screening Location Reconnaissance
Soil boring and groundwater screening locations will be identified in order to avoid potential logistical issues and physical access constraints for the drill rig. Locations will be adjusted as necessary.

Seep, Surface Water and Sediment Sample Location Reconnaissance
Seep, surface water, and sediment sample locations will be identified in order to avoid potential logistical issues and physical access constraints for the drill rig. The field team will determine the sedimentary depositional environment. Locations will be adjusted as necessary.

Cultural Resources Survey
The stage 1A cultural resources survey will be completed by a subcontractor. On-site work will determine the presence or absence of known cultural resources which may be impacted by potential remedial action. CDM will oversee the onsite activities of the cultural resources subcontractor.

Elevation, Location, and Bathymetry Survey
A subcontractor will perform the elevation, location, and bathymetry survey. The location and elevation of new monitoring wells and soil borings will be recorded. A bathymetry survey of Hessain Run and Woodbury Creek will be conducted to achieve more accurate volume estimates of contaminated sediment for the FS. In addition to performing oversight of this subcontractor, CDM will use a GPS to survey surface water, sediment, and seep sample locations.

Walkover Radiological Screening Survey (Optional)
At EPA direction, CDM will conduct a walkover radiological screening survey in the area of the site where the waste was deposited.

Field Procedures for these Activities are detailed in:

- TSOP 3-2 Topographic Survey
- TSOP 4-1 Field Logbook Content and Control
- TSOP 4-2 Photographic Documentation of Field Activities, Sections 5.2.2 General Guidelines for Still Photography and 5.2.4 Photographic Documentation

QAPP Worksheet # 17c
Sampling Design and Rationale
Groundwater Screening with DPT

Groundwater Screening Sampling

Direct push technology (DPT) groundwater screening sampling, along with 24-hour TAT analysis, is a quick screening method that can provide data regarding the lateral and vertical extent of the contaminant plume. The quick turnaround time will allow project staff to confirm or modify the locations of the subsequent screening points without interruption of ongoing field work. Following completion of the program the data will be used (along with existing data) to select the location and screen depth of the new monitoring wells in consultation with EPA.

The proposed groundwater screening locations were chosen in order to determine the current location and spatial extent of the aquifer plume. The locations were chosen along three north-south trending transects perpendicular to the estimated groundwater flow to the southeast. The information collected during the investigation will support the evaluation of the nature and extent of VOCs and metals detected in the groundwater, potential areas of release, and potential ongoing source areas.

Twelve (12) groundwater screening points and 3 contingency points will be advanced through the water table (~ 5 to 10 ft) to 120 feet bgs. Groundwater screening samples will be collected every 10 feet. As shown on Figure 3, 12 groundwater screening locations are located along three roughly north-south transects. As the screening program progresses, the 3 contingency locations will be located as initial data are evaluated and the orientation of the transects may be shifted to conform to the actual plume orientation. Table 1 provides a summary of the number and types of samples that will be collected for the groundwater screening program.

In each boring, the groundwater sampler will be advanced to the deepest sample interval, and a four-foot screen will be exposed to the formation. Upon completion of sampling at an interval the entire probe string will be retracted to the next interval until sampling is complete. Each screened interval will be developed for a maximum of 1 hour to remove any large fraction sediments using a peristaltic pump (or equivalent). During development, field indicator parameters (turbidity, temperature, specific conductance, and pH) will be monitored and recorded. Groundwater will be considered ready for sample collection after an hour of purging or when the indicator parameters have stabilized for three consecutive readings as follows: ±0.1 for pH, ±3% for specific conductance (conductivity) and ±10% turbidity. The groundwater will be collected from each screening point with location-dedicated Teflon-lined polyethylene tubing (equipped with check valve at bottom) to decrease agitation for a more representative VOC sample The same tubing can be used to collect all twelve samples at the same DPT location. Upon completion of sampling. the boreholes will be abandoned with cement/bentonite grout. All drilling will be conducted by a NJ-licensed driller and will adhere to N.J.A.C 7.9D

Field Procedures for these Activities are detailed in:

- TSOP 1-2 Sample Custody
- TSOP 1-6 Water Level Measurement, Section 5.2.3 Water Level Measurement Using Electronic Water Level Indicators (and manufacturer's instructions)
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
- TSOP 2-1 Packaging and Shipping Environmental Samples
- TSOP 2-2 Guide to Handling Investigation Derived Waste
- TSOP 3-1 Geoprobe® Sampling
- TSOP 4-1 Field Logbook Content and Control
- Worksheet 17f Decontamination Procedures
- Worksheet 18 Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17c
Sampling Design and Rationale
Hydrogeological Assessment

Monitoring Well Installation

The monitoring well locations and screen depths will be presented to EPA for approval prior to beginning monitoring well installation activities. It is anticipated that a total of five monitoring wells will be installed. It is also anticipated that the shallow background monitoring well will be installed using the hollow stem auger (HSA) drilling method due to its efficiency and cost, however double-cased mud rotary drilling methods are necessary for the four deep wells in order to segregate the perched groundwater from the regional aquifer. The silt and clay confining layer is approximately 20 feet bgs sand separates shallow silts and sands from the deeper sandy regional aquifer. The groundwater table is approximately 5 to 10 feet bgs.

Shallow Monitoring Well Installation (single cased)

- An 8 inch diameter borehole will be drilled to approximately 20 feet bgs using HSA drilling methods.
- Split-spoon samples will be collected every five feet from the surface to total depth of the borehole for lithologic logging and PID screening. Depth to water, lithology, and PID readings will be recorded in the field log book and/or boring logs.
- Monitoring wells will be constructed with 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) casing with 10-foot long, 0.010 (10-slot) screens. The annulus around the well screen will be backfilled with #01 morie sand, which will extend two feet above the well screen. Above the #01 morie sand, #00 sand seal will be placed above the sand pack and the remaining annulus will be grouted to surface using tremie pipe.
- An 8-inch steel protective casing stick-up with a locking cap will be installed and a concrete collar will be poured around the well.

Deep Monitoring Well Installation

- A 12 inch diameter borehole will be drilled a minimum of five feet into the confining unit using mud rotary or HSA drilling methods(approximately 20 feet bgs)
- An 8-inch diameter threaded steel casing will be lowered into the borehole and grouted in place using a cement/bentonite grout. The grout will be allowed to cure for at least 12 hours before continuing.
- An 8-inch borehole will then be advanced to approximately 100 feet bgs using mud rotary drilling methods.
- Split-spoon samples will be collected every five feet from the surface to total depth of the borehole for lithologic logging and PID screening. Depth to water, lithology, and PID readings will be recorded in the field log book and/or boring logs.
- Monitoring wells will be constructed with 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) casing with 10-foot long, 0.010 (10-slot) screens. The annulus around the well screen will be backfilled with #01 morie sand, which will extend two feet above the well screen. Above the #01 morie sand, #00 sand seal will be placed above the sand pack and the remaining annulus will be grouted to surface using tremie pipe.
- An 8-inch steel protective casing stick-up with a locking cap will be installed and a concrete collar will be poured around the well.
- If no confining unit is encountered deep wells will not be double cased.

Development

The five proposed new wells will be developed, and twenty-nine existing monitoring wells will be developed. Well development will be performed according to TSOP 4-3 using electrical down hole rotary pumps.

New Well Development

Monitoring well installation will not be considered complete until the wells have been fully developed. Monitoring well development will be performed to remove silt and other fine materials (drilling mud, etc.) from the well screen and sand pack and to provide a good hydraulic connection between the well and the aquifer materials. Turbidity, pH,

QAPP Worksheet # 17c
Sampling Design and Rationale
Hydrogeological Assessment

temperature, conductivity, and dissolved oxygen (DO) will be monitored during development. Development will continue until all parameters have stabilized (within 10 percent for successive measurements) and the water is clear.

Existing Well Development

In addition to development of new monitoring wells, the 29 existing monitoring wells will be re-developed to remove any accumulation of silt or sediment in the well screen. It is estimated that re-development will take three hours per well and that two wells can be re-developed per day.

IDW Management

Drill cuttings and water from drilling operations will be containerized at the drilling location and transported by the drilling subcontractor to a central IDW waste storage area. Liquid wastes will be transferred to a 5,000 gallon Baker tank and drill cuttings will be containerized in 55-gallon drums or roll-off containers for subsequent sampling, characterization, and disposal by CDM's IDW subcontractor.

Field Procedures for these Activities are detailed in:

- TSOP 1-2 Sample Custody
- TSOP 1-6 Water Level Measurement, Section 5.2 Water Level Measurement Using Electronic Water Level Indicators
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
- TSOP 2-1 Packaging and Shipping Environmental Samples
- TSOP 2-2 Guide to Handling Investigation Derived Waste
- TSOP 3-4 Geophysical Logging, Calibration, and Quality Control
- TSOP 4-1 Field Logbook Content and Control
- TSOP 4-2 Photographic Documentation of Field Activities, Sections 5.2.2 General Guidelines for Still Photography and 5.2.4 Photographic Documentation
- TSOP 4-3 Well Development and Purging, Section 5.3 Indicator Parameter Method of Well Purging
- TSOP 4-4 Design and Installation of Monitoring Wells in Aquifers (Mud Rotary Drilling)
- Worksheet 17f Decontamination Procedures
- Worksheet 18 Sampling Locations and Methods/ SOP Requirements
- ASTM D 1586-99 Penetration Test and Split-Barrel Sampling of Soils

QAPP Worksheet # 17c
Sampling Design and Rationale
Hydrogeological Assessment

Well Abandonment
Monitoring well MW-8 is currently screened across a clay layer. MW-8 will be abandoned to prevent potential downward migration of contaminants in the perched aquifer. MW-8 is 20 feet deep and constructed of 4 inch diameter, Schedule 40 PVC. MW-8 will be abandoned by a NJ-licensed driller, in accordance with NJDEP Well Construction; Maintenance and Sealing of Abandoned Wells NJAC 7:9D.

Field Procedures for Well Abandonment are detailed in:
- TSOP 2-2 Guide to Handling of Investigation-Derived Waste
- TSOP 4-10 Borehole and Well Decommissioning, except Sections 5.3 (Well Overdrilling) and 5.4 (Borehole or Well Plugging)
- Worksheet 17l Decontamination Procedures

Continuous Water Level Measurements
Continuous water level measurements will be collected from four monitoring wells (MW-1, MW-22D, MW-5, and MW-16) and one stilling well in Hessian Run over a period of four weeks. Water level and barometric pressure readings will be measured using data logging pressure transducers, and will be operated according to manufacturer's instructions.

Synoptic Water Level Measurements
Two rounds of synoptic water level elevation measurements are necessary in order to better define groundwater flow in the vicinity of the site and to determine the interaction between West Deptford municipal well #6 and the site groundwater flow. Water level measurements will be collected from all existing wells and the stilling well in Hessian Run during round one, and the same set of wells and the newly installed wells in the second round.

Water level measurements will be collected from monitoring wells using an electronic water level indicator, at the surveyors mark on the inner casing. CDM will coordinate with the West Deptford Township Water Department to determine when municipal well #6 is in use and perform the first round of water level measurements at least three months prior to the second round. The second round of measurements will be taken in conjunction with the monitoring well sampling event.

Field Procedures for these Activities are detailed in:
- TSOP 1-6 Water Level Measurement, Section 5.3.4 Continuous Recording Method
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement, if required by Health and Safety Plan
- TSOP 4-1 Field Logbook Content and Control
- TSOP 5-1 Control of Measurement and Test Equipment
- Worksheet 17f Decontamination Procedures

QAPP Worksheet # 17d
Sampling Design and Rationale
Soil Boring, Drilling, and Testing

Soil Sampling

Soil samples are proposed to fill gaps identified in the existing data to further refine the nature and extent of surface and subsurface soil contamination. To separate the site into manageable units and to support the HHRA and FS reports, the soil investigation will be divided into three areas (the scrapyard area, the open field/waste disposal area, and Willow Woods), based on functional differences defining the three areas. Figure 4 and Figure 8 show the proposed soil sampling locations.

Soil borings will be advanced using the DPT method, with core samples collected in advance of the push rods. Each sample core will be logged by the CDM on-site geologist to define site stratigraphy. Upon opening each plastic core sleeve, each sample will immediately be screened with a PID; the CDM field geologist will record the values detected by the PID. At sampling locations where only surface soil samples will be collected, samples will similarly be screened and their characteristics logged by the field geologist, sample collection will be accomplished using stainless steel hand augers, trowels, bowls, and associated tools. All soil samples will be collected following EPA-approved methodologies detailed in TSOP 1-3 and 1-4. The analytical parameters and numbers of samples to be collected during the soil sampling program are presented in Table 1. QC samples will be collected in as detailed in Worksheet #28.

Geographic coordinates for the soil sampling locations will be measured with a hand-held, or equivalent, GPS unit. Additionally, soil sampling locations will be both noted on a hardcopy site plan and recorded in the field logbook. Photographs should be taken at each sampling location to capture observed conditions, location, and weather.

Geotechnical Samples

To provide representative values for calculating site-specific soil screening levels, CDM will collect 14 soil samples from seven locations, analyzed for soil bulk density, TOC, grain size, pH, porosity, and soil moisture content analyses as specified in Table 1. Samples will be collected utilizing HSA drilling methods and Shelby tubes. Soil samples will be collected from two depth intervals at each of seven sampling locations. At each location, one sample will be collected from the surface (0 to 2 feet bgs) interval and one sample will be collected from a 2-foot interval between 2 feet bgs and the water table. The depth of the deep sample will be determined in the field based on visual observations, selecting soils with varying lithologies. Two borings will be completed in the scrapyard area and five borings will be completed in the open field area. The data will be used to calculate site-specific soil screening levels. All soil samples will be collected following EPA-approved methodologies detailed in TSOP 1-3, and 1-4.

Field Procedures for these Activities are detailed in:

- TSOP 1-2 Sample Custody
- TSOP 1-3 Surface Soil Sampling
- TSOP 1-4 Subsurface Soil Sampling
- TSOP 1-6 Water Level Measurement, Section 5.2 Water Level Measurement Using Electronic Water Level Indicators (In-Situ Level TROLL or equivalent)
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
- TSOP 2-1 Packaging and Shipping Environmental Samples
- TSOP 2-2 Guide to Handling Investigation Derived Waste
- TSOP 3-5 Lithologic Logging
- TSOP 4-1 Field Logbook Content and Control
- Worksheet 17f Decontamination Procedures
- Worksheet 18 Sampling Locations and Methods/ SOP Requirements

QAPP Worksheet # 17e
Sampling Design and Rationale
Environmental Sampling

Seep/Shallow Groundwater Sampling

Seep and shallow groundwater samples will be collected to update analytical data from the NJDEP RI and to evaluate the interaction between groundwater and surface water in local water bodies (e.g., Hessian Run and Woodbury Creek). The samples will also help to characterize the nature and extent of contamination in order to support the RI. A major pathway for contamination of surface water is via discharge of contaminated groundwater to the tidally influenced surface water bodies and via overland runoff from the waste and battery casing disposal areas. Accordingly, the seep and shallow groundwater sampling program focuses on those areas where contaminated groundwater is expected to discharge.

One round of seep and shallow groundwater samples will be collected. It is assumed that 10 seep samples and 10 shallow groundwater samples will be collected concurrently from areas where groundwater discharges to surface water. The seep and shallow groundwater samples will be co-located and analyzed for the same parameters. The approximate locations of the seep samples are shown on Figure 5. The samples will be located in the same approximate areas from which they were collected during the NJDEP RI. Actual locations of the seep and shallow groundwater samples will be based on actual field conditions. The shallow ground water samples will be collected in the adjacent portion of Hessian Run. Seep samples will be collected using EPA approved methodologies in TSOP 1-1. Shallow groundwater samples will be collected by driving a 1-inch diameter well point with a slotted screen so that the top of the screen is approximately 2 feet below the creek bottom. The screen will be purged briefly to develop the well point. Prior to collecting samples water levels in the well point and the creek will be measured, referenced from the top of the well point. Once the water level has stabilized the sample will be collected using a peristaltic pump.

In addition to laboratory analyses listed in Table 1, CDM will collect field measurements including temperature, conductivity, pH, turbidity, DO, and oxidation reduction potential (ORP) at each seep and shallow groundwater sampling location. CDM will survey the seep/shallow groundwater sample locations using a hand-held GPS.

Sediment Sampling

Sediment samples will be collected to characterize the nature and extent of contamination in order to support the RI, SLERA, and HHRA. The overall objective of the sediment investigation is to fill gaps identified in the existing data focusing on the lateral and vertical extent of lead and PCB contamination and the existence of dioxins, furans, and PCB congeners in the sediment. The PCB congener results will be used to perform risk calculations for a biological assessment for the bald eagle and mink by the United States Fish and Wildlife Service (USFWS). The major pathway for contamination of sediment is via overland runoff from the battery casings and waste disposal areas. In addition, discharge of contaminated groundwater to the tidally-influenced water bodies may contribute to the sediment contamination.

The sediment investigation will include collection of approximately 240 sediment samples from Hessian Run and Woodbury Creek along 11 of the transects sampled during the NJDEP RI and 5 new transect locations. The lateral and vertical extent of the existing transects have been extended to further define the extent of sediment contamination. Sample location/depths collected by NJDEP will not be repeated; data collected from this RI investigation will supplement data collected by NJDEP. The sediment sample location rationale4 is presented in Table 3. Locations are shown on Figures 6 and 7.

Analysis at each sample depth will vary based on the results of the NJDEP RI samples. If analytical results from the NJDEP RI were above the site-specific screening criteria at the deepest interval (typically 2 to 3 feet), CDM will extend the boring at that location and analyze for that parameter. If the analytical results from the NJDEP RI were below the site-specific screening criteria at the deepest interval, CDM assumed the extent of contamination was significantly bounded at that location for that parameter. Table 4 indicates which samples/depths will be analyzed for each analysis.

QAPP Worksheet # 17e
Sampling Design and Rationale
Environmental Sampling

Surface Water Sampling
Surface water samples will be collected in conjunction with the seep and shallow groundwater sampling to characterize the nature and extent of contamination in order to support the RI, SLERA, and HHRA. Twenty-seven samples will be collected along the transects shown on Figure 4 and 5. Two samples (one at each end) will generally be collected at the shallow edges of Hessian Run and Woodbury Creek along the transects and one sample will be collected in the main channel of each water body. Surface water samples will be collected during periods of higher tides and will be collected using EPA approved methodologies which can be found in TSOP1-1. Surface water samples will be collected for the analyses shown on Table 1.

Monitoring and Potable Well Sampling
One round of groundwater samples will be collected at the Matteo site to characterize the nature and extent of contamination in groundwater at the site. Analytical data from groundwater sampling will be used to support preparation of the RI, HHRA, and FS reports.

Groundwater samples will be collected from a total of 34 monitoring wells (29 existing and 5 new wells) and 3 potable wells (PW-1, PW-2, and PW-3). Sampling will occur a minimum of two weeks after development of the newly installed wells and re-development of the existing wells. It is anticipated that all monitoring wells will be sampled using the EPA Region 2 low-flow method (EPA 1998b). The potable wells will be sampled at a spigot prior to any water treatment. Sampling procedures are provided in Appendix A.

Groundwater samples will be collected from each monitoring well and potable well for the analyses listed on Table 1. In addition, samples will be collected for field measurement of ferrous iron using the Hach Colorimeter as outlined in Appendix B. QC samples will be collected as indicated on Worksheet 20.

IDW Management
Remnant soil, sediment and water sample volume will be containerized and transported to a central IDW waste storage area by CDM (or a subcontractor). Liquid wastes will be transferred to a 20,000 gallon Baker tank and drill cuttings will be containerized in 55-gallon drums or roll-off containers for subsequent sampling, characterization, and disposal by CDM's IDW subcontractor.

Field Procedures for these Activities are detailed in:
- Appendix A Site-Specific Low Flow Groundwater Purging and Sampling Procedure
- TSOP 1-1 Surface Water Sampling
- TSOP 1-2 Sample Custody
- TSOP 1-6 Water Level Measurement, Section 5.2.3 Water Level Measurement Using Electronic Water Level Indicators (and manufacturer's instructions)
- TSOP 1-9 Tap Water Sampling
- TSOP 1-10 Field Measurement of Organic Vapors, Section 5.1 Direct Reading Measurement
- TSOP 2-1 Packaging and Shipping Environmental Samples
- TSOP 2-2 Guide to Handling Investigation Derived Waste
- TSOP 4-1 Field Logbook Content and Control
- Worksheet 17f Decontamination Procedures
- Worksheet 18 Sampling Locations and Methods/ SOP Requirements
- Appendix B HACH SOP 8146 for Ferrous Iron sampling using Colorimeter

QAPP Worksheet # 17f
Sampling Design and Rationale
Decontamination Procedures

Field decontamination will be performed on all personnel and equipment that enters the exclusion zone. Personnel decontamination procedures will be implemented to prevent worker exposure to site contaminants. Equipment decontamination procedures will be implemented to prevent cross-contamination of environmental samples and prevent off-site migration of contaminants as a result of site investigation activities.

Personal Protective Equipment

- Non-residual detergent (Alconox) and tap water rinse
- Respirator sanitizer (for respirator or self contained breathing apparatus [SCBA] face piece)
- Thorough rinse with potable water
- Air dry

Field Monitoring and Geophysical Logging Equipment

Instruments should be cleaned per manufacturer's instructions. The electronic water level indicators, geophysical logging equipment, and water quality parameter probes cannot be rinsed with solvents or acids. The electronic water level indicators will be decontaminated with a non-phosphate detergent, tap water rinse, and a final distilled/deionized water rinse prior to use. The water quality parameter probes will be rinsed prior to and after each use with deionized/distilled water only.

Well Components

Well components must be steam cleaned prior to installation to ensure that all oils, greases, and waxes have been removed. The components should be stored using clean polyethylene sheeting to keep the possibility of contamination to a minimum.

Drilling Equipment and Other Large Pieces of Equipment

All drilling equipment that comes in contact with the soil must be steam cleaned before use, and after drilling each borehole. This includes drill rods, bits and augers, dredges, or any other large piece of equipment. Sampling devices such as split-spoons must be decontaminated, after each use, by the procedure listed below.

Sampling Apparatus, General Considerations

All sampling apparatus must be properly decontaminated prior to its use in the field to prevent cross-contamination. Equipment should be decontaminated after usage (once a day or on an as needed basis). Decontamination will be performed in an area outside the contamination zone. Enough equipment will be available to be dedicated to the sampling points planned each day.

QAPP Worksheet # 17f
Sampling Design and Rationale
Decontamination Procedures

Decontamination Procedure:
The required decontamination procedure for all sampling equipment* is:

**	a.	wash and scrub with low phosphate detergent
	b.	tap water rinse
***	c.	10 percent nitric acid rinse (for metals analysis only), laboratory grade (one percent solution will be used when carbon steel equipments, such as split-spoons, are used)
	d.	demonstrated analyte-free water rinse
****	e.	isopropanol rinse (all solvents must be pesticide-grade or better)
*****	f.	demonstrated analyte-free water rinse (amount of water must be at least five times that of the solvents used)
	g.	air dry
	h.	wrap in aluminum foil, shiny side out, for transport

* Low-flow groundwater sampling equipment will follow only steps a, b, d, g and h.
** Tap water must be from a municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.
*** Nitric acid rinse will only be used when samples are collected for inorganics
**** Solvent rinse required only when sampling for organics.
***** A sample of the demonstrated analyte-free water will be collected and submitted for chemical analysis. Analytical results will be kept on-site. Determination of analyte-free water will be according to the EPA Region II CERCLA QA Manual (EPA 1989) (see page 59).

While performing decontamination activities, phthalate-free gloves should be used to prevent phthalate contamination of the sampling equipment that could result from the interaction of the gloves with the organic solvents.

Decontamination Equipment

- Steam cleaner
- Distilled/deionized water
- Potable water
- Deep basins
- Brush
- Acetone or isopropanol (pesticide-grade)
- Personnel protective equipment
- 10 percent nitric acid (one percent when needed), ultra pure grade
- Power source (e.g., generator), if required
- Demonstrated analyte-free water
- Polyethylene sheeting
- Utility knife
- Non-phosphate detergent (i.e. Alconox)
- Aluminum foil
- Air monitoring equipment and calibration gas

Field Procedures for these Activities are detailed in:
■ TSOP 4-5 Field Equipment Decontamination at Nonradioactive Sites.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
Scrapyard Soil Sampling							
SB-101 SB-102 SB-103	Soil	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOCs, TCL SVOCs, TCL pesticides, TCL PCBs, TAL inorganics, dioxins, furans, SPLP pH, TOC, grain size	Low	30 Total (28 samples plus 2 duplicates) At 50 percent of the locations: pH (14) Grain Size (14) TOC (14) SS only: Dioxins (7) Furans (7) SPLP analysis (5)	See Worksheet 19/ Worksheet 17	Characterization of underlying soils for use in RI, HHRA, FS. Soil sampling not previously performed in this area which was covered with debris during the NJDEP RI.
SB-104 SB-105 SB-106	Soil						
SB-107		0 to 2 ft bgs 2 to 4 ft bgs 8 to 12 ft bgs 12 to 16 ft bgs					Delineation of vertical extent of contamination; samples collected at 11 to 11.5 feet bgs have exhibited concentrations of PCBs and metals above NJDEP RSC. Characterization of underlying soils for use in RI, HHRA, FS.
Open Field/Waste Disposal Area Soil Sampling							
SB-108 SB-109 SB-110 SB-111	Soil	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOC, TCL SVOC, TCL PCBs, TCL pesticide, TAL inorganics, dioxins, furans SPLP	Low	16	See Worksheet 19/ Worksheet 17	Characterization of soils near Scrapyard Area and sweating fire box which were obstructed by debris piles during prior investigations.
SB-112	Soil	5.5 to 6 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Low	2	See Worksheet 19/ Worksheet 17	Delineation of vertical extent of subsurface PCB contamination identified in samples collected from TP-86, near the westernmost Waste Disposal Area.
SB-113 SB-114 SB-115	Soil	4.5 to 5 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Low	6	See Worksheet 19/ Worksheet 17	Delineation of horizontal and vertical extent of subsurface PCB contamination within Waste Disposal Area identified during the NJDEP RI.
SB-116 SB-117 SB-118	Soil	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOC, TCL SVOC, TAL inorganics	Low	12	See Worksheet 19/ Worksheet 17	Characterization of subsurface soils upgradient of VOC impacts.
SB-119 SB-120 SB-121	Soil	5.5 to 6 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Low	6	See Worksheet 19/ Worksheet 17	Delineation of vertical extent of subsurface PCB contamination identified during the NJDEP RI.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
SS-101 SS-102 SS-103 SS-104	Soil	0 to 2 ft bgs	TCL PCBs, TCL pesticides, TAL inorganics, pH, TOC, grain size	Low	4	See Worksheet 19/ Worksheet 17	Characterization of surface soils within the Open Field Area.
SS-105 SS-106	Soil	0 to 2 ft bgs	TCL PCBs	Low	2	See Worksheet 19/ Worksheet 17	Delineation of horizontal extent of surficial PCB contamination within Waste Disposal Area identified during the NJDEP RI.
SS-107	Soil	0 to 2 ft bgs	TCL PCBs	Low	1	See Worksheet 19/ Worksheet 17	Delineation of horizontal extent of surficial PCB contamination within Open Field Area identified during the NJDEP RI.
SS-108 SS-109 SS-110	Soil	0 to 2 ft bgs	TAL inorganics, pH, TOC, grain size	Low	3	See Worksheet 19/ Worksheet 17	Delineation of horizontal extent of surficial lead contamination identified during the NJDEP RI at test pit TP-62.
SS-111 SS-112 SS-113	Soil	0 to 2 ft bgs	TCL PCBs	Low	3	See Worksheet 19/ Worksheet 17	Delineation of horizontal extent of surficial PCB contamination identified during the NJDEP RI at test pit FULL-2.
SS-114 SS-115	Soil	0 to 2 ft bgs	TCL PCBs	Low	2	See Worksheet 19/ Worksheet 17	Characterization of surface soils along former ‘road surface’.
SS-116 SS-117 SS-118 SS-119 SS-120	Soil	0 to 2 ft bgs	TCL PCBs TAL inorganics, pH, TOC, grain size	Low	5	See Worksheet 19/ Worksheet 17	Characterization of surface soils along former ‘road surface’. Investigation of lead contamination between MW-3 and MW-7 and near NJDEP RI test pit TPSS-F.
SS-121 SS-122 SS-123 SS-124	Soil	0 to 2 ft bgs	TCL PCBs	Low	4	See Worksheet 19/ Worksheet 17	Characterization of surface soils along former ‘road surface’
SS-125 SS-126 SS-127	Soil	0 to 2 ft bgs	dioxins, furans	Low	3	See Worksheet 19/ Worksheet 17	Characterization of ash-like material observed near MW-18.
Geotechnical Sampling							

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
Scrapyard: 2 boring locations to be determined	Soil	0 to 2 ft bgs Between 2 ft bgs and top of water table	Soil bulk density TOC Grain size pH Porosity Soil moisture content	NA	15 Total (14 samples plus one duplicate)	See Worksheet 19/ Worksheet 17	To provide representative values for calculating site-specific soil screening levels.
Open Field/Waste Disposal: 5 boring locations to be determined	Soil						
Willow Woods Sampling							
WW-SB-201 WW-SB-202 WW-SB-203 WW-SB-204 WW-SB-205 WW-SB-206 WW-SB-207 WW-SB-208 WW-SB-209 WW-SB-210	Soil	0 to 2 ft bgs Between 2 ft bgs and top of water table	TCL VOC, TCL SVOC, TCL PCBs, TCL pesticides, TAL inorganics	Low	11 Total (10 samples plus one duplicate)	See Worksheet 19/ Worksheet 17	Characterization of soil in residential area where fill may have been used to level the ground prior to trailers being installed.
Groundwater Screening Sampling 1 event, 15 locations	Groundwater[1]	Every 10 feet from 0 to 120 feet bgs	Trace VOCs Dissolved TAL metals and mercury 24 hr TAT	Low	VOC: 189 Total (180 samples plus 9 duplicates) Metals: 189 Total (180 samples plus 9 duplicates)	See Worksheet 19/ Worksheet 17	To collect preliminary data pertaining to the chemical characteristics of groundwater and the location and spatial extent of the groundwater contamination associated with the site

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
Seep/ Shallow Groundwater Sampling 1 event, 10 Seep locations, 10 adjacent shallow groundwater locations under creek bed. Collected at low tide	Groundwater	-	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics (total and dissolved) Alkalinity Ammonia Bromide Chloride Hardness Nitrate/Nitrite Orthophosphate Sulfide Sulfate pH TKN TOC TSS TDS	Low	21 Total (20 samples plus one duplicate)	See Worksheet 19/ Worksheet 17	To update analytical data collected in the NJDEP RI and for comparison to analytical results of the groundwater samples to make a detailed evaluation of the interaction of the surface water and groundwater

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
Monitoring and Potable Well Sampling 1 Round; 37 locations (29 existing wells, 5 new wells and 3 potable wells)	Groundwater	-	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics MNA Parameters: Chloride MEE Nitrate/Nitrite Sulfate Sulfide TOC Ferrous Iron (Fe^{2+}) Water Quality Parameters: Alkalinity Ammonia Bromide Hardness Orthophosphate TSS TDS TKN	Low	39 Total (37 samples and 2 duplicates)	See Worksheet 19/ Worksheet 17	Characterize the nature and extent of contamination in groundwater from contaminants associated with the site
Sediment Sampling							
Hessian Run: SD-T1-a/b/d SD-T2-a/b/d/e SD-T4-d/e/f/g/h SD-T7-d/e/f/g; SD-S2 SD-T11-a/b/c/d/e/f/g/h SD-T14-a/b/e/f/g//h/i SD-T16-c/e/f/g SD-T17-a/b/e/f SD-T30-a/b/d/e	Sediment	0 - 0.5 ft 1 – 2 ft 2 - 3 ft 3 – 5 ft 5 – 7 ft	TCL PCBs, TAL inorganics Dioxins Furans PCB Congeners Geotechnical At 15 percent of sample locations.	Low	For all sediment sampling: PCBs: 128 Total (127 samples plus 7 duplicates) Inorganics: 237 Total (236 samples plus 12 duplicates) Dioxins (4) Furans (4) PCB Congeners (4) Geotechnical (4)	See Worksheet 19/ Worksheet 17	Delineation of horizontal and vertical extent of contamination for use in RI, ERA, and FS; previous transects did not confirm depth of PCB and lead contamination Characterization of shallow sediment contamination for use in RI, RA, and FS; no dioxin, furan, or PCB congeners analyses were performed during prior investigations Some transects extended to span the entire surface water body

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
SD-T31-a/b		0 - 0.5 ft 1 – 2 ft 2 - 3 ft 3 – 5 ft 5 – 7 ft	TCL PCBs, TAL inorganics Dioxins Furans PCB Congeners Geotechnical At 15 percent of sample locations	Low	Sediment samples collected from this transect are included above	See Worksheet 19/ Worksheet 17	Characterization of reference/background sediment quality within area further upstream of the site
Woodbury Creek: SD-T22-a/d/e/f/g/h SD-T32-a/b/c/d; SD-7 SD-T25-a/c/e SD-T34-a/b/c SD-T35-a/b/c	Sediment	0 - 0.5 ft 1 - 2 ft 2 - 3 ft 3 - 5 ft 5 - 7 ft	TCL PCBs, TAL inorganics Dioxins Furans PCB Congeners Geotechnical At 15 percent of sample locations	Low	Sediment samples collected from these transects are included above	See Worksheet 19/ Worksheet 17	Delineation of horizontal and vertical extent of contamination for use in RI, ERA, and FS No sediment sampling has been performed in the area closest to the western fill area where soil samples collected via test-pitting exhibited elevated contaminant concentrations Characterization of shallow sediment contamination for use in RI, RA, and FS; no dioxin, furan, or PCB congeners analyses were performed during prior investigations Transect extended to span the entire surface water body
SD-T33-a/b	Sediment	0 - 0.5 ft 1 - 2 ft 2 - 3 ft 3 - 5 ft 5 - 7 ft	TCL PCBs, TAL inorganics Dioxins Furans PCB Congeners Geotechnical At 15 percent of sample locations	Low	Sediment samples collected from this transect are included above	See Worksheet 19/ Worksheet 17	Characterization of reference/background sediment quality within area further upstream of the site

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Analytical/Sampling Methods	Rationale for Sampling Location
Surface Water Sampling 1 event, 27 locations	Surface Water	-	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics (total and dissolved) Alkalinity Ammonia Bromide Chloride Hardness Nitrate/Nitrite Orthophosphate Sulfide Sulfate pH TKN TOC TSS TDS	Low	29 Total (27 samples plus one duplicate) A portion of the Locations will be sampled for: Alkalinity (5) Ammonia (5) Bromide (5) Chloride (5) Hardness (27) Nitrate/Nitrite (5) Orthophosphate (5) Sulfide (5) Sulfate (5) pH (5) TKN (5) TOC (5) TSS (5) TDS (5)	See Worksheet 19/ Worksheet 17	Characterize the nature and extent of contamination in surface water from contaminants associated with the site

Notes:
PCB – polychlorinated biphenyl
SVOC – semi-volatile organic compound
TAT – turn-around time
TDS – total dissolved solids
TKN – total kjehldahl nitrogen
TOC – total organic carbon
TSS – total suspended solids
VOC – volatile organic compound

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Soil or Sediment for DESA, CLP or subcontract lab.	VOC	Low	SOM01.2	15 grams total	(3) 40 mL glass vials with magnetic stir bars and PTFE lined septa/open top screw caps	Cool to 4°C	48 hours before lab preservation. 10 days VTSR; Technical-14 days (Technical is from time of sample collection)
	Percent Moisture (include with VOC vials)	NA	SOM01.2	50 grams	(1) 4 oz. jar w/Teflon lined cap	No preservation No headspace in sample jar	Technical-48 hours
	TCL SVOC	SIM	SOM01.2	Fill to capacity	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR; 40 days analyze
	TCL SVOCs	Low	SOM01.2	100 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR; 40 days analyze
	TCL Pesticide	Low	SOM01.2	100 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	10 days extract-VTSR; 40 days analyze Technical 14/40
	TCL PCB	Low	SOM01.2	100 grams	Included with Pesticides	Cool to 4°C	
	TAL Metals	Low		250 grams	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	Technical-180 days (Hg-28 days and cyanide 14 days) VTSR - Subtract 2 days – this allowance for sample receipt by laboratory
Soil or Sediment for CLP, DESA or subcontract lab.	TOC	NA	Lloyd Kahn	10 g	(1) 8-oz glass jar	Cool to 4°C	14 days
	Grain Size	NA	ASTM D421-85/ ASTM D422-63	500 g	(1) 8-oz glass jar	None	None
	pH	NA Soil or sediment for DESA or CDM Subcontract laboratory	SW-846, 9045D	10 g	(1) 8-oz glass jar	Cool to 4°C	48 hours

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
	Atterberg Limits	NA	ASTM D4318	TBD	TBD	None	None
	Percent Moisture/ Solids	NA	ASTM D2216	TBD	TBD	None	None
	Bulk Density	NA	ASTM D-2937-00	TBD	TBD	None	None
	Specific Gravity	NA	ASTM D854	TBD	TBD	None	None
	In-situ Porosity (Determined from specific gravity & dry bulk density)	NA	ASTM D854/ ASTM D2937	TBD	Shelby Tube	None	None
	Dioxins and Furans	Low	EPA 1613	TBD	1- 4 oz amber glass jar	Maintain in the dark at less than 4°C from collection until receipt at the laboratory	If stored at less than -10 degrees C, solid multiphase samples can be stored up to one year. Sample extracts can be stored at less than -10oC for up to one year
Soil or Sediment for CLP, DESA or subcontract lab.	SPLP	Low	ISM01.3/ SW-846 1312	TBD	(1) 8 oz. glass jar w/Teflon lined cap	Cool to 4°C	Technical-180 days (Hg-28 days and cyanide 14 days) VTSR - Subtract 2 days – this allowance for sample receipt by laboratory
	PCB Congeners	Low	EPA Method 1668A	10 g minimum	1- 4 oz amber glass jar	Maintain in the dark at less than 4°C from collection until receipt at the laboratory	If stored at less than -10 degrees C, solid multiphase samples can be stored for up to one year. Sample extracts can be stored at less than -10 degrees Celsius for up to one year

Technical holding time is referenced unless otherwise noted.
MS/MSD is not required for TCL VOC and SVOC.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate.
Additional sample volumes may be required when more than one option of a method is requested, for example Low plus SIM SVOC analysis. Consult the CLP Guidance for Field Samplers.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous	TCL VOCs	Trace plus SIM	SOM01.2	200 mL	(5) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; no headspace; no bubbles. Do not preserve if effervescence occurs. Cool to 4°C	Technical 14 days 10 days VTSR Preserved; Unpreserved 7 days
	TCL VOCs	Trace or Low	SOM01.2	120 mL	(3) 40 ml VOA vials w/Teflon lined septum		
	Methane, ethane and ethene	Low	RSK 175	40 mL	(3) 40 ml VOA vials w/Teflon lined septum		14 days
	TCL SVOCs	Low or Low plus SIM	SOM01.2	1000 mL	(2) 1L amber glass bottles w/Teflon lined cap. No additional volume required for SIM	Cool to 4°C	5 days extract, 40 days analyze for VTSR; 7/40 Technical
	TCL Pesticide Compounds	Low	SOM01.2	1000 mL	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze; 7/40 Technical
	TCL PCBs	Low	SOM01.2	1000 mL	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze; 7/40 Technical
	TAL Metals, Mercury	Low (AES)	ISM01.3	250 mL each	(2) 1 L high density polyethylene bottle (HDPE)	HNO_3 to pH<2; Cool to 4°C	6 months (Hg-26 days VTSR or 28 days Technical)
	TAL Metals	Trace (MS)		250 mL	(1) 1 L HDPE [extra bottle is for MS analysis]		
	Cyanide	Low		250 mL	(1) 1 L HDPE	NaOH to pH >12; cool to 4°C	12 days VTSR; 14 days Technical
	Alkalinity	Low	EPA 310.2	100 mL	(1) 250 mL HDPE	Cool to 4°C	14 days

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
	Ammonia	Low	SM 4500-NHs-B,C,D,E,F,G and H	400 mL	(1) 1 L HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days
Aqueous	Bromide	Low	EPA 300, 320.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	28 days
	Chloride	Low	EPA 300	50 mL	(1) 125 mL HDPE	Cool to 4°C	28 days
	Ferrous Iron (field test)	Low	HACH 8146	25 mL	1 HDPE	Cool to 4°C	Analyze on day collected
	Hardness	Low	ISM01.3+ calculation	100 mL	(1) 250 mL HDPE	HNO_3 to pH<2; Cool to 4°C	6 months
	Nitrate	Low	EPA 300, 352.1	100 mL	(1) 250 mL HDPE	Cool to 4°C	48 hours
	Nitrite	Low	EPA 300	100 mL	(1) 250 mL HDPE	Cool to 4°C	48 hours
	Nitrate/Nitrite	Low	EPA 353.2	100 mL	250 mL polyethylene bottle	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Total Organic Carbon	Low	EPA 415.2 or 9060	50 mL	(1) 250 mL amber glass bottle or protect from light	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Orthophosphorus	Low	EPA 300, 365.1/365.3	50 mL	(1) 125 mL HDPE	Cool to 4°C	48 hours
	TKN	Low	EPA 351.1/351.2	500 mL	(1) 1 L HDPE	H_2SO_4 to pH <2; Cool to 4°C	28 days
	TDS (Filterable residue)	Low	SM2540C	100 mL	(1) 250 mL HDPE	Cool to 4°C	7 days

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
	TSS (Non-filterable residue)	Low	SM2540D	100 mL	(1) 250 mL HDPE	Cool to 4°C	7 days
Aqueous	Sulfate	Low	EPA 375.2	50-100 mL	(1) 250 mL HDPE	Cool to 4°C	28 days
	Sulfide	Low	SM4500S-2D,E,F or G	200 mL	(1) 1 L HDPE	Sodium acetate and NaOH to pH>9; Cool to 4°C	7 days; Unpreserved 48 hours

Technical holding time is referenced unless otherwise noted.
MS/MSD is not required for TCL VOC and SVOC.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate. Additional sample volumes may be required when more than one option of a method is requested, for example Low plus SIM SVOC analysis. Consult the CLP Guidance for Field Samplers.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group [Lab Assignment]	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Aqueous (Equipment Blanks)	Trace VOCs	Trace	SOM01.2	120 ml	(3) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	10 days
	TCL SVOCs	Low	SOM01.2	1000 ml	(2) 1L amber glass bottles w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze
	TCL Pesticides	Low	SOM01.2	1000 ml	(2) 1L amber glass bottle w/Teflon lined cap	Cool to 4°C	5 days extract, 40 days analyze
	TCL Aroclors/PCBs	Low	SOM01.2	1000 ml	Included with Pesticides	Cool to 4°C	5 days extract, 40 days analyze
	TAL Metals	Low	ISM05.4	250 ml	(1) 1 L polyethylene	HNO_3 to pH<2; cool to 4°C	6 months (Hg-26 days)
Aqueous (Trip Blanks)	Trace VOCs	Trace	SOM01.2	120 ml	(4) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	10 days
	Methane, Ethane and Ethene	Low	RSK 175	40 mL	(3) 40 ml VOA vials w/Teflon lined septum	cool to 4°C	10 days

Verified time of sample receipt (VTSR) holding time is referenced above.
MS/MSD is not required for QC samples.
The field team is encouraged to consolidate the sample volumes in consultation with DESA, RSCC and the subcontract laboratories as appropriate.

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Samples	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of Total Samples
Soil	TCL VOC	Low	See Worksheet 19	58	76	4	NA	1 per decontamination event (~ 4)	NA	84
	Percent Moisture	NA		7	14	1	NA	NA	NA	1
	TCL SVOC	Low		58	76	4	NA	1 per decontamination event (~4)	NA	84
	TCL Pesticides	Low		58	56	4	Double or Triple Volume as Applicable		NA	63
	TCL Aroclors (PCB)	Low		58	119	6			NA	108
	TAL Metals	Low		58	85	6	1 per SDG (~5)		NA	94
	Mercury	Low		58	85	6	1 per SDG (~5)		NA	94
	Cyanide	Low		58	85	6	1 per SDG (~5)		NA	94
	Dioxins	Low		14	14	1	1 per SDG (~1)	1 per decontamination event (~1)	NA	15
	Furans	Low		14	14	1	1 per SDG (~1)		NA	15
	SPLP	Low		6	6	1	1 per SDG (~1)	1 per decontamination event (~1)	NA	8
	pH	Low		10	34	1	NA	NA	NA	21
	Grain Size	Low		10	34	1	NA	NA	NA	21
	TOC	Low		10	34	1	NA	NA	NA	21
	Geotechnical parameters (Soil bulk density, TOC, Grain size, pH, Porosity, Soil moisture, content)	NA		7	14	1	NA	NA	NA	15
Sediment	TCL Aroclors (PCB)	Low	See Worksheet 19	69	127	7	NA	1 per decontamination event (~12)	NA	146
	TAL Metals	Low		69	236	12	1 per SDG		NA	260
	Mercury	Low		69	236	12	1 per SDG		NA	260
	Cyanide	Low		69	236	12	1 per SDG		NA	260

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Samples	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of Total Samples
Sediment	Geotechnical parameters (bulk density, grain size, moisture content, percent solids, specific gravity, atterberg limits, pH, and TOC)	NA	See Worksheet 19	10	35	2	NA	NA	NA	37
	Dioxins	Low		4	4	1	1 per SDG (~ 1)	1 per decontamination event (~ 1)	NA	6
	Furans	Low		4	4	1			NA	6
	PCB Congeners	Low		4	4	1			NA	6
Groundwater	Trace VOCs (24 hr TAT)	Low	See Worksheet 19	15	180	9	NA	NA	1 per cooler (~37)	226
	TAL Metals + Mercury (48 hr TAT)	Low		15	180	9	1 per SDG (~ 20)	NA	NA	209
	Trace VOCs	Low		57	57	3	NA	1 per decontamination event (~ 15)	1 per cooler (~15)	90
	SVOCs	Low		57	57	3	NA		NA	75
	TCL Pesticides	Low		57	57	3	NA			75
	TCL PCBs	Low		57	57	3	Double or Triple Volume as Applicable			75
	TAL Metals (total and dissolved)	Low		57	114	6				135
	Mercury (total and dissolved)	Low		57	114	6				135
	Cyanide (total and dissolved)	Low		57	114	6				135
	MEE	Low		37	37	2	1 per SDG (~2)	1 per decontamination event (~ 5)	1 per cooler (~5)	49

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Samples	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of Total Samples
Groundwater	Nitrate/Nitrite	Low	See Worksheet 19	57	57	3	NA	NA	NA	60
	Chloride	Low		57	57	3				60
	Sulfide	Low		57	57	3				60
	Sulfate	Low		57	57	3				60
	Alkalinity	Low		57	57	3				60
	Ammonia	Low		57	57	3				60
	Bromide	Low		57	57	3				60
	Hardness	Low		57	57	3				60
	Orthophosphate	Low		57	57	3				60
	TOC	Low		57	57	3				60
	TSS	Low		57	57	3				60
	TDS	Low		57	57	3				60
	TKN	Low		57	57	3				60
	pH	Low		20	20	1				21
	Ferrous Iron (Fe^{2+})	Low		37	37	1				38
	pH; conductivity; dissolved oxygen; turbidity; temperature and Oxidation Reduction Potential	NA	See equipment manual	52	NA	NA	NA	NA	NA	NA

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Samples	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of Total Samples
Surface water	Trace VOCs	Low	See Worksheet 19	27	27	2	NA	NA	1 per cooler (~ 5)	34
	SVOCs	Low		27	27	2	NA		NA	29
	TCL Pesticides Compounds	Low		27	27	2	Double or Triple Volume as Applicable			29
	TCL PCBs	Low		27	27	2				29
	TAL Metals (total and dissolved)	Low		27	54	3				57
	Mercury (total and dissolved)	Low		27	54	3				57
	Cyanide (total and dissolved)	Low		27	54	3				57
	Hardness	Low		27	27	29	NA			29
	Nitrate/Nitrite	Low		27	5	1				6
	Chloride	Low		27	5	1				6
	Sulfide	Low		27	5	1				6
	Sulfate	Low		27	5	1				6
	Alkalinity	Low		27	5	1	NA			6
	Ammonia	Low		27	5	1				6
	Bromide	Low		27	5	1				6
	Orthophosphate	Low		27	5	1				6
	TOC	Low		27	5	1				6
	TSS	Low		27	5	1				6

QAPP Worksheet #20
Field Quality Control Sample Summary Table[1]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Samples	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of Total Samples
	TDS	Low	SM2540C	27	5	1	NA	NA	NA	6
	TKN	Low	EPA 351.4, 351.1/351.2/351.3	27	5	1				6
	pH	Low	NA	27	5	1				6

1. The frequency of QC samples are outlined above, the exact number of QC samples will be determined in the field.

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1-1	Surface Water Sampling, Rev. 7, 3/2007	CDM	*NA*	N	
1-2	Sample Custody, Rev. 5, 3/31/07	CDM	*NA*	Y	Sample tags are not required. Use Forms II Lite or Scribe generated COC copies as per EPA Region 2 guidelines Use waterproof ink for any handwritten labels.
1-4	Subsurface Sampling, Rev. 6, 3/31/07	CDM	*TSOP*	Y	-Homogeniztion of sample using coning and quartering -use of close system spinner bar vials for VOC sampling
1-6	Water Level Measurement, Rev. 6, 3/31/07	CDM	*TSOP*	N	
1-9	Tap Water Sampling	CDM	*NA*	N	
1-10	Field Measurement of Organic Vapors, Rev. 4, 3/31/07	CDM	*TSOP/ Mini-RAE/Multi-RAE*	N	FID Section 2.2.2 not applicable
2-1	Packaging and Shipping Environmental Samples, Rev. 3, 3/31/07	CDM	*TSOP*	Y	Methanol and Vermiculite will not be used. Metal cans may be used to collect medium level soil samples.
2-2	Guide to Handling of Investigation-Derived Waste, Rev. 5, 3/31/07	CDM	*NA*	N	
3-1	Geoprobe® Sampling, Rev. 5, 3/31/07	CDM	Section 4 of TSOP and Section 5.3	N	
3-2	Topographic Survey, Rev. 6, 3/31/07	CDM	*NA*	N	
3-5	Lithologic Logging	CDM		N	USGS Standards

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
4-1	Field Logbook Content and Control, Rev. 6, 3/31/07	CDM	*NA*	Y	Logbook notes should include decon procedures used, descriptions of photos taken, problems encountered and notes of conversations with Project Engineer/ PM/Project Geologist. Details of samples collected including CLP numbers and visual observations.
4-2	Photographic Documentation of Field Activities, Rev. 7, 3/31/07	CDM	*Camera*	N	
4-3	Well Development and Purging, Rev. 5, 3/31/07	CDM	*TSOP* *YSI*	Y	Water removed during evacuation should not be reintroduced into the well. Record water level in well, pumping flow rate, and the total volume of water purged.
4-4	Design and Installation of Monitoring Wells in Aquifers, Rev. 6, 3/31/07	CDM		Y	NJDEP Monitoring Well Construction Requirements
4-5	Field Equipment Decontamination at Nonradioactive Sites, Rev. 7, 3/31/07	CDM	*TSOP*	Y	-Use phthalate-free gloves
4-10	Borehole and Well Decommissioning,	CDM	*TSOP*	Y	Except Sections 5.3 (Well Overdrilling) and 5.4 (Borehole or Well Plugging)
5-1	Control of Measurement and Test Equipment, Rev. 8, 3/31/07	CDM	*NA*	Y	Leased or rented equipment only to be used.

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
N/A	Site-Specific Low Flow Groundwater Purging and Sampling Procedure	CDM	*SOP*	N	
D1586	Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils	ASTM	*SOP*	N	

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsi-ble Person	SOP Reference
Mini RAE plus Classic (PGM-76) Toxic Gas Monitor - 11.7 electron volt (eV) lamp	Calibration checked at the beginning and end of day	As needed in field; semi-annually by supplier	Measure Isobutylene 100 parts per million (ppm) (calibration gas)	Upon receipt, Successful operation	Calibrate am, check pm	± 10% of the calibrated value	Manually zero meter or service as necessary and recalibrate	FTL	Manufacturers specifications
Multi-RAE plus photoionization detector (PID) Toxic Gas Monitor - 11.7 eV lamp	Calibration checked at the beginning and end of day	As needed in field; semi-annually by supplier	Measure known concentration of Isobutylene 100 ppm (calibration gas); plus O_2, CO, H_2S, LEL	Upon receipt, Successful operation	Calibrate am, check pm	± 10% of the calibrated value	Manually zero meter or service as necessary and recalibrate	FTL	Manufacturers specifications
YSI-*600XL* Flow through cell	Calibrate: beginning of day and check calibration at the end of the day	Performed before shipment and as needed	Measure with known National Institute for Standards and Technology (NIST) traceable buffers and conductivity calibration solutions	Upon receipt, Successful operation	Daily, before each use	pH: ± 0.05 Specific Conductivity:±5 micro Siemens (µS) DO ± 0.02 ppm Temp.: ±0.3^{0}C	Recalibrate or service as necessary	FTL	Manufacturers specifications
In-Situ Mini TROLL® 30 psig level transducer with HP *IPAQ 2215 PDA* and Pocket-Situ	Manufacture Calibration only	Performed by manufacture or prior to shipping	Manufacture Calibration only	Check instrument is in working order	Performed by manufacture or prior to shipping	Pass/Fail	Return to rental company for replacement	FTL	Manufacturers specifications
3001 LT Level Logger Gold *M10/F30* part #108081 with Level Loader Gold	Manufacture Calibration only	Performed by manufacture or prior to shipping	Manufacture Calibration only	Check instrument is in working order	Performed by manufacture or prior to shipping	Pass/Fail	Return to rental company for replacement	Sub-contractor	Manufacturers specifications
Water Level Meter	N/A	None	Check daily, before each use	Check instruments are working	Check daily before each use	Pass/Fail	Return to rental company for replacement	Sub-contractor	Manufacturers specifications
LaMotte Turbidity Meter *Model 2020 or equivalent*	Accuracy/calibration check at the beginning and end of the day	Return for replacement	Measure with standard solution	Upon receipt, Successful operation	Calibrate before use and whenever anomaly suspected	Pass /fail	Replace battery or bulb or return for replacement	FTL	Manufacturers specifications

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
SOM01.2	EPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL/ Trace VOCs	GC/MS	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL/ Trace SVOCs	GC/MS	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL Pesticides	GC/ECD	DESA or CLP Laboratory	
SOM01.2	CLP SOW for Multi-Media, Multi-Concentration Organic Analysis; April 2007 amendment	Definitive	TCL Aroclors (PCBs)	GC/ECD	DESA or CLP Laboratory	

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
RSK 175/ AM20Gax or other SOP using QC procedures in RSK 175	Analysis of Dissolved Methane, Ethane, and Ethane in Groundwater -Robert S. Kerr Environmental Research Laboratory Standard Operating Procedures. May 1998.	Definitive	Methane, Ethane, Ethane	GC / FID	DESA or subcontract laboratory	
ISM01.3	CLP SOW for Multi-Media, Multi-Concentration Inorganic Analysis; December 2006	Definitive	TAL Metals	ICP-AES / ICP-MS	DESA or CLP Laboratory	
		Definitive	Mercury	Cold Vapor Atomic Absorption	DESA or CLP Laboratory	
		Definitive	Cyanide	Distiller - Colorimeter	DESA or CLP Laboratory	
SW-846 9060	Determination of "Total Organic Carbon"	Definitive	TOC	Carbon analyzer/ FID	DESA or subcontract laboratory	
130.1, 2340B or C	Methods for Chemical Analysis of Water and Wastes (MCAWW): EPA-600/4-79-029, revised March 1983.	Definitive	Hardness	Colorimeter, automated or titrator	DESA or subcontract laboratory	
2540C	MCAWW. Revised 1983	Definitive	TDS and TSS	Balance, oven	DESA or subcontract laboratory	
300.0	Determination of Inorganic Anions by Ion Chromatography	Definitive	Bromide, Chloride, Nitrate/Nitrite, Orthophosphate	Ion chromatograph	DESA or subcontract laboratory	
310.2 and 2320B	MCAWW. Revised 1983	Definitive	Alkalinity	pH meter or electronic titrator	DESA or subcontract laboratory	
320.1	MCAWW. Revised 1983	Definitive	Bromide	Titrimetric	DESA or subcontract laboratory	
4500-Cl-B, -C, -D and –E	MCAWW. Revised 1983	Definitive	Chloride	1-Colorimetric, 2-Titrimetric	DESA or subcontract laboratory	
4500-NH3-B, C, D, E, F, G and H	MCAWW. Revised 1983	Definitive	Ammonia	Colorimeter-automated, Titrimetric, Potentiometric		
1-351.1, 351.2, 4500-NH3 B, C, D, E, F or G	MCAWW. Revised 1983	Definitive	TKN	1- Colorimeter 2- Potentiometric		

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)*
353.2, 4110B, 4500-NO3-E, F, or H or line item 6	MCAWW. Revised 1983	Definitive	Nitrate/Nitrite	Colorimeter		
364.1 or 365.3 and 4110B, 4500-P-E or F	MCAWW. Revised 1983	Definitive	Ortho-phosphate	Colorimeter		
375.2	MCAWW. Revised 1983	Definitive	Sulfate	Colorimeter or Gravimetric (balance/oven) Spectrophotometer		
4500-S-2-D, E, F or G	MCAWW. Revised 1983	Definitive	Sulfide	1-Titrimetry 2-Colorimeter		
415.2, 9060	MCAWW. Rev. 1983	Definitive	TOC	Carbon analyzer/IR/FID		
Lloyd Kahn	Determination of TOC in Sediment, July 1998 and Attachment B, Supplemental Technical Direction and Additional QC Procedures.	Definitive	TOC - soil	Carbon analyzer	DESA or subcontract laboratory	
ASTM D421-85	Standard Practice for Dry Preparation of Soil Samples. 2002	Definitive	Grain Size	Sieves, hydrometer	DESA or CDM subcontract laboratory	
ASTM D422-63	Standard Test Method for Particle-Size Analysis of Soils. 2002	Definitive	Grain Size	Sieves, hydrometer	DESA or CDM subcontract laboratory	
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method	Definitive	Dry bulk Density	thin-walled cylinder	CDM subcontract laboratory	
ASTM D854	Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer	Definitive	Specific Gravity	Water Pycnometer	CDM subcontract laboratory	
HACH 8146	HACH Test Kit - Phenanthroline Method (adapted from PM for Water and Wastewater)	Screening	Ferrous Iron	Colorimeter or Spectrophotometer model DR/890, 850 or 820 or as per project requirement	CDM field personnel	
NA	Manufacturer's Manual	Screening	Water Quality Parameters	YSI Water quality Checker, Model 600XL or current version as defined by project-specific QAPP	CDM field personnel	
NA	Manufacturer's Manual	Screening	Turbidity	La Motte Turbidity Meter, Model 2020	CDM field personnel	

1. CLP laboratories SOPs are reviewed through EPA. DESA laboratory specific SOPs will apply and not these generic SOPs whenever the DESA laboratory is able to perform the analyses. CDM subcontract laboratory specific SOPs are not available at this stage since the Region II Field and Analytical Services Teaming Advisory Committee (FASTAC) Policy will be implemented for procuring laboratory services. If the DESA laboratory does not have capacity for these analyses, then a CDM master services agreement (MSA) subcontractor laboratory will be selected. Following subcontractor lab procurement, the QAPP will be amended with the appropriate Worksheets via Field Change Request.
2. For non-RAS data, the ASC will submit the electronic "Analytical Services Tracking System (ANSETS) Data Requirement" form to the Regional Sample Control Coordinator (RSCC) by the first day of each month for the previous month's sampling.

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS See SOM01.2	Initial calibration: 5 points standards	Upon award of the contract, whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.), or if the continuing calibration acceptance criteria have not been met.	relative response factor (RRF) ≥ minimum acceptable RRF listed in Table 5 of procedure; All target compounds, initial relative standard deviation (RSD) ≤ 10% or 20% and correlation coefficient > 0.995. %RSD ≤ value listed in Table 5 of procedure.	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate.	EPA CLP Laboratory GC/MS Technician	SOM01.2
GC/MS	Continuing calibration (CCV)	Once every 12 hours	%D ≤15% or <30% as required	Inspect system; correct problem; recalibrate the instrument, reanalyze samples and standards.		
GC/MS	Calibration Standards Verification	Each lot of standards	As per lab established control limits	Inspect system; correct problem; re-run standard and affected samples		
GC/MS	Tuning	Daily: every 12 hours	Response factors and RRF as method specified	Inspect system; correct problem; re-run standard and affected samples		
GC/ECD See SOM01.2	Initial calibration	Upon award of the contract, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met.	Initial calibration/ Calibration verification: resolution between two adjacent peaks ≥60.0%, single components ≥90.0% resolved, RTs within the RT window,	Inspect the system (e.g., change the column, bake out the detector, clean the injection port); correct problem, re-calibrate.	EPA CLP Laboratory GC/ECD Technician	SOM01.2
	Calibration verification	Once every 12 hours	%D must be greater than or equal to -25 percent and less than or equal to 25 percent, %RSD must be less than or equal to 20.0 percent.	Inspect system, recalibrate the instrument, and reanalyze samples.		

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-AES / ICP-MS	See ISM01.3; as per instrument manufacturer's recommended procedures	Initial calibration: daily or once every 24 hours and each time the instrument is set up.	ICP-AES: As per instrument manufacturer's recommended procedures, with at least 2 standards.	Inspect the system, correct problem, re-calibrate, and re-analyze samples.	TBD EPA CLP Laboratory ICP-AES / ICP-MS Technician or DESA Laboratory analyst / QA officer -	ISM01.3
	Initial calibration	Daily; after tuning and optimizing instrument	Correlation coefficient >0.995 with a minimum of 3 standards and a blank	Repeat analysis; re-prepare calibration standards and reanalyze		
	ICV	Before sample analysis	90-110% recovery; source of standard separate from calibration standards	Re-calibrate instrument; prepare fresh ICV standards; do not analyze samples until problem is corrected		
	Reporting Limit Standard	After initial calibration verification standard	80-120% recovery or concentration ≤ 30% difference (from true value)	Re-analyze failed standard		
	CCV	Every 10 samples and at end of analytical sequence	90-110% recovery; source of standard separate from calibration standards	Re-check; re-calibrate and rerun all samples analyzed after last valid CCV		
ICP-MS	Continuing calibration	Beginning and end of run; 10% frequency or every 2 hours during an analysis run	As per instrument manufacturer's recommended procedures, with at least 2 standards. A minimum of three replicate integrations are required for data acquisition.			ISM01.3
CV-GAS	Calibration; 3 point standards	After instrument set up	$R^3 \geq 0.995$	Inspect system; correct problem	Laboratory analyst / QA officer - TBD	TBD
	Initial Calibration Verification (ICV)	Before sample analysis	80-120% recovery; source of standard separate from calibration standards	Do not analyze samples until problem is corrected	Laboratory analyst / QA officer - TBD	TBD
	Continuing Calibration Verification	10% or every 2 hours, whichever is more frequent	80-120% recovery	Inspect system, re-calibrate and rerun associated samples	Laboratory analyst / QA officer - TBD	TBD

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Total Organic Carbon Analyzer (soil)	Calibration and corrective action as per Manufacturer's instruction. No samples shall be analyzed if instrument calibration exceeds the acceptance criteria.				Lab analyst / QA officer - TBD	TBD
Colorimeter[4]	Initial Calibration; 4 - 9 point standards	Every 3 months; every 6 months for method 300. or as per lab SOP	90-110 % recovery	Re-check; re-calibrate	Lab analyst / QA officer - TBD	TBD
	Calibration check (Cal Check)	Every 10 samples and at end of analytical run	80-120 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid Cal Check	Lab analyst / QA officer - TBD	TBD
Infra red or UltraViolet Spectrophotometer	Initial Calibration; 5 point standards	Every 3 months or when other unresolved QC failure occurs	90-110 % recovery	Re-check; re-calibrate	Lab analyst / QA officer - TBD	TBD
	Calibration check	Every 10 samples and at end of analytical run	80-120 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid cal check		
Ion Chromatography	Initial Calibration; 5 point standards	Every 12 hours of operation	90-110 % recovery	Find the problem and re-calibrate	Lab analyst / QA officer - TBD	TBD
Ion Chromatography	Calibration check	Every 10 samples and at end of analytical run	90-110 % recovery	Re-check; re-calibrate and rerun all samples analyzed after last valid cal check	Lab analyst / QA officer - TBD	TBD
Spectrophotometer model	1 point standard	Daily	All target compounds, initial relative standard deviation (RSD) ≤ 20%	Inspect system; correct problem; re-run standard and affected samples	Lab analyst / QA officer - TBD	TBD
Thermometer	Calibration	Quarterly; serviced annually	See instrument manual	Replace defective thermometer	Lab analyst / QA officer - TBD	TBD
Balance	Calibration verification	Daily - before use	See instrument manual	Troubleshoot as per equipment manual/call for repair	Lab analyst / QA officer - TBD	TBD
	Mass check	Daily - before use	See instrument manual	Troubleshoot as per equipment manual/call for repair	Lab analyst / QA officer - TBD	
	Temperature check	Annually	± 2°C			

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Oven	Serviced annually as per Manufacturer's instruction				Lab analyst / QA officer - TBD	TBD
pH meter	Daily buffer checks (2 point bracketing sample pH)	Before use/per batch; other checks as per rental company and manufacturer's recommendations	± 0.1 pH units or ± 0.05 pH units	Recheck; replace buffer solutions and recheck. If still fails perform instrument check or place out of service	CDM – FTL Lab analyst / QA officer - TBD	TBD
YSI	Calibrate with standard solutions; as per instrument manufacturer's recommended procedures	Prior to day's activities; check at end of day's activities; anytime anomaly suspected	+/- 0.1 units	Clean probe, replace battery, replace membrane, replace probe	CDM FTL	Manufacturer's Instructions
LaMotte Turbidity Meter	Calibrate with standard solutions; as per instrument manufacturer's recommended procedures	Prior to day's activities; check at end of day's activities; anytime anomaly suspected	Pass/ Fail	Replace battery, replace standards, replace bottle, replace lightbulb	CDM FTL	Manufacturer's Instructions

1. The FASTAC decision process will be used for procuring laboratory services. CLP, DESA and CDM subcontract laboratory's calibration and/or method SOPs will be utilized to meet calibration criteria. Specific instrument information (Manufacturer and model) is not available at this time.
2. To be determined (TBD) - Reference SOP depends on the laboratory assignment. EPA maintains the CLP laboratory SOP information. If a subcontract laboratory is needed, CDM will submit their SOP as a field change request.
3. R represents the correlation coefficient
4. For field screening use the HACH test kit SOPs 8023 for 8146 for ferrous iron located in Appendix B. Field instrument are calibrated by the supplier.

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Analytical instrument maintenance, testing and inspection information and availability of spare parts are not available since the FASTAC decision process will be utilized for analytical services							
Information is provided in CDM BOA subcontract laboratories' QA Manuals. BOA laboratory to be utilized (if DESA is not available) not determined at this time. Maintenance, testing and inspection frequencies are documented in the BOA laboratories SOPs.							
GC/MS	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM01.2	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP Laboratory GC/MS Technician	SOM01.2
GC/ECD	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	See SOM01.2; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM01.2	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP Laboratory GC/ECD Technician	SOM01.2
ICP-AES / ICP-MS	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see ISM01.3	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP Laboratory ICP-AES / ICP-MS Technician	ISM01.3
YSI Multi-parameter meter	Check/replace battery	Visual inspection	Prior to day's activities; anytime anomaly suspected	No visual defects; +/- 0.1 units	Replace battery; replace probe	CDM FTL	Manufacturer's Instructions
LaMotte Turbidity Meter	Check/replace battery	Visual inspection	Prior to day's activities; anytime anomaly suspected	Pass/ Fail	Replace battery; replace light bulb	CDM FTL	Manufacturer's Instructions

QAPP Worksheet #26
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT

Sample Collection: CDM staff and subcontractors will collect all samples. Sample numbers will be assigned as described below. A coding system will be used to identify each sample collected during the duration of the project. This coding system will provide a tracking record to allow retrieval of information about a particular sample and ensure that each sample is uniquely identified. Each sample is identified by a unique code which indicates the sample type, sample number, and, in some cases, sample depth. A sample numbering system is described below which provides a unique identifier for all samples that will be collected during the site field investigation. The total number and types of samples collected are detailed in Worksheet #18.

Sample Packaging: Qualified CDM personnel will perform the sample packaging. Sample packaging will follow TSOP 1-2 and TSOP 2-1 and the CLP Guidance for Field Samplers, January 2011, with the exception that: sample tags and vermiculite will not be used. Forms II Lite or Scribe will be used to track sample information and create chain of custodies. This task will be assigned to experienced field personnel.

Coordination of Shipment: FTL, CDM ASC and CLP coordinator

Type of Shipment/Carrier: Priority Overnight Shipping/TBD. Samples for Saturday delivery will have the airbills checked for Saturday delivery.

SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Laboratory Sample Custodian - TBD as per FASTAC. The CLP Laboratory assignment sheet will indicate the laboratory sample custodian, and if a subcontract laboratory is required. The laboratory project officer will notify the field team of the laboratory sample custodian.
Sample Custody and Storage (Personnel/Organization): TBD as per FASTAC
Sample Preparation (Personnel/Organization): TBD as per FASTAC
Sample Determinative Analysis (Personnel/Organization): TBD as per FASTAC

SAMPLE ARCHIVING

Field Sample Storage (No. of days from sample collection): All samples will be shipped to a CLP laboratory, DESA or a subcontract laboratory on the day of collection via priority overnight (FedEx). Samples may be hand delivered/courier depending on laboratory location.

Sample Extract/ Digestate Storage (No. of days from extraction/digestion): Refer to Worksheet #19 for holding time requirements

Biological Sample Storage (No. of days from sample collection): Not Applicable

SAMPLE DISPOSAL

Laboratory responsible for analysis will dispose of samples in accordance with the applicable regulations.

Number of Days from Analysis: 90 days

QAPP Worksheet #27
Sample Custody Requirements

Sample Identification Procedures: Each sample will be labeled with a specific sample ID that depicts a specific location. Each sample will also be labeled with a CLP or Non- CLP assigned number. Depending on the type of sample, additional information such as depth, sampling round, date, etc. will be added. Examples are provided below.

Groundwater Screening Samples
Groundwater screening samples will be named GW- # -depth, where GW refers to groundwater, # refers to the sample ID number and depth refers to the middle of the sampling interval in feet bgs.An example would be GW-03-50

Soil Samples (surface soil and subsurface soil)
Soil samples (Willow Woods soil sampling, scrapyard soil sampling, open field/ waste disposal soil samples, and geotechnical samples) will be named (SS or SB) - # - Depth interval, where SS refers to surface soil, SB refers to soil boring, # refers to sample ID number and the depth interval refers to the top and bottom of a sampling interval separated by a dash and expressed in feet bgs. An example would be SB-101-0-2. Samples collected in Willow Woods will have a WW prefix added to the beginning of the sample.

Sediment Sampling
Sediment samples will be named SD – T# - letter – depth interval, where SD refers to sediment, T# refers to the transect number, letter refers to the sample location on the transect and the depth interval refers to the top and bottom of a sampling interval separated by a dash and expressed in feet bgs. An example would be SD-T31-b-2-4.

Seep Sampling
Seep samples will be named Seep- #, where the # refers to the sample location. An example would be Seep-02.

Shallow Groundwater Sampling
Shallow groundwater samples will be named SGW- #, where SGW refers to shallow groundwater and the # refers to the sample location. An example would be SGS-02. These locations will be co-located with the seep samples and will have identical sample location numbers.

Surface Water Sampling
Surface water samples will be named SW - #, where SW refers to surface water and the # refers to the sample location. An example would be SW-04.

Monitoring Well Sampling
Monitoring well samples will be named MW- # - RIFS, where MW refers to monitoring well, # refers to the monitoring well number, and RIFS identifies the sample as being collected during the RIFS phase of work. An example would be MW-6-RIFS.

Trip Blanks

QAPP Worksheet #27
Sample Custody Requirements

Trip blanks will be named TB- MMDDYYYY- #, where TB refers to trip blank, MMDDYYYY refers to the date, and the # suffix will be added if more than one trip blank is collected during a day. An example would be TB-09052011-1.

Field Blanks
Field blanks will be named FB- MMDDYYYY- identifier, where FB refers to field blank, MMDDYYYY refers to the date, and the identifier will be added o identify what type of equipment the field blank was collected from. An example would be FB-09052011-P (P refers to pump).

Additional Notes
Duplicates will use the same sampling scheme as described for each media above, however the sample # will be modified by adding a 90 before the number. Therefore MW-101-RIFS becomes MW-90101-RIFS; SB-1-0-2 becomes SB901-0-2 etc.

Background locations, if collected, should have the suffix bg tagged to the sampling ID with a hyphen to identify them as a background location.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Packaging for all shipments will be performed according to the EPA Contract Laboratory Program (CLP) Guidance for Field Samplers, Final (EPA 2011) and TSOP 2-1. To maintain a record of sample collection transfer between field personnel, shipment, and receipt by the laboratory, the applicable sample chain-of-custody paperwork (TSOP 1-2) is completed for each shipment (i.e., cooler) of packed sample bottles. The team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred properly. The field technician will review all field sampling activities to confirm that proper custody procedures were followed during the field work. Subcontractor personel relinquishing the sample to the courier will sign the chain of custody record.

QAPP Worksheet #27
Sample Custody Requirements

All courier receipts and/or paperwork associated with the shipment of samples will serve as a custody record for the samples while they are in transit from the field to the laboratory. Custody seals should remain intact during this transfer.

Coolers are secured with nylon fiber tape and at least two custody seals are placed across cooler openings. Since custody forms are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign the chain-of-custody form. Examples of custody seals are included in TSOP 1-2

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): A sample custodian at the laboratory will accept custody of shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. Samples may be archived at the laboratory if sufficient sample volume exists following initial analysis.. Disposal of the samples will occur only after analyses and QA/QC checks are completed. This will complete sample transfer.

It will be each laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis. To track field samples through data handling, the subcontractors responsible for sampling will maintain photocopies of all chain-of-custody forms.

QAPP Worksheet #28
QC Samples Table

Duplicates: Field duplicate samples are collected and analyzed to assess the overall precision of the field sampling technique. Duplicate samples, of a similar matrix, will be collected at a rate of five percent or at least one per every 20 samples. These duplicates will be submitted "blind" to the laboratories by using sample numbers that differ from their associated environmental samples. For groundwater samples collected during the annual site-wide groundwater event, duplicate samples will be collected on a per event basis. For process samples, duplicate samples will be collected based on an ongoing sample count basis. Unless otherwise noted the relative percent difference (RPD) for the field duplicates will be ≤ 50%.

Duplicate samples will be collected by alternately filling bottles for the same analysis. Duplicate air samples will be co-located.

Trip Blanks A trip blank will be prepared at the start of each day on which aqueous samples will be collected for analysis of VOCs and methane/ ethane/ethene. Trip blanks are used to determine whether on site atmospheric contaminants are seeping into the sample vials, or if any cross-contamination of samples is occurring during shipment or storage of sample containers. A trip blank consists of demonstrated analyte-free water sealed in 40-ml Teflon septum vials with no headspace (including bubbles) in the vials. Trip blank water will be considered analyte-free when analysis results for VOC analysis are below CRQL. Certification of blank water quality will be kept on site and will be filed in the project files once field work is completed. A sample of the blank water lot used in the field will be submitted for confirmatory analysis.

Trip blanks are to be kept in close proximity to the samples being collected and will be maintained at 4degrees Celsius (°C) and handled in the same manner as the other VOC or ethane/ethene aqueous samples. Preservation of trip blanks is presented on Worksheet # 19. One trip blank will be included with each daily shipment that contains aqueous samples collected for VOC analysis and one trip blank will be included with each daily shipment that contains aqueous samples collected for ethane/ethene analysis. Trip blanks will be analyzed by the same VOC method as the associated set of samples.

Field Blanks: One field blank will be collected for each equipment type per decontamination event and will be analyzed for the same constituents as the environmental samples. Field blanks, also known as "rinsate blanks" or "equipment blanks," are used to assess the effectiveness of equipment decontamination. Field blanks will be collected before the use of the decontaminated equipment for sampling. The frequency for field blanks is one per decontamination event, not to exceed one per day, for each equipment type and for each sample matrix. Field blanks are generated by pouring demonstrated analyte-free water over or through the decontaminated sampling tool. The definition of demonstrated analyte-free water is discussed in the previous section. Field blanks will be collected in a way that will minimize potential contamination from the ambient air. The use of the same aliquot of water on all equipment associated with a particular matrix for the required analyses is permissible. However, a separate field rinse blank must be collected for each piece of equipment associated with a particular sample matrix that will be analyzed for VOCs. Preservation of field blanks is specified on Worksheet # 19. Field blanks will accompany the set of samples collected by the decontaminated sampling equipment and will be kept at 4°C. *Field blanks may be minimized by decreasing the frequency of decontamination and using additional equipment. In this case the samples associated with the field blank will be noted in the field logbooks and sample trip report.*

QAPP Worksheet #28
QC Samples Table

Cooler Temperature Indicators
One cooler temperature indicator or "temperature blank" will be placed in each cooler containing samples (solid and aqueous) being sent to the laboratory for analysis. The temperature blank will consist of a sample container filled with non-preserved water (potable or distilled). The container will be labeled "COOLER TEMPERATURE INDICATOR" and dated.

Matrix Spikes
Matrix spikes (MS) are laboratory QC samples drawn from excess volumes of existing samples to demonstrate the accuracy of laboratory analysis. In accordance with EPA Region 2, matrix spikes will be designated on environmental samples at a rate of one per sample delivery group (SDG). This designation will be noted on the sample container labels and the sample paperwork. An SDG is defined as one of the following:

1. All samples of an analytical case if the sample number is less than 20 (including environmental duplicates and QC blanks) and if sampling is completed within 7 calendar days.
2. Each group of 20 samples within an analytical case (including environmental duplicates, but excluding QC blanks) if the number is greater than 20.
3. Each 7-day calendar day period during which samples within an analytical case are received. This period begins with the receipt of the first sample in the SDG.

Triple volume may be required for aqueous VOC matrix MS/MSD if a subcontract laboratory is being used and are not required for CLP method SOM01.2. The water quality parameters do not require extra volume unless identified on Worksheet #19 and confirmed with a non-CLP laboratory.

CDM Generic QAPP
See the CDM Generic QAPP for QC sample information for the following analyses:

- Aqueous: TCl VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs, TAL Inorganics (including cyanide and mercury), alkalinity, ammonia, bromide, chloride, hardness, methane, ethane, ethene, nitrate/ nitrite, orthophosphate, sulfide, sulfate, pH, TKN, TOC, TSS, TDS. Unless otherwise noted the relative percent difference (RPD) for the aqueous field duplicates will be < 50% and for lab duplicates will be <40%.
- Soil/sediment: TCl VOCs, TCL SVOCs, TCL Pesticides, TCL PCBs, TAL Inorganics (including cyanide and mercury), pH and grain size. Unless otherwise noted the relative percent difference (RPD) for the soil/sediment field duplicates will be < 50% and for lab duplicates will be <35%.

QC sample information for the following analytes are provided on Worksheet 28a through 28c of this QAPP:

- Aqueous: SPLP (Leachate sample) for TAL inorganic analysis.
- Soil/sediment: PCB congeners, dioxins and furans.

QAPP Worksheet #28 Continued

QC Samples Table

for

Non-Routine Analytical Services

PCB Congeners, Dioxins, Furans, and SPLP Metals

QAPP Worksheet #28-a
QC Samples Table

Matrix	Sediment
Analytical Group	PCB Congeners
Concentration Level	Low (pg/g)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	EPA 1668A
Sampler's Name	TBD
Field Sampling Organization	CDM
Analytical Organization	EPA Headquarters Laboratory
No. of Sample Locations	See Worksheets #18 & 20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per 20 samples	< QL	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	≤ 20% RPD; ±QL for samples <10x QL	Flag outliers	Laboratory Analyst	Precision	RPD ≤ 20%
Certified Reference Material or Quality Control Sample	Periodically at least quarterly	70-130%R;	Check standards; recalibrate if required	Laboratory Analyst	Accuracy	70-130%R;
Calibration Verification Sample	Beginning of each 12-hour shift	70-130%R;	Adjust and/or recalibrate	Laboratory Analyst	Accuracy/bias	70-130%R;
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	Accuracy	60-140%R ≤ 40% RSD
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	Laboratory Analyst	Accuracy	Warning 70-130%R; Accept 50-150%R
Field Duplicates	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM ASC	Precision	≤ 40% RPD (for results ≥ 5QL)
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM of failure and need for additional coolant; check packing procedure	Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

QAPP Worksheet #28-b
QC Samples Table

Matrix	Sediment
Analytical Group	PCDD/PCDF (Dioxins and Furans)
Concentration Level	Low (pg/g)
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	EPA 1613B
Sampler's Name	TBD
Field Sampling Organization	CDM
Analytical Organization	TBD
No. of Sample Locations	See Worksheet #18 & 20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per 20 samples	Per laboratory SOP	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; Flag outliers	Laboratory Analyst	Precision	± 20% of mean if sample concentration >10x DL
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	Accuracy	Per method/laboratory SOP
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, make other adjustments; redigest if needed and reanalyze	Laboratory Analyst	Accuracy	Individual laboratory established limits per SOP
Field Duplicates	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM ASC	Precision	≤ 40% RPD (for results ≥ 5QL)
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM of failure and need for additional coolant; check packing procedure	Laboratory Analyst	Accuracy/bias	≤ 10 degrees Celsius for data validation

Notes:

The assigned laboratory also must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in EPA Method 1613B.

QAPP Worksheet #28-c
QC Samples Table

Matrix	Aqueous (SPLP Leachate)
Analytical Group	SPLP inorganic Metals
Concentration Level	Low/Medium
Sampling SOP(s)	See Worksheet #21
Analytical Method/SOP Reference	ISM01.3/ SW-846 1312 (extraction)
Sampler's Name	TBD
Field Sampling Organization	CDM
Analytical Organization	As per FASTAC [DESA or CLP]
No. of Sample Locations	See Worksheet #20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 20 samples	None	Notify PM and flag duplicate results	CDM ASC and PM	Precision	50% RPD
Temperature Blank	1 per cooler	≤ 6 degrees Celsius	Increase coolant	CDM FTL	Accuracy	≤ 10 degrees Celsius
Field Blank	1 per decontamination event not to exceed 1 per day	≤ CRQL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / CDM PM	Accuracy / Contamination	≤ CRQL
Preparation Blank	1 per 20 samples	No constituent > CRQL	Suspend analysis rectify source; redigest/ reanalyze affected samples	Laboratory ICP Technician	Accuracy	No constituent > CRQL
Spike	1 per 20 samples	75-125%R*	Flag outliers	Laboratory ICP Technician	Accuracy	75-125%R*
Laboratory Duplicate	1 per 20 samples	± 20% RPD- water ± 35%-soil**	Flag outliers	Laboratory ICP Technician	Precision	± 20% RPD ± 35%**
Post-Digestion Spike	after any analyte (except Ag & Hg) fails spike %R	75-125%R	Flag outliers	Laboratory ICP Technician	Accuracy	75-125%R
Interference Check Sample [ICP Only]	beginning, end and periodically (not less than 1 per 20 samples)	± 2 x CRQL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	Laboratory ICP Technician	Sensitivity	± 2 times CRQL of true value or ± 20% of true value, whichever is greater
Laboratory Control Sample - aqueous	1 per 20 samples	80-120%R (except Ag and Sb)	Suspend analysis rectify source; redigest, reanalyze affected samples	Laboratory ICP Technician	Accuracy	80-120%R (except Ag and Sb)
Laboratory Control Sample – soil****	1 per 20 samples	Control limits established by EPA*	Suspend analysis rectify source; redigest, reanalyze affected samples	Laboratory ICP Technician	Accuracy	Control limits established by EPA*

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken
**Reference EPA Region 2 SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.
**** If the EPA LCS is unavailable, other EPA QC samples or other certified materials may be used. In such cases, control limits for the LCS must be documented and provided.

QAPP Worksheet #29
Project Documents and Records Table

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
FORMS II Lite or SCRIBE Traffic Reports/ COC Records	Equipment Calibration and Maintenance Log	Sample Receipt, Custody and Tracking Logs	Field Sampling Audit Plans, Reports and Checklists	M&TE (measurement and testing equipment) Forms
Airbills	Field Data Collection Logs	Standards Tracking Logs	Office Audit Plans, Reports and Checklist	Technical/QA Review Forms
Sample Tracking Log/Sheets	PID Logs, if applicable	Sample Disposal and Waste Manifests	Corrective Action Reports	Purchase Requisition Forms
Field logs/logbooks	Water Quality Data Logs	Sample Preparation Logs	Analytical sample results	Telephone Logs
Chain of Custody Forms	Photographs	Corrective Action Reports	Subcontract Laboratory certifications	Electronic Data Deliverables
Field Change Request Forms	Water Level Measurement logs	Corrective Action Forms	Subcontract Laboratory QA Plan (on file with EPA and CDM)	Non-Conformance Reports
Custody Seals	Groundwater treatment facility data collection logs	Data Packages (Case Narratives, Sample Results, QC Summaries and Raw Data (detailed in CLP SOPs).	QC Audit Reports Data Validation SOPs Data Validation Reports	Subcontract Documents (Contract, Scopes of Work, Bid Sheet), Subcontract Documents and Review Forms
ANSETS Forms	Inspection and maintenance records	Trip Reports	Data Package Completeness Checklist Validated Data Reports	Electronic Transducer data
Boring Logs	Spill incident reports	Sample analysis run logs	Self Assessment Checklist	Subcontract Laboratory SOPs
NA	Well Constructions Diagram	Telephone logs	Data Quality Assessments	NA

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Aqueous RAS	Trace VOCs	Low	SOM01.2	Standard	EPA Primary contact: RSCC Adly Michael/Bob Toth 732-906-6161/6171 DESA contact: John Birri 732-906-6886	RAC Master Services Agreement Subcontract Laboratory (TBD)
	SVOCs	Low	SOM01.2			
	PCBs	Low	SOM01.2			
	Pesticides	Low	SOM01.2			
	TAL Metals Mercury/Cyanide	Low	ISM01.3 -ICP-AES/MS			
Soil/ Sediment - RAS	TCL VOCs	Low	SOM01.2	Standard	EPA Primary contact: RSCC Adly Michael/Bob Toth 732-906-6161/6171 DESA contact: John Birri 732-906-6886	RAC Master Services Agreement Subcontract Laboratory (TBD)
	TCL SVOCs	Low	SOM01.2			
	TCL PCBs	Low	SOM01.2			
	TCL Pesticides	Low	SOM01.2			
	TAL Metals Mercury/Cyanide	Low	ISM01.3 -ICP-AES/MS			
	Dioxins	Low	EPA1613			
	Furans	Low	EPA1613			
Soil/ Sediment – non-RAS	SPLP	Low	ISM01.3 / SW-846 1312	Standard	EPA Primary contact: RSCC Adly Michael/Bob Toth 732-906-6161/6171 DESA contact: John Birri 732-906-6886	FASTAC Tier 3: RAC Master Services Agreement Subcontract Laboratory (TBD)
	PCB Congeners	Low	EPA Method 1668A			
	TOC	NA	Lloyd Kahn			
	Grain size	NA	ASTM D421-85 ASTM D422-63			
	pH	NA	SW-846, 9045D			
	Bulk density		ASTM D-2937-00			
	In-situ porosity	NA	ASTM D854/ ASTM D2937			
	Specific Gravity	NA	ASTM D854			
	Atterberg Limits	NA	ASTM D4318			
	Percent Moisture/ Solids	NA	ASTM D2216			

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Aqueous Non-RAS	Alkalinity	Low	EPA 310.2	Standard	FASTAC Tier 1: DESA All Laboratory Services: EPA Primary contact: RSCC Adly Michael/Bob Toth 732-906-6161/6171 DESA contact: John Birri 732-906-6886	FASTAC Tier 3: RAC Master Services Agreement Subcontract Laboratory (TBD)
	Ammonia	Low	SM 4500-NHs-B,C,D,E,F,G and H			
	pH	NA				
	Bromide	Low	EPA 300, 320.1			
	Chloride	Low	EPA 300			
	Hardness	Low	ISM01.3+ calculation			
	Nitrate/Nitrite	Low	EPA 353.2			
	TOC	Low	EPA 415.2 or 9060			
	Orthophosphorus	Low	EPA 300, 365.1/365.3			
	TKN	Low	EPA 351.1/351.2			
	TDS	Low	SM2540C			
	TSS	Low	SM2540D			
	Sulfate	Low	EPA 375.2			
	Sulfide	Low	SM4500S-2D,E,F or G			
Aqueous	Methane, Ethane, Ethene	Low	RSK 175	Standard	DESA	RAC Master Services Agreement Subcontract Laboratory (TBD)

For non-RAS analyses, the EPA DESA laboratory will provide analytical services; where the DESA laboratory is not available or does not provide a particular analytical service, the CDM subcontract MSA will be used to procure these services.

Ferrous Iron (field test)

QAPP Worksheet #31
Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Laboratory Technical Systems/ Performance Audits	TBD	External	CDM/ EPA	TBD	EPA CLP RAS Laboratory	EPA CLP RAS Laboratory	EPA or other Regulatory Agency
Performance Evaluation Samples	TBD	External	CDM/ EPA	TBD	EPA CLP RAS Laboratory	EPA CLP RAS Laboratory	EPA or other Regulatory Agency
Sample Collection and Documentation	Once	External	EPA	EPA Auditor	Sharon Budney PM, CDM	Sharon Budney PM, CDM	Jeniffer Oxford (RQAC) or field auditor, CDM
Health and Safety	Once if warranted	Internal/ External	EPA	EPA Auditor	Sharon Budney PM, CDM	Sharon Budney PM, CDM	Shawn Oliveira, Health & Safety Manager or designee, SSHO, CDM
Field Audit	Once	Internal	CDM	Approved field auditor	Sharon Budney PM, CDM	CDM Project Geologist and field staff	Field Auditor, CDM
Office Audit	Once	Internal	CDM	Approved CDM QA Staff	Sharon Budney PM, CDM	Sharon Budney PM, CDM	Jeniffer Oxford (RQAC) or designee, Sharon Budney PM, CDM
Data Review	Once	Internal	CDM	Scott Kirchner (ASC) or designee, CDM	Sharon Budney PM, CDM	Sharon Budney PM, CDM & Laboratory manager(s) (TBD)	Scott Kirchner (ASC), Sharon Budney PM, CDM

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Laboratory Technical Systems/ Performance Audits	Written Report	Phil Cocuzza (EPA) Laboratory Manager and Jeanne Litwin (CDM)	30 days	Letter	EPA CLP Laboratory	14 days
Performance Evaluation Samples	Electronic Report	Phil Cocuzza (EPA) Laboratory Manager and Jeanne Litwin (CDM)	30 days	Letter or Written Report	EPA CLP Laboratory	14 days
Project Readiness Review	Checklist or logbook entry	Jeffrey Rakowski (CDM FTL)	Immediately to within 24 hours of review	Checklist or logbook entry	Jeffrey Rakowski (FTL), CDM	Immediately to within 24 hours of review
Field Observations/ Deviations from Work Plan	Logbook	Jeffrey Rakowski (CDM FTL) and Larry Granite (EPA RPM)	Immediately to within 24 hours of deviation	Logbook	Jeffrey Rakowski (FTL), CDM and Larry Granite (RPM), EPA	Immediately to within 24 hours of deviation
On-Site Field Inspection	Written Report	Jeffrey Rakowski (CDM FTL)	7 calendar days after completion of the audit	Letter/Internal Memorandum	Jeffrey Rakowski (FTL), CDM	To be identified in the cover letter of the report
Health and Safety	Audit checklist	Sharon Budney (CDM PM)	Notify by phone immediately Report 1 week after audit	Memorandum and checklist	Shawn Oliveira, CDM Health and Safety Manager	Immediate CA required where possible; otherwise as specified on the CA Notice, typically 15 to 30 days from date of CA Notice
Field Audit	Field Audit Report	Joseph Button (CDM RITL) Sharon Budney (CDM PM)	Provide summary of findings to field team on day of audit; Draft Report due within 30 days	Corrective Action Plan	Jeniffer Oxford, CDM RQAC; Jo Nell Mullins, CDM QA Manager	
Data Review	Memorandum	Scott Kirchner (CDM ASC)	Notify by phone -24 hours	Memorandum	Sharon Budney (PM), CDM	TBD

QAPP Worksheet #33
QA Management Reports Table

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
EPA CLP RAS Laboratory Data (unvalidated)	As performed	21 days for unvalidated data	EPA CLP RAS Laboratory	Adly Michael, RSCC, EPA Region 2 and CDM ASC, Project Manager
EPA CLP RAS Laboratory Data (validated)	As performed	Up to 60 days after receipt of unvalidated data	EPA Region 2	Scott Kirchner(ASC)), CDM, Jeffrey Rakowski (FTL), CDM
Laboratory Technical Systems/ Performance Audits	As requested by EPA or as required	TBD; within 30 days of informal report	CDM/ EPA or other Regulatory Agency	EPA RSCC, Laboratory, CDM management
Performance Evaluation Samples	As requested by EPA or as required	None Requested	EPA or other Regulatory Agency	EPA RSCC, Laboratory, CDM management
Field Change Request	As required per field change	Three days after identification of need for field change	Jeffrey Rakowski (FTL), CDM	Larry Granite EPA RPM
Final Project Report	Once	As determined by project work plan (see project schedule)	Jeffrey Rakowski (FTL), CDM	Larry Granite EPA RPM, Jennifer Oxford CDM QAC
QAPP Addendums	As needed by project changes	TBD	Joseph Button (RITL), CDM	Larry Granite EPA RPM, EPA Project Officer, EPA QA Officer, Jeanne Litwin CDM Program Manager, Sharon Budney CDM Project Manager
Field Audit Report	Once	internal draft 30 calendar days after completion of the inspection	Jeffrey Rakowski (FTL), Field Auditor, CDM	
Office Audit Report	Once	30 calendar days after completion of the inspection	Jeffrey Rakowski (FTL), Jeniffer Oxford, (QAC) or designee, CDM	
Corrective Action Reports	As required on CA request	As required on CA request	QA Auditor, CDM	
Data Usability Assessments	With each Measurement Report	With final report	Scott Kirchner (ASC), CDM	
RI/ or RD Report (Draft and Final)	Once	draft approximately 6 months after receipt of all data, final approximately 9 months after receipt of all data	Sharon Budney (PM), CDM	

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field logbooks	Field notes will be prepared daily by the Field Team Leader (FTL) and will be complete, appropriate to the project tasks, and legible. The FTL will review logbooks for accuracy and completeness. Upon completion of field work, logbooks will be placed in the project files. Field reports will be verified with field log books to ensure correct reporting of information. Review will be conducted prior to completion of each report.	Internal	Jeffrey Rakowski (FTL), CDM
Chains of custody	COC forms will be reviewed against the samples packed in the each cooler prior to shipment. COCs will be sent with the samples to the laboratory, while copies are retained for the Sampling Trip Report and the project files. They will be internally reviewed upon completion of activities and verified against field logs, and laboratory report. Review will be conducted with completion of each data usability assessment/measurement report.	Internal	Jeffrey Rakowski (FTL), CDM, Scott Kirchner (ASC), CDM, data assessor
Sampling Trip Reports	They will be prepared for each case of field sampling for which samples are sent to a CLP laboratory. Information will be reviewed against the COC forms, and potential discrepancies will be discussed with field personnel to verify locations, dates, etc.	Internal	Jeffrey Rakowski (FTL), CDM or designee; Laboratory coordinator
QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	Internal	All data users
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All laboratory data will be verified by the laboratory performing the analysis for completeness and technical accuracy prior to submittal to EPA. Data packages will be reviewed as to content and sample information upon receipt by EPA. EPA or its contractor will evaluate the data packages for completeness and compliance. Table 9 of the IDQTF UFP-QAPP shows items for compliance review.	Internal	Laboratory analyst and QA officer; EPA DV contractor-data validator; Kimberly Zilis (DV), CDM, data assessor
Final Sample Report	The project data results will be compiled in a sample report for the project. Entries will be reviewed/verified against hardcopy information. Data validation reports, QAPP, FCRs and outputs of the EQuiS database will be used to prepare the project data quality and usability assessment report. The data will be evaluated against project DQOs and measurement performance criteria, such as completeness.	Internal	Joseph Button (RITL), CDM, Kimberly Zilis (DV), CDM or Jeffrey Rakowski (FTL), CDM
	Evaluate whether field sampling procedures were followed with respect to equipment and proper sampling support using audit and sampling reports, field change request forms and field logbooks.	Internal	Kimberly Zilis (DV), CDM
Electronic Data Deliverables (EDDs)	Determine whether required fields and format were provided compatible with EQuIS.	Internal	CDM Data Manager

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved. Determine potential impacts from noted/approved deviations, in regard to PQOs.	Joseph Button (RITL), CDM, or Scott Kirchner (ASC), CDM
IIa	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.). Examine traceability of data from sample collection to generation of project reported data. Provides sampling dates and time; verification of sample ID; and QC sample information.	ESAT Data Validation Personnel, EPA Region 2 or CDM, Scott Kirchner (ASC), CDM
IIa	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.). Determine potential impacts from noted/approved deviations, in regard to PQOs.	ESAT Data Validation Personnel, EPA Region 2 or CDM ASC
IIb	Laboratory data package	Used to perform data validation on 100% of all CLP and DESA data. Any subcontractor analyzed data will be validated by CDM. This will ensure that all analytical procedures were followed. Corrective actions will be taken and documented when applicable per specific methods. Deviations will be documented. Data will be qualified in accordance with specific methods. A report shall be prepared and utilized internally in preparation of the Data Usability Assessment Report.	ESAT Data Validation Personnel, or Scott Kirchner (ASC), CDM
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria	Scott Kirchner (ASC), CDM, Kimberly Zilis (DV), CDM
IIa	Methods	Records support implementation of the SOP - sampling and analysis	
IIb	Data Narrative	Determine deviations from methods and contract and the impact.	
llb	Audit Report	Reports used to validate compliance of field sampling, handling and analysis activities with the QAPP.	
IIb	Project Quantitation Limit	PQLG achieved as established in the QAPP and that the laboratory successfully analyzed a standard at the QL.	
IIb	Field and Lab data and QC report	A summary of all QC samples and results will be verified for measurement performance criteria, completeness and 10 percent verified to field and laboratory data reports from vendors. A report shall be prepared and utilized internally in preparation of the Data Usability Assessment Report	

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
Organics: *Data Validation SOP for Organic Analysis of _[Level]_ Concentration _[Analytical Fraction]__ under SOW SOM01.2*, Region II - Data Validation Guidelines					
IIa / IIb	Soil/Sediment/ Aqueous	TCL VOCs	Trace	SOP HW-34, rev 1	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL VOCs	Low and Medium	SOP HW-33, rev 2	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL SVOCs	Trace and Low	SOP HW-35, rev 1	ESAT DV Personnel, or EPA Region 2 - DESA
IIb	Soil/Sediment/ Aqueous	TCL Pesticides	Low and Medium	SOP HW-36, rev 2	ESAT DV Personnel, or EPA Region 2 - DESA
IIa / IIb	Soil/Sediment/ Aqueous	TCL Aroclors (PCBs)	Low and Medium	SOP HW-37, rev 1	ESAT DV Personnel, or EPA Region 2 - DESA
Inorganics: Data Validation SOP for Region II - Data Validation Guidelines					
IIa / IIb	Soil/Sediment/ Aqueous	TAL Metals, and cyanide	Low and Medium	Evaluation of Metals Data for the CLP Program based on SOW ISM01.3, September 2006, SOP HW-2, rev 13	ESAT DV Personnel, or EPA Region 2 - DESA

There is no anticipated streamlining of data validation. All data will be fully validated with the exception of the groundwater screening data, which will not be validated if the quick turn-around samples are analyzed by a subcontract laboratory. DV – data validation

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa / IIb	Soil/Sediment/ Aqueous	Methane, ethane, ethene	Trace or Low	DESA SOP or National Functional Guidelines	ESAT Data Validation Personnel, EPA Region 2 DV Personnel, or CDM, Scott Kirchner (ASC), CDM / designee
IIa / IIb	Soil/Sediment/ Aqueous	Inorganics (Hexavalent chromium)	Low and Medium	DESA SOP or CDM 029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or CDM, Scott Kirchner (ASC), CDM / designee
IIb	Soil/Sediment	CEC TOC, pH, Sulfide, AVS-SEM	Low and Medium	DESA SOP or CDM 029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or CDM, Scott Kirchner (ASC), CDM / designee
IIa / IIb	Aqueous	Wet Chemistry	Low and Medium	DESA SOP or CDM 029A SOP	ESAT DV Personnel, EPA Region 2 DV Personnel, or CDM, Scott Kirchner (ASC), CDM / designee
IIa / IIb	Soil/Sediment/ Aqueous	Perchlorate	Low and Medium	DESA SOP or CDM 029A SOP and National Functional Guidelines	ESAT DV Personnel, EPA Region 2 DV Personnel, or CDM, Scott Kirchner (ASC), CDM / designee

In-situ porosity (Determined from specific gravity & dry bulk density), grain size, and rigid wall permeability will not be validated.
Wet Chemistry = Alkalinity, ammonia, bromide, chloride, fluoride, hardness, nitrate-nitrite, sulfate, chloride, fluoride, ortho-phosphate, total phosphorus, TKN, COD, DOC, and TOC
Method requirements will also be used to evaluate the data during data validation.

QAPP Worksheet #37
Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
The Data Usability Assessment will be performed by a team of personnel at CDM. Scott Kirchner (ASC) will be responsible for information in the Usability Assessment and will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data. After the Data Usability Assessment has been performed, data deemed appropriate for use will then be used in the *RI, human health risk assessment, screening level ecological risk assessment, and FS*. The results of the Data Usability Assessment will be presented in the project-specific report. The following items will be assessed and conclusions drawn based on their results.

Precision – Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited on Worksheet #36. Field duplicates will be assessed by matrix using the RPD for each pair of results reported above CRQL for organic and inorganic analyses respectively. RPD acceptance criteria, presented in Worksheet #12, will be used to access field sampling precision. Absolute difference will be used for low results as described in worksheets 12 and 28. A discussion summarizing the results of laboratory and field precision and any limitations on the use of the data will be described.

Field duplicates - The ASC will review the extent of exceedance of the field duplicate criteria. For groundwater, the sample results will be flagged according to the data validation protocol. For soils/sediment, the exceedances will be compared with the field lithological logs and grain size results, if available. Based on this review, the project manager will determine whether the exceedance is due to inherent soil heterogeneity or the result of sample handling in the field or laboratory. This information will be included in the data assessment report. As an added measure, the field team leader will be asked to inspect the soil coning and quartering procedures and re-train staff if needed. The data assessor will review the data validation report. If the field duplicate comparison is not included, it will be performed by the assessor.

Accuracy/Bias Contamination –Laboratory blank results will be assessed as part of data validation. During the data validation process the validator will qualify the data following the procedures listed on Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and limitations on the use of the data will be described.

Overall Accuracy/Bias – The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the data validation procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity – Data results will be compared to criteria provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented and any limitations on the use of the data will be described.

Representativeness – A review of adherence to the sampling plan, field procedures and of project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives will also be reviewed and any conclusions about the representativeness of the data set will be discussed.

Comparability – Study results will be used in conjunction with existing data to make qualitative and quantitative assessments of the data to be used to produce the Site reports.

QAPP Worksheet #37
Usability Assessment

Reconciliation – The DQIs presented in Worksheet #12 will be examined to determine if the MPC were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the DQIs were met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Completeness - The Environmental Quality Information Systems (EQuIS) database will be queried to summarize the number of samples in each analytical fraction that are estimated and rejected. This data will be used along with the planned samples indicated in the QAPP to calculate the completeness of the obtained data set.

Data validation reports will be reviewed to determine the quality of the data and potential impacts on data usability. Field duplicates will be evaluated against the MPCs outlined in worksheet #12. Non-compliant data will be discussed in the usability report. The following equations will be used :

1. To calculate field duplicate precision: RPD = 100 x 2 |X1 - X2 | / (X1 + X2) where X1 and X2 are the reported concentrations for each duplicate or replicate

2. To calculate completeness: % Completeness = V/n x 100

where V= number of measurements judged valid; n = total number of measurements made and % Completeness = C/x x 100

where C= number of samples collected; x = total number of measurements planned

2. *Describe the evaluative procedures used to assess overall measurement error associated with the project:*

CDM will determine if quality control data is within specifications (MPC) through the data assessment and data validation process IIb.

3. Identify the personnel responsible for performing the usability assessment: Scott Kirchner, ASC or designee

4. Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

A usability report will describe the rationale for the data used and present any data limitations. The report will include a discussion of the accuracy, precision, representativeness, completeness and comparability of the data set and deviations from planned procedures and analysis and the impact on the project objectives. Tables will be prepared, including: a summary of planned samples, collected samples and parameters analyzed; detections in field and trip blanks; comparison of field duplicates; and a comparison of planned and actual detection limits.

QAPP Worksheet #37
Usability Assessment

5. Discuss the impacts of any qualified data, any deviations from original plan or sampling procedures, whether the project objectives were met, etc.

The following procedures will be followed for using data in preparing the RI/RD/RA Report.

- Defining the nature and extent of contamination – [CDM will evaluate individual sample results for the RI Report. The sample results will be compared to the site specific screening criteria defined as project action limits on worksheet #15. In addition, as part of the RI Report, figures will be generated in order to further refine the understanding of the nature and extent of contamination and to help identify data gaps. Figures will include geological profiles and cross-sections, water table maps, contaminant iso-concentration maps, and longitudinal and cross-sectional profiles of groundwater contamination.

- Identifying data gaps - Data gaps will be identified while writing the RI Report. As soon as data gaps are identified, CDM will discuss them with EPA. To identify data gaps, CDM will evaluate the analytical results by media and determine if results indicate levels or locations of contamination that need to be further delineated.

    - Using qualified data - CDM utilizes all data not rejected during validation to determine the nature and extent of contamination.

- Deciding if high results are legitimate or outliers - CDM will assume that all data not rejected during validation will be considered in defining the nature and extent of contamination at the site. CDM will work with EPA if there is a concern about the statistical validity of the sample results. In particular, high “outlier” results that have no surrounding comparable results as confirmation will be discussed with EPA.

Table 1
Summary of Sampling and Analysis Program
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NUMBER OF CLP SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NUMBER OF NON-RAS SAMPLES	SAMPLING FREQUENCY
Groundwater Screening Sampling 1 event, 15 locations	Groundwater[1]	None	NA	Trace VOCs Dissolved TAL metals and mercury 24 hr TAT	180 VOC 180 metals	12 per location 12 per location
Scrapyard Soil Sampling 1 event, 7 soil boring locations	Soil	TCL VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	28 28 28 28 28	At 50 percent of the locations: pH Grain Size TOC SS only: Dioxins Furans SPLP analysis	 14 14 14 7 7 5	4 per location; See Table 2 for more detail
Open Field/Waste Disposal Areas Soil Sampling 1 event, 14 soil boring locations and 27 surface soil locations	Soil	TCL VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	28 28 8 51 37	SS only at 50 percent of 12 locations: pH Grain Size TOC SS only at 7 locations: Dioxins Furans SPLP analysis	 6 6 6 7 7 1	See Table 2 for more detail
Geotechnical Sampling 1 event, 7 borings (2 in Scrapyard Area and 5 in Open Field/Waste Disposal Area)	Soil	None	NA	Soil bulk density TOC Grain size pH Porosity Soil moisture content	14 14 14 14 14 14 14	Two samples per boring

Table 1
Summary of Sampling and Analysis Program
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Thorofare, Gloucester County, New Jersey

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NUMBER OF CLP SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NUMBER OF NON-RAS SAMPLES	SAMPLING FREQUENCY
Willow Woods Sampling 1 event, 10 locations	Soil	TCL VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	20 20 20 20 20	None	NA	Two samples per location
Seep/ Shallow Groundwater Sampling 1 event, 10 Seep locations, 10 adjacent shallow groundwater locations under creek bed. Collected at low tide	Groundwater	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	20 20 20 20 40 (20 dissolved and 20 total)	Alkalinity Ammonia Bromide Chloride Hardness Nitrate/Nitrite Orthophosphate Sulfide Sulfate pH TKN TOC TSS TDS	20 20 20 20 20 20 20 20 20 20 20 20 20 20	One sample per location
Sediment Sampling 1 event, 69 locations	Sediment	TCL PCBs TAL Inorganics[2]	127 236	Dioxins Furans PCB Congeners Geotechnical[3] At 15 percent of sample locations.	4 4 4 4 35	See Table 4 for more detail

Table 1
Summary of Sampling and Analysis Program
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

SAMPLE TYPE/ LOCATION	SAMPLE MEDIA	CLP ANALYTICAL PARAMETERS	NUMBER OF CLP SAMPLES	NON-RAS ANALYTICAL PARAMETERS	NUMBER OF NON-RAS SAMPLES	SAMPLING FREQUENCY
Surface Water Sampling 1 event, 27 locations	Surface Water	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	27 27 27 27 54 (total & dissolved)	Alkalinity Ammonia Bromide Chloride Hardness Nitrate/Nitrite Orthophosphate Sulfide Sulfate pH TKN TOC TSS TDS	5 5 5 5 27 5 5 5 5 5 5 5 5 5	See Table 4 for more detail
Monitoring and Potable Well Sampling 1 Round; 37 locations (29 existing wells, 5 new wells and 3 potable wells)	Groundwater[1]	TCL Trace VOCs TCL SVOCs TCL Pesticides TCL PCBs TAL Inorganics[2]	37 37 37 37 74 (total & dissolved)	MNA Parameters: Chloride Methane Ethane/Ethene Nitrate/Nitrite Sulfate Sulfide TOC Ferrous Iron (Fe^{2+}) Water Quality Parameters: Alkalinity Ammonia Bromide Hardness Orthophosphate TSS TDS TKN	37 37 37 37 37 37 37 37 37 37 37 37 37 37 37 37	One sample per location

Table 1
Summary of Sampling and Analysis Program
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Notes:
1. Groundwater samples also will be measured for field parameters: dissolved oxygen, pH, oxidation-reduction potential, turbidity, temperature, and conductivity.

2. TAL Inorganics includes TAL metals, mercury and cyanide

3. Geotechnical includes bulk density, grain size, moisture content, percent solids, specific gravity, Atterberg limits, pH and TOC.

Abbreviations:
CLP = Contract Laboratory Program
LDL VOC = low detection limit volatile organic compounds
MNA = monitored natural attenuation
Pest/PCBs = pesticides/polychlorinated biphenyls
RAS = routine analytical services
SPLP = synthetic precipitation leaching procedure
SS = surface soil
SVOCs = semi-volatile organic compounds
TAT = turnaround time
TCL = Target Compound List
TDS = total dissolved solids
TKN = Total Kjehldahl nitrogen
TOC = total organic carbon
TAL = Target Analyte List
TSS = total suspended solids

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Location	Boring/Surface Soil Sample Location	Sampling Intervals	Analysis	Rationale
Scrapyard Area				
East of contaminated soils delineated during the NJDEP RI	SB-101 SB-102[4] SB-103[4]	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOCs, TCL SVOCs, TCL pesticides, TCL PCBs, TAL inorganics, dioxins[3], furans[3], pH[1], TOC[1], grain size[1] SPLP[4]	Characterization of underlying soils for use in RI, HHRA, FS. Soil sampling not previously performed in this area which was covered with debris during the NJDEP RI.
West of contaminated soils delineated during the NJDEP RI	SB-104[4] SB-105[4] SB-106			
GP-2	SB-107	0 to 2 ft bgs 2 to 4 ft bgs 8 to 12 ft bgs 12 to 16 ft bgs		Delineation of vertical extent of contamination; samples collected at 11 to 11.5 feet bgs have exhibited concentrations of PCBs and metals above NJDEP RSC. Characterization of underlying soils for use in RI, HHRA, FS.
Geotechnical Samples	2 boring locations to be determined	0 to 2 ft bgs Between 2 ft bgs and top of water table	Soil bulk density TOC Grain size pH Porosity Soil moisture content	To provide representative values for calculating site-specific soil screening levels.

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Location	Boring/Surface Soil Sample Location	Sampling Intervals	Analysis	Rationale
Open Field/Waste Disposal Areas				
NW of Scrapyard between MW-3, MW-4, and MW-5	SB-108[4] SB-109 SB-110 SB-111	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOC, TCL SVOC, TCL PCBs, TCL pesticide[3], TAL inorganics, dioxins[3], furans[3] SPLP[4]	Characterization of soils near Scrapyard Area and sweating fire box which were obstructed by debris piles during prior investigations.
NJDEP RI test pit TP-86 (TP-86)	SB-112	5.5 to 6 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Delineation of vertical extent of subsurface PCB contamination identified in samples collected from TP-86, near the westernmost Waste Disposal Area.
20 ft N of TP-86	SB-113	4.5 to 5 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Delineation of horizontal and vertical extent of subsurface PCB contamination within Waste Disposal Area identified during the NJDEP RI.
20 ft S of TP-86	SB-114			
20 ft E of TP-86	SB-115			
West edge of Waste Disposal Area	SB-116 SB-117 SB-118	0 to 2 ft bgs 2 to 4 ft bgs 4 to 8 ft bgs 8 to 12 ft bgs	TCL VOC, TCL SVOC, TAL inorganics	Characterization of subsurface soils upgradient of VOC impacts.

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Location	Boring/Surface Soil Sample Location	Sampling Intervals	Analysis	Rationale
NJDEP RI location S28S2	SB-119	5.5 to 6 ft bgs 7.5 to 8 ft bgs	TCL PCBs	Delineation of vertical extent of subsurface PCB contamination identified during the NJDEP RI.
NJDEP RI location S34N3	SB-120			
NJDEP RI location 22SW12	SB-121			
225 ft NNW of MW-17	SS-101	0 to 2 ft bgs	TCL PCBs, TCL pesticides, TAL inorganics, pH[1], TOC[1], grain size[1]	Characterization of surface soils within the Open Field Area.
200 ft NNE of MW-17	SS-102			
275 ft NW of MW-2	SS-103			
200 ft N of MW-2	SS-104			
20 ft W of NJDEP RI location P12NW6A	SS-105	0 to 2 ft bgs	TCL PCBs	Delineation of horizontal extent of surficial PCB contamination within Waste Disposal Area identified during the NJDEP RI.
75 ft E of MW-7	SS-106			
20 ft SE of MW-16D	SS-107		TCL PCBs	Delineation of horizontal extent of surficial PCB contamination within Open Field Area identified during the NJDEP RI.
25 ft N of NJDEP RI Test pit TP-62 (TP-62)	SS-108	0 to 2 ft bgs	TAL inorganics, pH[1], TOC[1], grain size[1]	Delineation of horizontal extent of surficial Pb contamination identified during the NJDEP RI at test pit TP-62.
25 ft S of TP-62	SS-109			
25 ft W of TP-62	SS-110			

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Location	Boring/Surface Soil Sample Location	Sampling Intervals	Analysis	Rationale
20 ft N of NJDEP RI test pit FULL-2 (FULL-2)	SS-111	0 to 2 ft bgs	TCL PCBs	Delineation of horizontal extent of surficial PCB contamination identified during the NJDEP RI at test pit FULL-2.
20 ft E of FULL-2	SS-112			
20 ft S of FULL-2	SS-113			
375 ft W of MW-15	SS-114	0 to 2 ft bgs	TCL PCBs	Characterization of surface soils along former 'road surface'.
500 ft W of MW-15	SS-115			
Along unexplored roads between MW-3 and MW-7	SS-116 SS-117 SS-118 SS-119 SS-120	0 to 2 ft bgs	TCL PCBs, TAL inorganics[2], pH[1], TOC[1], grain size[1]	Characterization of surface soils along former 'road surface'. Investigation of Pb contamination between MW-3 and MW-7 and near NJDEP RI test pit TPSS-F.
North/South extension and western limit of easement along western extent of site	SS-121 SS-122 SS-123 SS-124	0 to 2 ft bgs	TCL PCBs	Characterization of surface soils along former 'road surface'.
25 ft NNW of MW-18	SS-125	0 to 2 ft bgs	dioxins, furans	Characterization of ash-like material observed near MW-18.
25 ft E of MW-18	SS-126			
25 ft SSW of MW-18	SS-127			

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Location	Boring/Surface Soil Sample Location	Sampling Intervals	Analysis	Rationale
Geotechnical Samples	5 boring locations to be determined	0 to 2 ft bgs Between 2 ft bgs and top of water table	Soil bulk density TOC Grain size pH Porosity Soil moisture content	To provide representative values for calculating site-specific soil screening levels.
Willow Woods Area				
Willow Woods Manufactured Mobile Home Community	WW-SB-201 through WW-SB-210 (10 locations)	0 to 2 ft bgs Between 2 ft bgs and top of water table[5]	TCL VOCs, TCL SVOCs, TCL pesticides, TCL PCBs, TAL inorganics	Characterization of soil in residential area where fill may have been used to level the ground prior to trailers being installed.

Notes:
1. pH, TOC, and grain size analyses will be performed on approximately 50% of SB samples and on SS samples where noted
2. TAL Inorganics sample for two easternmost locations only
3. Surface soil sample only
4. SPLP samples collected from the 8-12 ft bgs sample from SB-102, SB-103, SB-104, SB-105, and SB-108.
5. The sample to be collected from 2 ft bgs and the top of the water table will be determined in the field. The field team will visually inspect the soil boring looking for fill material and collect the deepest 2 foot interval of fill. If no fill material is observed, the 2-4 ft bgs interval will be collected.

Table 2
Surface and Subsurface Soil Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Acronyms:

bgs	below ground surface	SB	subsurface soil sample
FS	feasibility study	SS	surface soil sample (0-6 inches below surface and below cover material if it exists)
ft	feet		
GP	NJDEP RI Geoprobe sampling location	SPLP	synthetic precipitation leaching procedure
HHRA	human health risk assessment	SVOCs	semi-volatile organic compounds
MW	monitoring well	TAL	Target Analyte List
NJDEP	New Jersey Department of Environmental Protection	TCL	Target Compound List
PCBs	polychlorinated biphenyls	TOC	total organic carbon
RDCSCC	Residential Direct Contact Soil Cleanup Criteria	TP	test pit excavated during NJDEP RI
RI	Remedial Investigation	VOCs	volatile organic compounds

Table 3
Sediment Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Area/Transect	Sample Locations[1]	Rationale
Hessian Run		
NJDEP transects with extensions	SD-T1-a/b/d SD-T2-a/b/d/e SD-T4-d/e/f/g/h SD-T7-d/e/f/g; SD-S2 SD-T11-a/b/c/d/e/f/g/h SD-T14-a/b/e/f/g//h/i SD-T16-c/e/f/g SD-T17-a/b/e/f SD-T30-a/b/d/e	■ Delineation of horizontal and vertical extent of contamination for use in RI, ERA, and FS; previous transects did not confirm depth of PCB and lead contamination ■ Characterization of shallow sediment contamination for use in RI, RA, and FS; no dioxin, furan, or PCB congeners analyses were performed during prior investigations ■ Some transects extended to span the entire surface water body
~1000 ft east of T1	SD-T31-a/b	■ Characterization of reference/background sediment quality within area further upstream of the site
Woodbury Creek		
T-22 with extensions New transect T-32 west of fill area NJDEP T-25 NJDEP 'Station 10' ~500 ft west of T-34	SD-T22-a/d/e/f/g/h SD-T32-a/b/c/d; SD-7 SD-T25-a/c/e SD-T34-a/b/c SD-T35-a/b/c	■ Delineation of horizontal and vertical extent of contamination for use in RI, ERA, and FS ■ No sediment sampling has been performed in the area closest to the western fill area where soil samples collected via test-pitting exhibited elevated contaminant concentrations ■ Characterization of shallow sediment contamination for use in RI, RA, and FS; no dioxin, furan, or PCB congeners analyses were performed during prior investigations ■ Transect extended to span the entire surface water body
~500 ft south of T-25	SD-T33-a/b	■ Characterization of reference/background sediment quality within area further upstream of the site

Table 3
Sediment Sampling Rationale
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Notes: 1. Depth and analysis for each sample location are presented on Table 5-4.

Acronyms:

FS	feasibility study
ft	feet
PCBs	polychlorinated biphenyls
RA	risk assessment
RI	Remedial Investigation
SD	sediment sample

Table 4
Sediment and Surface Water Sample Location, Interval, and Analysis Summary
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Analysis	depth (ft bgs)	Hessian Run Transects																																				
		T31*		T1					T2					T4						T7						T11												
		a	b	a	b	c	d	e	e	d	c	b	a	e	d	c	f	g	h	e	d	c	f	S2	g	e	d	c	ST4	b	a	f	g	h				
Metals	0 - 0.5	1	1	1	1		1		1	1			1	1	1		1	1	1	1	1		1		1	1	1					1	1	1				
	1 - 2	1	1														1	1	1				1	1	1							1	1	1				
	2 - 3	1	1														1	1	1				1	1	1							1	1	1				
	3 - 5	1	1		1		1		1	1		1	1	1	1		1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1				
	5 - 7	1	1		1		1		1	1		1	1	1	1		1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1				
PCBs	0 - 0.5	1	1											1	1		1	1	1	1			1		1	1						1	1	1				
	1 - 2	1	1														1	1	1				1	1	1							1	1	1				
	2 - 3	1	1														1	1	1				1	1	1							1	1	1				
	3 - 5	1	1																								1			1	1							
	5 - 7																																					
Congeners	0 - 0.5	1																		1									1									
Dioxins	0 - 0.5	1																		1									1									
Furans	0 - 0.5	1																		1									1									
Surface Water Sample	-		1	1					1				1	1					1	1					1	1						1		1				

Analysis	depth (ft bgs)	Hessian Run Transects																																				
		T14									T16							T17						T30													
		e	d	c	b	a	f	g	h	i	e	d	c	b	a	f	g	e	d	c	b	a	f	e	d	c	b	a										
Metals	0 - 0.5	1			1	1	1	1	1	1	1		1			1	1	1			1	1	1	1	1			1										
	1 - 2						1	1	1	1						1	1						1															
	2 - 3						1	1	1	1						1	1						1															
	3 - 5	1			1	1	1	1	1	1	1		1			1	1	1			1	1	1		1		1	1										
	5 - 7	1			1	1	1	1	1	1	1		1			1	1	1			1	1	1		1		1	1										
PCBs	0 - 0.5	1					1	1	1	1	1		1			1	1	1			1		1	1				1										
	1 - 2						1	1	1	1						1	1						1															
	2 - 3						1	1	1	1						1	1						1															
	3 - 5	1			1																								1									
	5 - 7																																					
Congeners	0 - 0.5	1																																				
Dioxins	0 - 0.5	1																																				
Furans	0 - 0.5	1																																				
Surface Water Sample	-	1			1					1	1						1	1					1	1														

Table 4
Sediment and Surface Water Sample Location, Interval, and Analysis Summary
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Analysis	depth (ft bgs)	Woodbury Creek Transects																										
		T33*		T25					T32*					T22								T34*			T35*		
		a	b	e	d	c	b	a	a	b	c	d	S7	h	g	f	e	d	c	b	a	a	b	c	a	b	c
Metals	0 - 0.5	1	1	1		1		1	1	1	1	1		1	1	1	1	1				1	1	1	1	1	1
	1 - 2	1	1						1	1	1	1		1	1	1						1	1	1	1	1	1
	2 - 3	1	1						1	1	1	1		1	1	1						1	1	1	1	1	1
	3 - 5					1			1	1	1	1	1	1	1	1	1				1						
	5 - 7					1			1	1	1	1	1	1	1	1	1				1						
PCBs	0 - 0.5	1	1			1			1	1	1	1		1	1	1	1	1				1	1	1	1	1	1
	1 - 2	1	1						1	1	1	1		1	1	1						1	1	1	1	1	1
	2 - 3	1	1						1	1	1	1		1	1	1						1	1	1	1	1	1
	3 - 5												1	1	1	1											
	5 - 7													1	1	1											
Congeners	0 - 0.5																										
Dioxins	0 - 0.5																										
Furans	0 - 0.5																										
Surface Water Sample	-	1		1					1			1		1				1				1			1		

Analytical Totals: 236 Metals; 127 PCB; 4 PCB congeners; 4 dioxins; 4 furans; 35 geotechnical; 27 Surface Water Samples

Legend:

h	sampling location along transect
1	sample to be collected for analysis
	no sample to be collected
*	transect not included in NJDEP RI

	NJDEP RI PCB or Pb results < low criteria
	NJDEP RI PCB or Pb results > low criteria, < SEL
	NJDEP RI PCB or Pb results > SEL
	Surface Water Sample co-located with designated sediment location.

Abbreviations:

ft bgs	feet below ground surface
congeners	analysis for 209 PCB congeners
NJDEP	New Jersey Department of Environmental Protection
Pb	lead
PCBs	polychlorinated biphenyls
RI	Remedial Investigation
SEL	severe effects level
T#	Transect number

Notes:

1. Within each transect in the table, sampling locations move away from the site from left to right.
2. Transect locations are shown on Figure 4.
3. Geotechnical analyses will be performed on 15 percent of samples and will include bulk density, grain size, moisture content/percent solids, specific gravity, Atterberg limits, pH and TOC.
4. TOC analysis will be performed on samples analyzed for PCB congeners.
4. Co-located surface water samples will be collected for TCL VOCs, TCL SVOCs, TCL pesticides, TCL PCBs, TAL inorganics (dissolved and total), and hardness. 5 of the samples will also be submitted for alkalinity, ammonia, bromide, nitrate, nitrite, orthophosphate, TKN, sulfate, sulfide, chloride, pH, TOC, TDS and TSS analyses.

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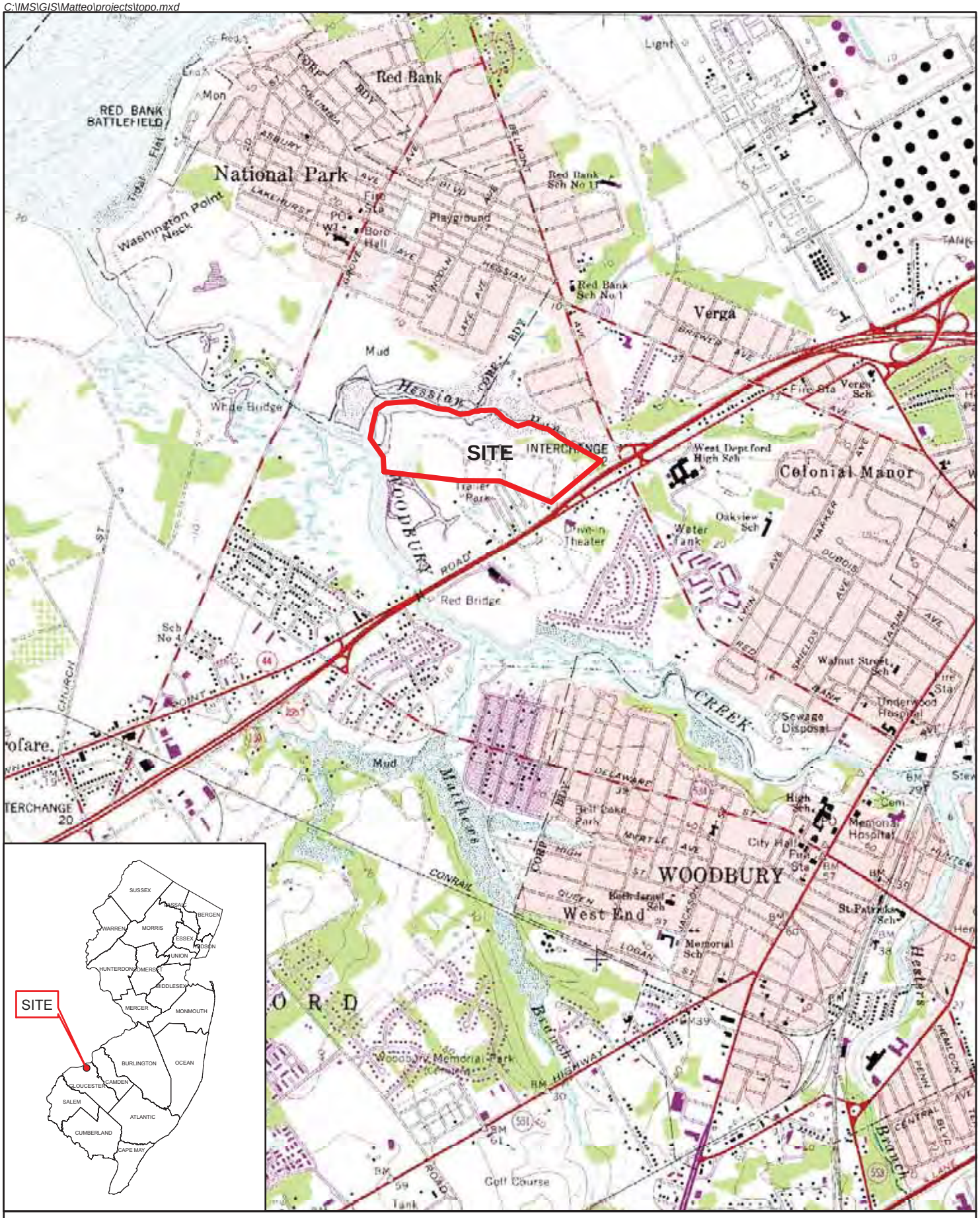

Source: USGS 7.5 Minute Quadrangle, Woodbury, NJ

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Figure1
Site Location Map
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

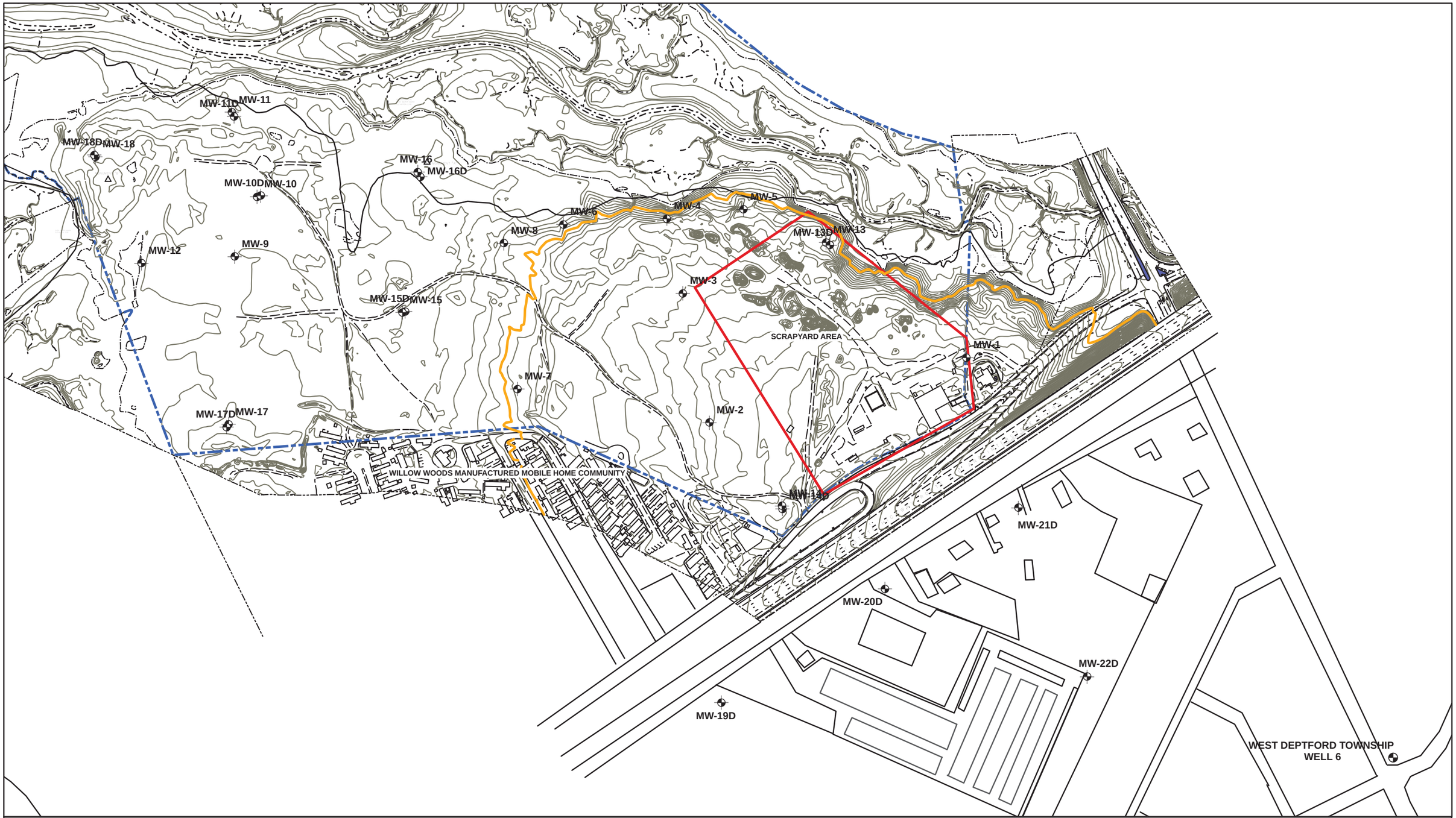
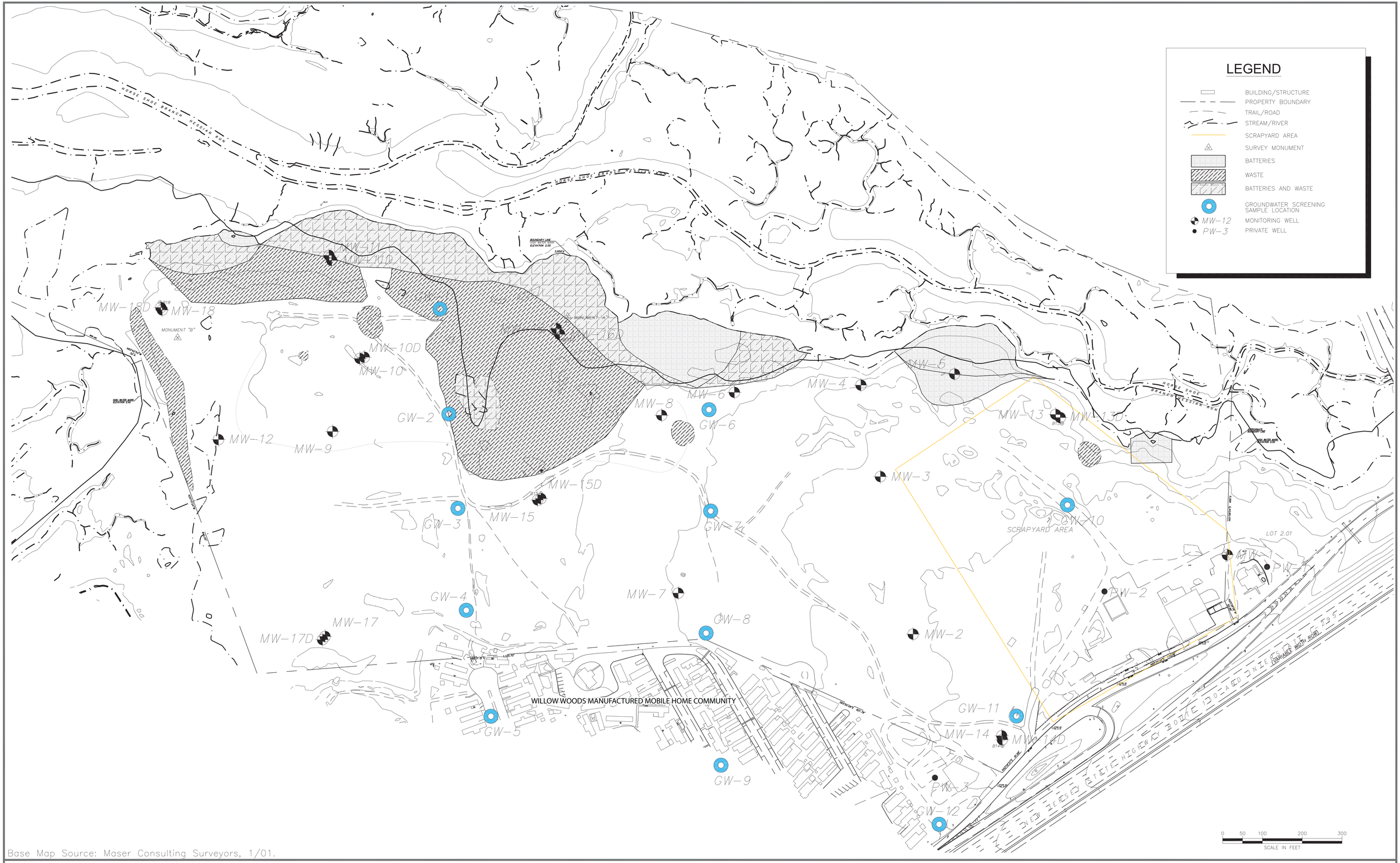


Figure 2
Site Map
Matteo & Sons, Inc. Site
Thororfare, Gloucester County, New Jersey



Base Map Source: Maser Consulting Surveyors, 1/01.

Note: 3 Additional Locations (GW-13, GW-14, and GW-15) will be contingency points and located based on initial data.

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Figure 3
Proposed Groundwater Screening Sampling Locations
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

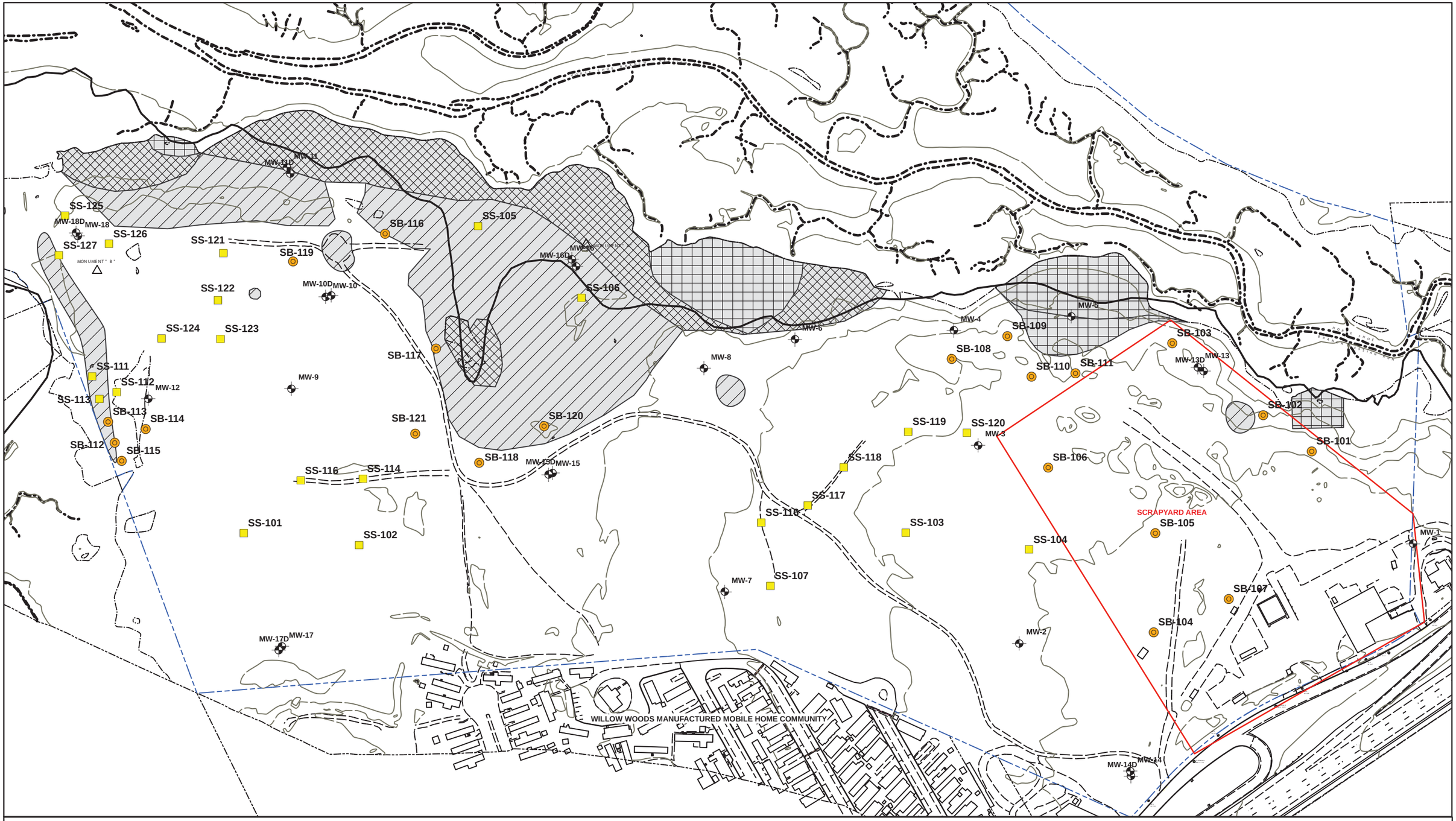

Figure 4
Proposed Soil Sampling Locations
Matteo & Sons, Inc. Site
Thororfare, Gloucester County, New Jersey

LEGEND

- BUILDING/STRUCTURE
- PROPERTY BOUNDARY
- TRAIL/ROAD
- STREAM/RIVER
- SCRAPYARD AREA
- SURVEY MONUMENT
- BATTERIES
- WASTE
- BATTERIES AND WASTE
- SEEP SAMPLE LOCATION
- MW–12 MONITORING WELL
- PW–3 PRIVATE WELL
- SHALLOW GROUNDWATER SAMPLE LOCATION

Hessian Run

Woodbury Creek

SEEP–1 SEEP–2 SEEP–3 SEEP–4 SEEP–5 SEEP–6 SEEP–7 SEEP–8 SEEP–9 SEEP–10

MW–1 MW–1D MW–2 MW–3 MW–4 MW–5 MW–6 MW–7 MW–8 MW–9 MW–10 MW–10D MW–12 MW–13 MW–13D MW–14 MW–14D MW–15 MW–15D MW–16D MW–17 MW–17D MW–18 MW–18D

PW–2 PW–3

MONUMENT "B"

SCRAPYARD AREA

LOT 2.01

NEW JERSEY STATE HIGHWAY ROUTE 130 (LIMITED ACCESS VARIABLE WIDTH ROW)

Base Map Source: Maser Consulting Surveyors, 1/01.

0 50 100 200 300
SCALE IN FEET

N

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Figure 5
Proposed Seep and Shallow Groundwater Sampling Locations
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

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Hessian Run

Woodbury Creek

Station 4

SCRAPYARD AREA

WILLOW WOODS MANUFACTURED MOBILE HOME COMMUNITY

T-30 T-17 T-16 T-14 T-11 T-7 T-4 T-2 T-22 T-32

5E 4.5E 4E

MW-18D MW-18 MW-11D MW-11 MW-10D MW-10 MW-16D MW-16 MW-12 MW-9 MW-8 MW-4 MW-5 MW-13D MW-13 MW-15D MW-15 MW-3 MW-1 MW-7 MW-17D MW-17 MW-2 MW-14

NOTES:
1. Circles denote locations previously sampled by NJDEP.
2. Area south of site boundary is estimated.
3. Letters indicate sample location ID.

- Former NJDEP sediment sample location - No sample to be collected
- Proposed Sediment Sample for Dioxin/Furan/PCB congener; Former NJDEP location
- Proposed Sediment Sample for Metals/Dioxin/Furan/PCB congener; Former NJDEP location
- Proposed Sediment Sample for Metals; Former NJDEP location
- Proposed Sediment Sample for Metals/PCBs
- Proposed Sediment Sample for Metals/PCBs; Former NJDEP location
- Proposed Sediment Sample for Metals/PCBs/Dioxin/Furan/PCB congener; Former NJDEP location
- Proposed Surface Water Sample
- Former NJDEP Aquatic Biota Sample Location
- Former NJDEP Upland Sample Location
- Monitoring Well
- Property Boundary
- Stream/River
- Scrapyard Area
- Batteries and Waste
- Batteries
- Waste

N

0 100 200 400 600 Feet

Figure 6
Proposed Sediment and Surface Water Sampling Locations
Matteo & Sons, Inc. Site
Thororfare, Gloucester County, New Jersey

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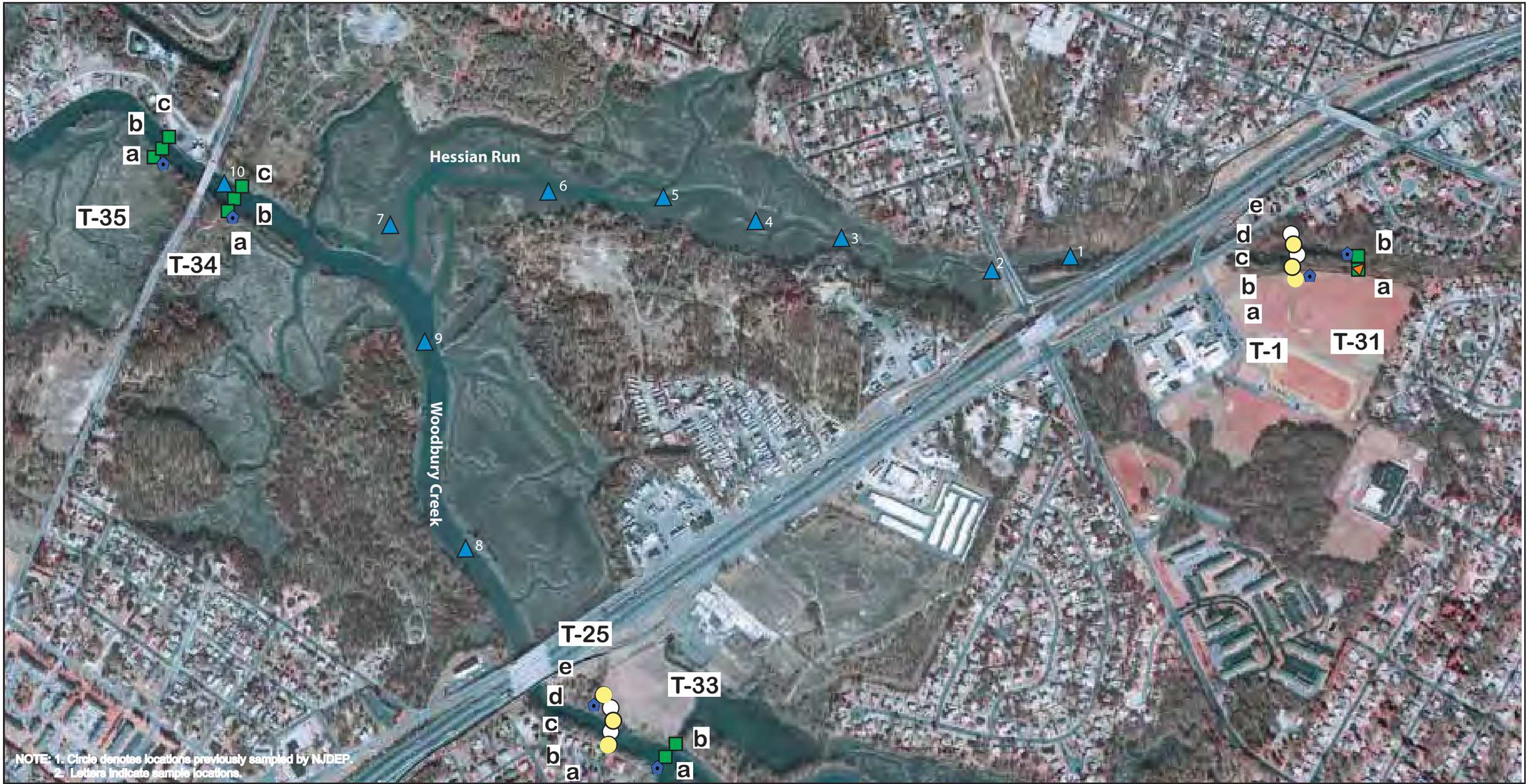

- Proposed Surface Water Sample
- Former NJDEP Sample Location - No sample to be Collected
- Proposed Sediment Sample for Metals
- Proposed Sediment Sample for Metals/PCBs
- Proposed Sediment Sample for Dioxin/Furan/PCB Congener
- Former NJDEP Aquatic Biota Sample Location

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NORTH

0 250 500 1,000 1,500 2,000

Scale in Feet

Figure 7

Proposed Offsite Sediment and Surface Water Sample Locations

Matteo & Sons, Inc. Site

Thorofare, Gloucester County, New Jersey

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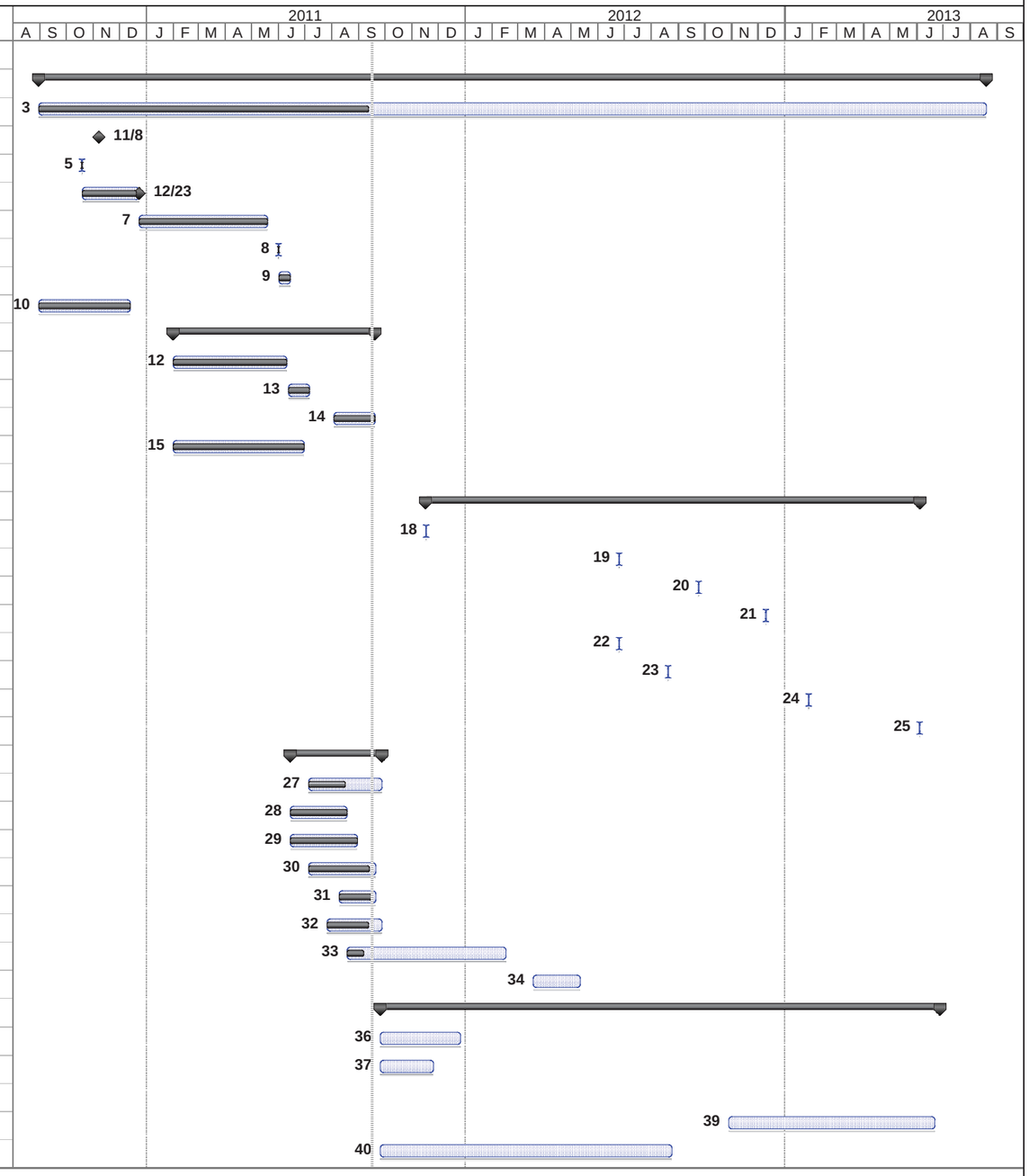
Figure 8
Willow Woods Manufactured Mobile Home Community Soil Boring Locations
Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Matteo & Sons, Inc. Site

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Matteo & Sons, Inc. Site (WA 032**	**775 days**	**8/31/10**	**8/19/13**	
2	**TASK 1 Project Planning & Support**	**775 days**	**8/31/10**	**8/19/13**	
3	1.1 Project Administation	155 wks	8/31/10	8/19/13	
4	1.2 Attend Scoping Meeting	1 day	11/8/10	11/8/10	
5	1.3 Conduct Site Visit	1 day	10/19/10	10/19/10	
6	1.4 Develop Revised Final Work Plan and Associated Cost Estimate	9.4 wks	10/20/10	12/23/10	5
7	EPA Review of Revised Final Work Plan	21 wks	12/24/10	5/19/11	6
8	Negotiate Budget	1 day	6/1/11	6/1/11	
9	Prepare/Submit Final Work Plan	9 days	6/2/11	6/14/11	8
10	1.6 Evaluate Existing Data and Documents	15 wks	8/31/10	12/13/10	3SS
11	1.7 Quality Assurance Project Plan	165 days	2/1/11	9/19/11	
12	Prepare/Submit Draft QAPP	18.8 wks	2/1/11	6/10/11	
13	EPA Review	3.6 wks	6/13/11	7/6/11	12
14	Prepare/Submit Final QAPP	6.6 wks	8/4/11	9/19/11	13FS+4 wks
15	1.8 Health & Safety Plan	108 days	2/1/11	6/30/11	
16	1.9 Non-RAS Analyses	1 day	7/1/11	7/1/11	15
17	1.10 Meetings	404 days	11/17/11	6/4/13	
18	First Meeting	1 day	11/17/11	11/17/11	50
19	Second Meeting	1 day	6/25/12	6/25/12	87SS
20	Third Meeting	1 day	9/24/12	9/24/12	75
21	Fourth Meeting	1 day	12/10/12	12/10/12	88
22	Fifth Meeting	1 day	6/25/12	6/25/12	91SS
23	Sixth Meeting	1 day	8/20/12	8/20/12	93SS
24	Seventh Meeting	1 day	1/28/13	1/28/13	95
25	Eighth Meeting	1 day	6/4/13	6/4/13	98
26	1.11 Subcontract Procurement	75 days	6/15/11	9/27/11	
27	Topographic/Bathymetric Survey	60 days	7/6/11	9/27/11	9FS+3 wks
28	Drilling Services	47 days	6/15/11	8/18/11	9
29	Speciality Drilling Services	55 days	6/15/11	8/30/11	9
30	Cultural Resources	55 days	7/6/11	9/20/11	9FS+3 wks
31	Analytical Laboratory	30 days	8/10/11	9/20/11	9FS+8 wks
32	Waste Hauling and Disposal	45 days	7/27/11	9/27/11	9FS+6 wks
33	1.12 Perform Subcontract Management	130 days	8/19/11	2/16/12	28
34	1.13 Pathway Anaysis Report (PAR)	40 days	3/19/12	5/11/12	68
35	**TASK 2 Community Relations**	**459 days**	**9/26/11**	**6/27/13**	
36	2.1 Community Interviews	66 days	9/26/11	12/26/11	47
37	2.2 Community Relations Plan	45 days	9/26/11	11/25/11	47
38	2.3 Public Meeting Support	170 days	10/29/12	6/21/13	
39	Public Meetings # 1 through #4	170 days	10/29/12	6/21/13	87
40	2.4 Fact Sheet Preparation	240 days	9/26/11	8/24/12	47



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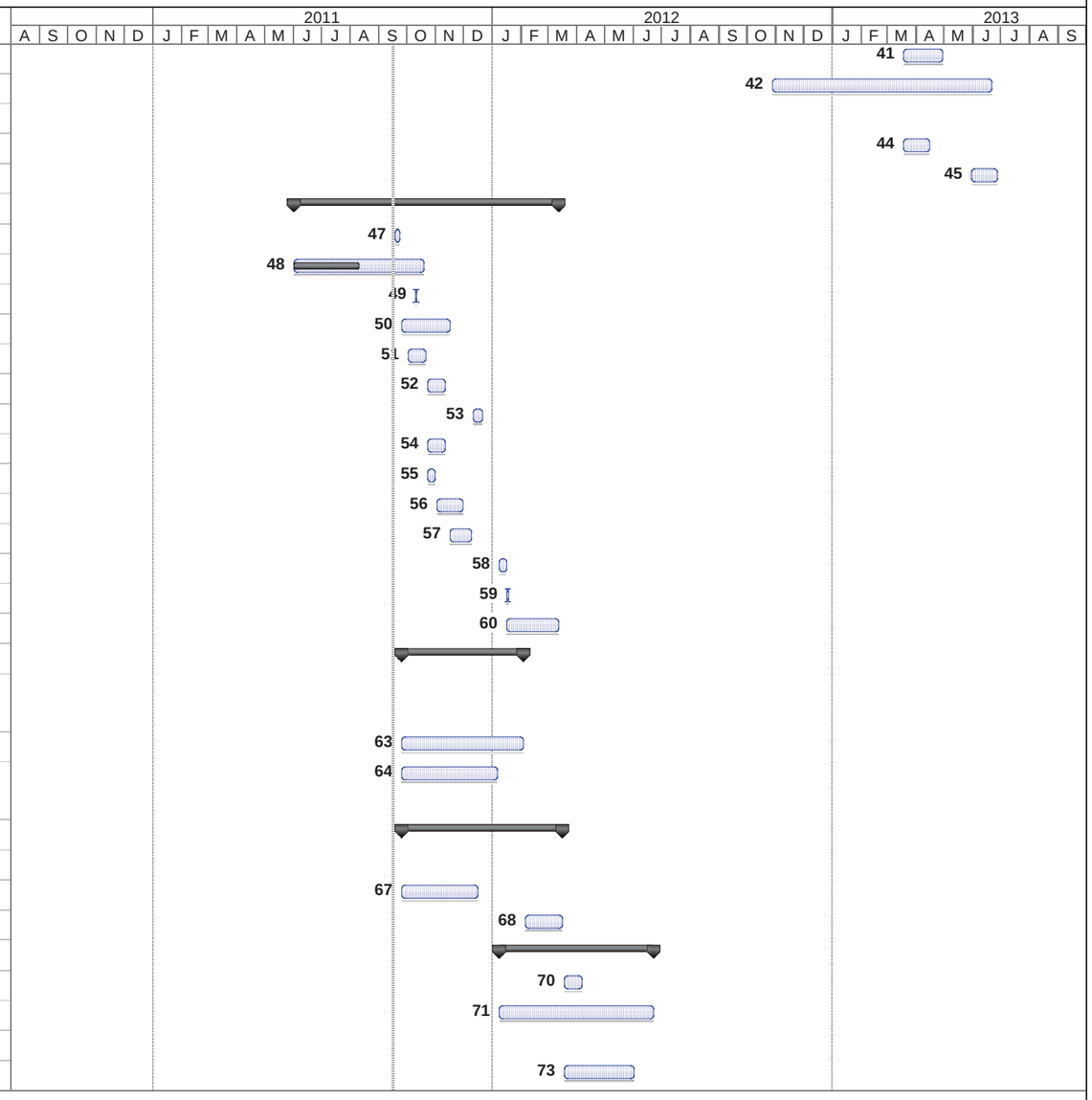
Date: 9/16/11

Task | Split | Progress | Milestone | Summary | Project Summary

Figure 9
Project Schedule Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Matteo & Sons, Inc. Site

ID	Task Name	Duration	Start	Finish	Predecessors
41	2.5 Proposed Plan Support	30 days	3/19/13	4/29/13	98SS
42	2.6 Public Notices	170 days	10/29/12	6/21/13	87
43	2.7 Information Repositories (Not Applicable)				
44	2.8 Site Mailing List	20 days	3/19/13	4/15/13	98SS
45	2.9 Responsiveness Summary Support	20 days	5/31/13	6/27/13	100SS-4 wks
46	**TASK 3 Field Investigation**	**203 days**	**6/2/11**	**3/12/12**	
47	Mobilization	5 days	9/19/11	9/23/11	
48	Site Access Support	20 wks	6/2/11	10/19/11	8
49	Cultural Resources Survey	1 day	10/11/11	10/11/11	
50	Groundwater Screening	38 days	9/26/11	11/16/11	47
51	Surface and Subsurface Soil Sampling	15 days	10/3/11	10/21/11	50SS+1 wk
52	Sediment Sampling	15 days	10/24/11	11/11/11	51
53	Seep and Shallow GW Sampling	8 days	12/12/11	12/21/11	57
54	Surafce Water Sampling	15 days	10/24/11	11/11/11	51
55	Ecological Characterization (if needed)	6 days	10/24/11	10/31/11	47FS+4 wks
56	Continuous Water Level Measurements	20 days	11/3/11	11/30/11	50FS-2 wks
57	Monitoring Well Installation/Development	17 days	11/17/11	12/9/11	50
58	Monitoring and Potable Well Sampling	6 days	1/9/12	1/16/12	57FS+4 wks
59	Demobilization	2 days	1/17/12	1/18/12	58
60	Disposal of Field Generated Waste	8 wks	1/17/12	3/12/12	58
61	**TASK 4 Sample Analysis**	**95 days**	**9/26/11**	**2/3/12**	
62	4.1 Innovative Methods/Field Screening Sample Analysis (Not Applicable)				
63	4.2 Analytical Services Provided Via CLP, DESA or ERTC	95 days	9/26/11	2/3/12	50SS
64	4.3 Non-Routine Analytical Services (Subcontracted Analytical Services)	75 days	9/26/11	1/6/12	50SS
65	**TASK 5 Analytical Support & Data Validation**	**125 days**	**9/26/11**	**3/16/12**	
66	5.1 Collect, Prepare and Ship Samples (Under Task 3.5)				
67	5.2 Sample Management	60 days	9/26/11	12/16/11	50SS
68	5.3 Data Validation	30 days	2/6/12	3/16/12	63
69	**TASK 6 Data Evaluation**	**120 days**	**1/9/12**	**6/22/12**	
70	6.1 Data Usability Evaluation	15 days	3/19/12	4/6/12	68
71	6.2 Data Reduction, Tabulation, and Evaluation	24 wks	1/9/12	6/22/12	
72	6.3 Modeling (Not Applicable)				
73	6.4 Technical Memorandum	55 days	3/19/12	6/1/12	68



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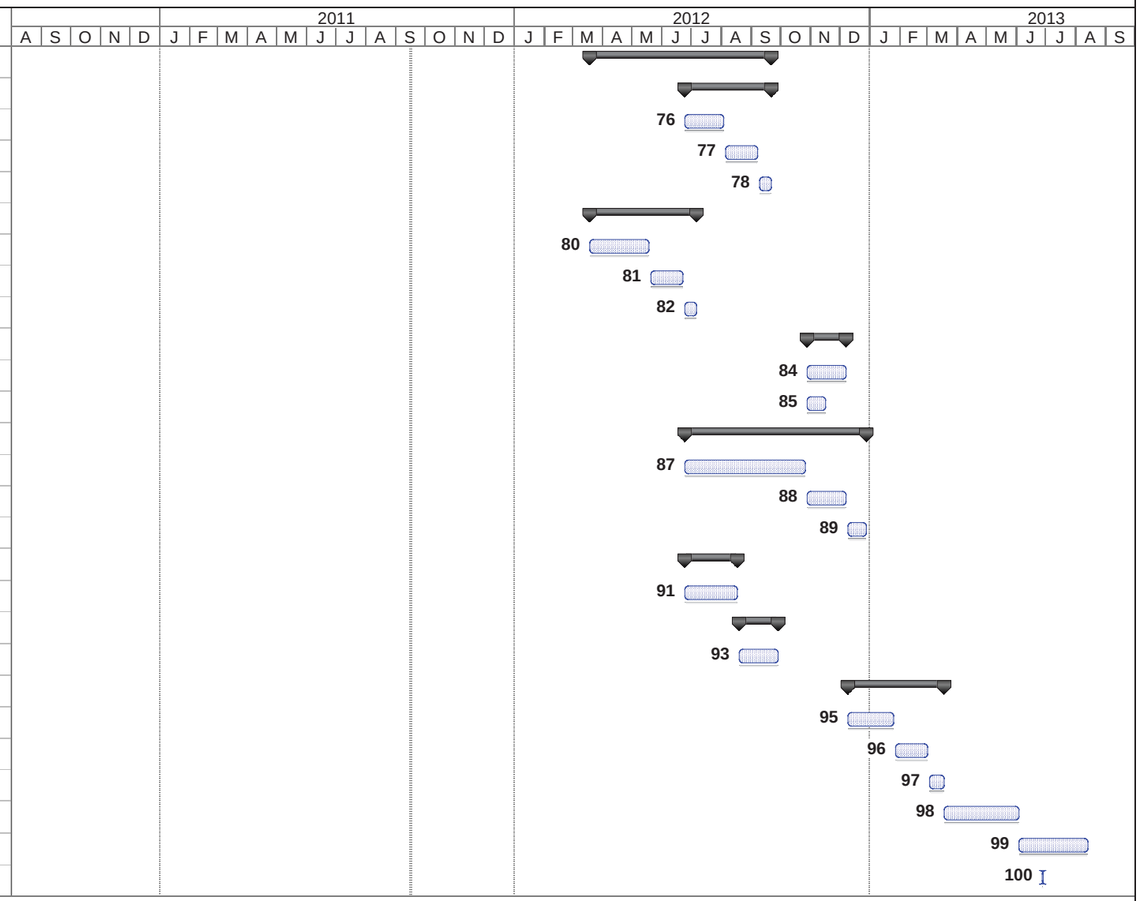
Matteo_Schedule-9-16-2011.mpp
Date: 9/16/11

Task | Split | Progress | Milestone | Summary | Project Summary

Figure 9
Project Schedule Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Matteo & Sons, Inc. Site

ID	Task Name	Duration	Start	Finish	Predecessors
74	**TASK 7 Assessment of Risk**	**135 days**	**3/19/12**	**9/21/12**	
75	7.1 Baseline Risk Assessment (Human Health)	65 days	6/25/12	9/21/12	
76	Prepare Draft Risk Assessment (HH)	30 days	6/25/12	8/3/12	34FS+6 wks
77	EPA Review of Draft Risk Assessment (HH)	25 days	8/6/12	9/7/12	76
78	Prepare Final Risk Assessment (HH)	10 days	9/10/12	9/21/12	77
79	7.2 Ecological Risk Assessment (Screening Level)	80 days	3/19/12	7/6/12	
80	Prepare Draft Ecological Risk Assessment	45 days	3/19/12	5/18/12	68
81	EPA Review of Draft Ecological Risk Assessment	25 days	5/21/12	6/22/12	80
82	Prepare Final Ecological Risk Assessment	10 days	6/25/12	7/6/12	81
83	**TASK 8 Treatability Study and Pilot Testing**	**30 days**	**10/29/12**	**12/7/12**	
84	8.1 Literature Search	30 days	10/29/12	12/7/12	87
85	8.2 Treatability Study Work Plan Letter (Optional)	15 days	10/29/12	11/16/12	84SS
86	**TASK 9 Remedial Investigation Report**	**135 days**	**6/25/12**	**12/28/12**	
87	Prepare Draft RI Report	90 days	6/25/12	10/26/12	71
88	EPA Review of Draft RI Report	30 days	10/29/12	12/7/12	87
89	Prepare Final RI Report	15 days	12/10/12	12/28/12	88
90	**TASK 10 Remedial Alternative Screening**	**40 days**	**6/25/12**	**8/17/12**	
91	Technical Memorandum 1	40 days	6/25/12	8/17/12	87SS
92	**TASK 11 Remedial Alternative Evaluation**	**30 days**	**8/20/12**	**9/28/12**	
93	Technical Memorandum 2	30 days	8/20/12	9/28/12	91
94	**TASK 12 Feasibility Study Report**	**71 days**	**12/10/12**	**3/18/13**	
95	Prepare Draft FS Report	35 days	12/10/12	1/25/13	88
96	EPA Review of FS Report	25 days	1/28/13	3/1/13	95
97	Prepare Final FS Report	11 days	3/4/13	3/18/13	96
98	**TASK 13 Post RI/FS Support**	**55 days**	**3/19/13**	**6/3/13**	**97**
99	**TASK 14 Work Assignment Closeout**	**51 days**	**6/4/13**	**8/13/13**	**98**
100	ROD Schedule	1 day	6/28/13	6/28/13	98



CDM
Matteo_Schedule-9-16-2011.mpp
Date: 9/16/11

Task | Split | Progress | Milestone | Summary | Project Summary

Figure 9
Project Schedule Matteo & Sons, Inc. Site
Thorofare, Gloucester County, New Jersey

Appendix A SITE-SPECIFIC LOW FLOW GROUNDWATER PURGING AND SAMPLING PROCEDURE

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2

GROUNDWATER SAMPLING PROCEDURE
LOW STRESS (LOW-FLOW) PURGING AND SAMPLING

I. SCOPE & APPLICATION

This Low Stress (or Low-Flow) Purging and Sampling Procedure is the EPA Region 2 preferred method for collecting groundwater samples from monitoring wells at the Matteo & Sons, Inc. Site. The procedure minimizes stress on the formation and minimizes disturbance of sediment in the well. The procedure applies to monitoring wells that have well casing with an inner diameter of 2.0 inch or greater. It is appropriate for groundwater samples that will be analyzed for volatile and semi-volatile organic compounds (VOC and SVOC), pesticides, polychlorinated biphenyls (PCB), metals, and microbiological and other contaminants in association with any EPA program.

This procedure does not address the collection of non-aqueous phase liquid (NAPL) samples and should be used for aqueous samples only. For sampling NAPLs (not expected to be encountered), the reader is referred to the following EPA publications: DNAPL Site Evaluation (Cohen & Mercer, 1993) and the RCRA Ground-Water Monitoring: Draft Technical Guidance (EPA/530-R-93-001), and references therein.

II. METHOD SUMMARY

The goal of the Low Stress Purging and Sampling procedure is to collect samples that are representative of groundwater conditions in the geological formation. This is accomplished by setting the intake velocity of the sampling pump to a flow rate that allows a maximum drawdown of 0.3 foot.

Sampling at such a low flow rate has three primary benefits. First, it minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity (i.e., low concentration of suspended particles). Typically, this saves time and analytical costs by eliminating the need for collecting and analyzing a filtered sample from the same well. Second, it minimizes aeration of the groundwater during sample collection, which improves the sample quality for VOC analysis. Third, in most cases it significantly reduces the volume of groundwater purged from a well and the costs associated with its proper treatment and disposal.

III. ADDRESSING POTENTIAL PROBLEMS

Problems that may be encountered using this technique include a) difficulty in sampling wells with insufficient yield; b) failure of a key indicator parameter to stabilize; c) cascading of water and formation of air bubbles in the tubing; and d) cross-contamination.

For wells with insufficient yield (i.e., low recharge rate of the well), care should be taken to avoid loss of pressure in the tubing line, cascading through the sand pack, or pumping the well dry. Purging should be interrupted before the water level in the well drops below the top of the pump. Sampling should commence as soon as the volume in the well has recovered sufficiently to allow collection of samples.

Alternatively, ground water samples may be obtained with techniques designed for the unsaturated zone, such as lysimeters.

If a key indicator parameter fails to stabilize after 4 hours, one of two options should be considered: a) continue purging in an attempt to achieve stabilization; or b) discontinue purging, collect samples, and document attempts to reach stabilization in the log book. The key indicator parameter for samples to be analyzed for VOCs is dissolved oxygen. The key indicator parameter for all other samples is turbidity.

For cascading and air bubbles in the tubing, care should be taken to ensure that the flow rate is sufficient to maintain pump suction. Minimize the length and diameter of tubing (i.e., 1/4 inch ID) to ensure that the tubing remains filled with liquid during sampling.

An item that should be checked on a daily basis, is the water within the cooling chamber of the submersible pump. This chamber should always be filled with demonstrated analyte-free water and any leakage from this chamber should be immediately brought to the attention of the person(s) responsible for equipment maintenance so that the appropriate seals can be replaced. Operating the pump with insufficient water in this cooling chamber could result in the pump overheating and/or pump failure. The analyte-free water should be replaced on a daily basis in order to facilitate the mechanical operation of the pump.

IV. EQUIPMENT

- Approved site-specific Quality Assurance Project Plan (QAPP). Generally, the target depth corresponds to just above the mid-point of the most permeable zone in the screened interval. Borehole geologic and geophysical logs can be used to help select the most permeable zone. However, in some cases, other criteria may be used to select the target depth for the pump intake.
- Well construction data, location map, field data from last sampling event.
- Polyethylene sheeting.
- Photo Ionization Detector (PID).
- Adjustable rate, positive displacement groundwater sampling pump constructed of stainless steel.
- Interface probe or equivalent device for determining the presence or absence of NAPL.
- Teflon-lined polyethylene tubing to collect samples for organic and inorganic analysis. Sufficient tubing of the appropriate material must be available so that each well has dedicated tubing.
- Electronic water level measuring device, 0.01 foot accuracy.
- Flow measurement supplies (e.g., graduated cylinder and stop watch).
- Power source (generator).
- Monitoring instruments for indicator parameters. Redox potential (Eh) and dissolved oxygen must be monitored in-line using an instrument with a continuous readout display. Temperature, pH and specific conductance may be monitored with an in-line monitor. A nephalometer is used to measure turbidity.
- Decontamination supplies (see Section VII, below).
- Logbook (see Section VIII, below).
- Sample bottles.
- Sample preservation supplies (as required by the analytical methods).
- Sample tags or labels, chain of custody.
- Other supplies as specified in the EPA approved field sampling plan/QAPP.

V. SAMPLING PROCEDURES

Pre-Sampling Activities

1. Start at the well known or believed to have the least contaminated groundwater and proceed systematically to the well with the most contaminated groundwater. Check well for damage or evidence of tampering. Record observations.

2. Lay out sheet of polyethylene for monitoring and sampling equipment.

3. Measure VOCs at the rim of the unopened well with a PID or FID instrument and record the reading in the field log book.

4. Remove well cap.

5. Measure VOCs at the rim of the well with a PID or FID instrument and record the reading in the field log book.

6. If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one.

7. Measure and record the depth to water (to 0.01 ft) in all wells to be sampled before any purging begins. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well.

8. If desired, measure and record the depth of any NAPLs using an interface probe. Care should be taken to minimize disturbance of any sediment which has accumulated at the bottom of the well. Record the observations in the log book.

Sampling Procedures

9. Install Pump: Slowly lower the pump, safety cable, tubing and electrical lines into the well to a depth midway within the screen interval for that well. The pump intake must be kept at least two feet above the bottom of the well to prevent disturbance and resuspension of any sediment or DNAPL present in the bottom of the well. Record the depth to which the pump is lowered.

10. Measure Water Level: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

11. Purge Well: Start pumping the well with a rate that varies from 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every three to five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

12. Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every

three to five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):

±0.1 for pH
±3% for specific conductance (conductivity)
±10 mv for redox potential
±10% for DO and turbidity

Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

If pH adjustment is necessary for sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 mls). Groundwater purged from the well prior to sampling can be used for this purpose.

13. Collect Samples: Collect samples at flow rates of between 100 and 250 ml/min or such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. Samples should be collected at the same flow rate at which the indicator parameters stabilized. VOC samples must be collected first, at the lower rate, and directly into pre-preserved sample containers. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container.

14. Remove Pump and Tubing: After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the well for re-sampling by hanging the tubing inside the well.

15. Measure and record well depth.

16. Close and lock the well.

VI. FIELD QUALITY CONTROL SAMPLES

Quality control samples must be collected to determine if sample collection and handling procedures have adversely affected the quality of the ground water samples. The appropriate EPA Program Guidance was consulted when preparing the field QC sample requirements of the site-specific QAPP.

All field quality control samples must be prepared exactly as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples will be collected for each batch of samples (a batch may not exceed 20 samples). Frequency of one per sample cooler

- Field duplicate.
- Equipment blank (not necessary if equipment is dedicated to the well).
- Trip blank (VOCs only)

Groundwater samples should be collected systematically beginning at wells known or believed to have the lowest level of contamination and proceeding in order to wells known or believed to have the highest level of contamination.

VII. DECONTAMINATION

Sampling equipment must be decontaminated thoroughly each day before use (daily decon) and after each well is sampled (between-well decon). As noted above, wells should be sampled in order from the least contaminated to the most contaminated. Pumps should not be removed from the well between purging and sampling operations. All non-disposable equipment, including the pump (support cable and electrical wires which are in contact with the sample) will be decontaminated as described below.

17. Decontamination Procedure

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and thoroughly flush other equipment with potable water for five minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and thoroughly flush other equipment with fresh detergent solution. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of potable water for 5 minutes and thoroughly flush other equipment with potable water for five minutes.

D) Final Rinse: Operate pump in a deep basin of analyte-free water to pump out 1 to 2 gallons of this final rinse water.

VIII. FIELD LOG BOOK

A field log book must be kept each time ground water monitoring activities are conducted in the field. The field log book should document the following:

- Well identification number and physical condition.
- Well depth, and measurement technique.
- Static water level depth, date, time, and measurement technique.
- Presence and thickness of immiscible liquid layers and detection method.
- Collection method for immiscible liquid layers.
- Pumping rate, drawdown, indicator parameters values, and clock time, at three to five minute intervals; calculate or measure total volume pumped.
- Well sampling sequence and time of sample collection.
- Types of sample bottles used and sample identification numbers.
- Preservatives used.
- Parameters requested for analysis.
- Field observations of sampling event.
- Name of sample collector(s).
- Weather conditions.
- QA/QC data for field instruments.
- Other logbook entries as required in the EPA approved field sampling plan/QAPP.

IX. REFERENCES

Cohen, R.M. and J.W. Mercer, 1993, DNAPL Site Evaluation, C.K. Smoley Press, Boca Raton, Florida.

EPA, 1993, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001.

EPA, 1998, EPA Region 2, Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling, March 16.

Puls, R.W. and M.J. Barcelona, 1996, Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, EPA/540/S-95/504.

Appendix B CDM Technical Standard Operating Procedures

HACH Method 8146 Ferrous Iron; 1-10 Phenanthroline Method

Note: See CDM Generic QAPP for TSOPs listed below.

1-1	Surface Water Sampling
1-2	Sample Custody
1-3	Surface Soil Sampling
1-4	Subsurface Soil Sampling
1-6	Water Level Measurement
1-9	Tap Water Sampling
1-10	Field Measurement of Organic Vapors
1-11	Sediment/Sludge Sampling
2-1	Packaging and Shipping of Environmental Samples
2-2	Guides to Handling of Investigation Derived Waste
3-1	Geoprobe® Sampling
3-2	Topographic Survey
3-5	Lithologic Logging
4-1	Field Logbook Content and Control
4-2	Photographic Documentation of Field Activities
4-3	Well Development and Purging
4-4	Design and Installation of Monitoring Wells in Aquifers
4-5	Field Equipment Decontamination
4-10	Boreholes and Well Decommissioning
5-1	Control of Measurement and Test Equipment

Iron, Ferrous

DOC316.53.01049

1-10 Phenanthroline Method[1]

Method 8146

0.02 to 3.00 mg/L

Powder Pillows or AccuVac® Ampuls

Scope and Application: For water, wastewater and seawater

[1] Adapted from *Standard Methods for the Examination of Water and Wastewater*, 15th ed. 201 (1980)

Test preparation

How to use instrument-specific information

The *Instrument-specific information* table displays requirements that may vary between instruments. To use this table, select an instrument then read across to find the corresponding information required to perform this test.

Table 1 Instrument-specific information

Instrument	Powder pillows		AccuVac Ampuls	
	Sample cell	Cell orientation	Sample cell	Adapter
DR 5000	2495402	Fill line faces user	2427606	—
DR 3900	2495402	Fill line faces user	2427606	LZV846 (A)
DR 3800, DR 2800, DR 2700	2495402	Fill line faces right	2122800	LZV584 (C)

Before starting the test:

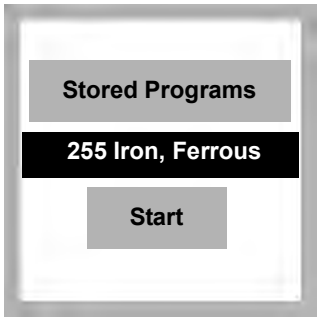
For more accurate results, determine a reagent blank value for each new lot of reagent. Follow the procedure using deionized water instead of the sample. Subtract the reagent blank value from the final results or perform a reagent blank adjust.
Analyze samples as soon as possible to prevent air oxidation of ferrous iron to ferric iron, which is not determined.
If ferrous iron is present, an orange color will form after adding the reagent.

Collect the following items:

Description	Quantity
Powder Pillow Test:	
Ferrous Iron Reagent Powder Pillows	1
Sample Cells (see *Instrument-specific information*)	2
AccuVac Test:	
Ferrous Iron Reagent AccuVac® Ampuls	1
Beaker, 50 mL (AccuVac test)	1
Sample Cell (see *Instrument-specific information*)	1

See *Consumables and replacement items* for reorder information.

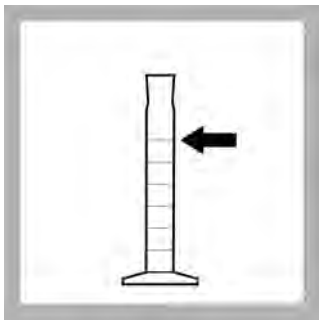
1-10 Phenanthroline method for powder pillows



1. Select the test.

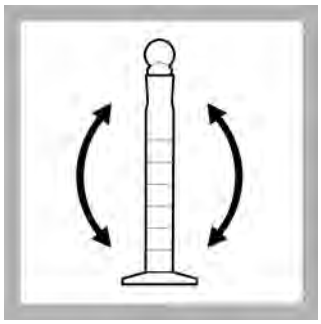
Insert an adapter if required (see *Instrument-specific information*).

Refer to the user manual for orientation.



2. Fill a clean graduated mixing cylinder with 25 mL of sample.

3. Prepared Sample: Add the contents of one Ferrous Iron Reagent powder pillow to the cylinder.



4. Insert a stopper and invert to mix. Undissolved powder does not affect accuracy.

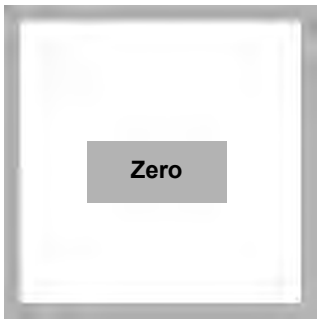
5. Start the instrument timer.

A three-minute reaction period will begin.

6. Blank Preparation: Fill a sample cell with 10 mL of sample.

7. Fill a second sample cell with the prepared sample from the mixing cylinder in step 4.

8. When the timer expires, insert the blank into the cell holder.



9. ZERO the instrument.

The display will show:

0.00 mg/L Fe^{2+}

10. Insert the prepared sample into the cell holder.

11. READ the results in mg/L Fe^{2+}.

1-10 Phenanthroline method for AccuVac® Ampuls

1. Select the test.

Insert an adapter if required (see *Instrument-specific information*).

Refer to the user manual for orientation.

2. Blank Preparation: Fill a round sample cell with 10 mL of sample.

3. Prepared Sample: Fill a Ferrous Iron Reagent AccuVac® Ampul with sample from the beaker. Keep the tip immersed while the Ampul fills completely.

4. Quickly invert the Ampul several times to mix.

5. Start the instrument timer.

A three-minute reaction period will begin.

6. Wipe the blank and insert it into the cell holder.

ZERO the instrument.

The display will show:

0.00 mg/L Fe^{2+}

7. Wipe the Ampul and insert it into the cell holder.

READ the results in mg/L Fe^{2+}.

Sample collection, preservation and storage

- Collect samples in plastic or glass bottles.
- Analyze samples as soon as possible after collection.

Accuracy check

Standard solution method

Note: *Refer to the instrument user manual for specific software navigation instructions.*

Required for accuracy check:

- Ferrous Ammonium Sulfate, hexahydrate, 0.7022 g
- 1 L Class A volumetric flask
- 100 mL Class A volumetric flask
- Deionized water

- Analytical balance
- 2 mL Class A volumetric pipet and pipet filler

1. Prepare a 100 mg/L Fe^{2+} ferrous iron stock solution as follows:
   a. Dissolve 0.7022 grams of Ferrous Ammonium Sulfate, hexahydrate, in deionized water.
   b. Dilute to one liter in a Class A volumetric flask.
   c. In a 100 mL Class A volumetric flask, dilute 2.00 mL of this solution to 100 mL with deionized water to make a 2.0 mg/L standard solution. Prepare this solution immediately before use.
2. Follow the *1-10 Phenanthroline method for powder pillows* or the *1-10 Phenanthroline method for AccuVac® Ampuls* test procedure.
3. To adjust the calibration curve using the reading obtained with the 2.00-mg/L Standard Solution, select Options>More>Standard Adjust from the instrument menu.
4. Turn on the Standard Adjust feature and accept the displayed concentration. If an alternate concentration is used, enter the concentration and adjust the curve to that value.

Method performance

Program	Instrument	Standard	Precision 95% Confidence Limits of Distribution	Sensitivity Concentration change per 0.010 Abs change
255	DR 5000	2.00 mg/L Fe^{2+}	1.99–2.01 mg/L Fe^{2+}	0.021 mg/L Fe^{2+}
257	DR 2800	2.00 mg/L Fe^{2+}	1.98–2.02 mg/L Fe^{2+}	0.023 mg/L Fe^{2+}

Summary of method

The 1-10 phenanthroline indicator in the Ferrous Iron Reagent reacts with ferrous iron (Fe^{2+}) in the sample to form an orange color in proportion to the iron concentration. Ferric iron (Fe^{3+})does not react. The ferric iron concentration can be determined by subtracting the ferrous iron concentration from the results of a total iron test. Test results are measured at 510 nm.

Consumables and replacement items

Required reagents

Description	Quantity/Test	Unit	Catalog number
Ferrous Iron Reagent Powder Pillows	1	100/pkg	103769
OR			
Ferrous Iron Reagent AccuVac® Ampuls	1	25/pkg	2514025

Required apparatus

Description	Quantity/Test	Unit	Catalog number
Beaker, 50 mL	1	each	50041H
Sample cell, 10 mL round, 25 x 54 mm	1	each	2122800
Sample cell, 10 mL round, 25 x 60 mm	1	6/pkg	2427606
Sample cell, 10 mL square, matched pair	2	2/pkg	2495402

Recommended standards and apparatus

Description	Unit	Catalog number
Balance, analytical, 80 g x 0.1 mg 100–240 VAC	each	2936701
Ferrous Ammonium Sulfate, hexahydrate, ACS	113 g	1125614
Flask, volumetric, 1000 mL	each	1457453
Pipet filler, safety bulb	each	1465100
Pipet, volumetric, 2.00 mL	each	1451535
Water, deionized	4 L	27256
Wipers, disposable	280/pkg	2097000

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Edition 6

Appendix C Applicable Portions of DESA QAPP

QAPP Worksheet #12 **Title:**
(UFP-QAPP Manual Section 2.6.2) **Revision Number:**

Measurement Performance Criteria Table

Matrix	Aqueous/Soil
Analytical Group[1]	Semi-Volatiles
Concentration Level	

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheet #28 & #23	Precision Accuracy	% RPD < 30 Compound Specific (full range: D-262%)	LCS Duplicate	A
		Accuracy	Factor of two(-50% to + 100%) from the initial/continuing calibration	Internal standards	A
		Accuracy	Compound Specific (full range: D-262%)	Matrix spike	A
		Accuracy	Limits 30%-120% for Base Neutrals Limits 20%-120% for Acids	Surrogate Compounds	A
		Accuracy	< RL	Method Blank	A

QAPP Worksheet #12 **Title:**
(UFP-QAPP Manual Section 2.6.2) **Revision Number:**

Measurement Performance Criteria Table

Matrix	Aqueous/Soil
Analytical Group[1]	Metals/Mercury
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See #28/ #23	Precision	% RPD < 20(Aq), % RPD <25(Soil)	LCS Duplicate	A
		Accuracy	Limits: Average Recovery ± 20% aqueous, ± 25% Soil)	LCS	A
		Accuracy	± 20% aqueous, ± 25% Soil)	Matrix spike	A
		Precision	< RL Except for Al, Fe, Ca, K, Mg and Na	Interference Check Sample(ICP/AES)	A
		Accuracy	< RL	Method Blank	A
		Precision	RPD < 20 %	Serial Dilution Test(ICP/AES)	A
		Accuracy	Range of 0.60-1.87 of the original response in the calibration blank	Internal Standards(ICP-MS)	A

QAPP Worksheet #12
(UFP-QAPP Manual Section 2.6.2)
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Title:
Revision Number:
Revision Date:
Page ___ of ___

Measurement Performance Criteria Table

Matrix	Aqueous/Soils
Analytical Group[1]	Microbiology
Concentration Level	N/A

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheets #28/ #23	Media selectivity,sensitivity	Growth promotion	LCS(Positive Control)	A
		Precision	10% (different analyst) 5%(same analyst)	Sample Duplicates Count	A
		Contamination	No growth	Method Blank	A
		Media /containers selectivity,sensitivity Contamination	No growth	Sterility or Performance Testing	A

QAPP Worksheet #12
(UFP-QAPP Manual Section 2.6.2)

Title:
Revision Number:
Revision Date:

Measurement Performance Criteria Table

Matrix	Aqueous/Soil
Analytical Group[1]	Pest/PCB
Concentration Level	

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheets #28/ #23	Precision Accuracy	% RPD < 30 Average Recovery 50-150%	LCS Duplicate	A
		Accuracy	Compound Specific (full range: 30-150%)	Matrix spike	A
		Accuracy	Limits 30%-150%	Surrogate Compounds	A
		Accuracy	< RL	Method Blank	A

QAPP Worksheet #12 **Title:**
(UFP-QAPP Manual Section 2.6.2) **Revision Number:**

Measurement Performance Criteria Table

Matrix	Aqueous/Soil
Analytical Group[1]	Sanitary
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheets #28/ #23	Precision	% RPD < 20	LCS Duplicates	A
		Accuracy	90-110% or manufacturer limits	LCS	A
		Accuracy	± 20%	Matrix Spike	A
		Precision	% RPD < 20	Sample Duplicates	A
		Accuracy	< RL	Method Blank	A

QAPP Worksheet #12 **Title:**
(UFP-QAPP Manual Section 2.6.2) **Revision Number:**
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Measurement Performance Criteria Table

Matrix	Aqueous/Soil
Analytical Group[1]	VOA
Concentration Level	Low(aq)/Medium(soil)

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheets #28/ #23	Precision Accuracy	% RPD < 20 Average Recovery 70-130%	LCS Duplicate	A
		Accuracy	Factor of two(-50% to + 100%) from the initial/continuing calibration	Internal standards	A
		Accuracy	Compound Specific (full range: 17-259%)	Matrix spike	A
		Accuracy	Limits 70%-130%(Aqueous) Table 7 of C-123(low Soil)	Surrogate Compounds	A
		Accuracy	< RL	Method Blank	A

QAPP Worksheet #12 **Title:**
(UFP-QAPP Manual Section 2.6.2) **Revision Number:**
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Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group[1]	VOA
Concentration Level	Trace

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
NA	See worksheets #28/ #23	Precision Accuracy	% RPD < 20 Average Recovery(80-120%)	LCS Duplicate	A
		Accuracy	+/- 40% from the initial/continuing calibration	Internal standards	A
		Accuracy	Limits 70%-130%	Matrix spike	A
		Accuracy	Limits 80%-120%	Surrogate Compounds	A
		Accuracy	< RL	Method Blank	A

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: Metals-ICP/AES
Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]		Achievable (DESA) Limits[2]	
			Method CRQLs µg/l	MDLs µg/l	RLs µg/l
Aluminum	7429-90-5		200	93.9	200
Antimony	7440-36-0		60	0.71	20
Arsenic	7440-38-2		10	2.26	8
Barium	7440-39-3		200	0.83	6
Beryllium	7440-41-7		5	0.24	5
Cadmium	7440-43-9		5	0.11	4
Calcium	7440-70-2		5000	68.0	1000
Chromium	7440-47-3		10	0.22	6
Cobalt	7440-48-4		50	0.18	8
Copper	7440-50-8		25	5.89	10
Iron	7439-89-6		100	35.6	100
Lead	7439-92-1		10	1.18	7
Magnesium	7439-95-4		5000	30..5	1000
Manganese	7439-96-5		15	0.07	5
Mercury	7439-97-6		0.2	.017	0.2
Nickel	7440-02-0		40	0.46	5
Potassium	7440-09-7		5000	53.3	1000
Selenium	7782-49-2		35	1.34	7
Silver	7440-22-4		10	.030	6
Sodium	7440-23-5		5000	161	1000
Thallium	7440-28-0		25	1.62	20
Vanadium	7440-62-2		50	2.14	10
Zinc	7440-66-6		60	4.84	8

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: Metals-ICP/MS
Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQLs µg/l	Achievable (DESA) Limits[2]	
				MDLs µg/l	RLs µg/l
Aluminum	7429-90-5		-	1.19	10
Antimony	7440-36-0		2	0.022	2.0
Arsenic	7440-38-2		1	0.062	1.0
Barium	7440-39-3		10	0.031	1.0
Beryllium	7440-41-7		1	0.010	1.0
Cadmium	7440-43-9		1	0.009	1.0
Calcium	7440-70-2		-		-
Chromium	7440-47-3		2	0.314	1.0
Cobalt	7440-48-4		1	0.015	1.0
Copper	7440-50-8		2	0.315	1.0
Iron	7439-89-6		-		-
Lead	7439-92-1		1	0.011	1.0
Magnesium	7439-95-4		-		-
Manganese	7439-96-5		1	0.135	1.0
Mercury	7439-97-6		-		-
Nickel	7440-02-0		1	0.471	1.0
Potassium	7440-09-7		-		-
Selenium	7782-49-2		5	0.183	5.0
Silver	7440-22-4		1	0.007	1.0
Sodium	7440-23-5		-		-
Thallium	7440-28-0		1	0.013	1.0
Vanadium	7440-62-2		1	0.082	1.0
Zinc	7440-66-6		2	0.165	1.0

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Metals
Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQLs mg/kg	Achievable (DESA) Limits[2]	
				MDLs - mg/kg	RLs - mg/kg
Aluminum	7429-90-5		20	*	100
Antimony	7440-36-0		6	0.22	2
Arsenic	7440-38-2		1	0.35	0.8
Barium	7440-39-3		20	0.24	10
Beryllium	7440-41-7		0.5	0.02	0.3
Cadmium	7440-43-9		0.5	0.02	0.3
Calcium	7440-70-2		500	12.57	50
Chromium	7440-47-3		1	0.34	0.5
Cobalt	7440-48-4		5	0.03	2
Copper	7440-50-8		2.5	0.26	1
Iron	7439-89-6		10	*	5
Lead	7439-92-1		1	0.23	0.8
Magnesium	7439-95-4		500	5.06	50
Manganese	7439-96-5		1.5	0.33	0.5
Mercury	7439-97-6		0.1	.0043	0.05
Nickel	7440-02-0		4	0.09	2
Potassium	7440-09-7		500	12.36	50
Selenium	7782-49-2		3.5	0.22	2
Silver	7440-22-4		1	0.06	0.5
Sodium	7440-23-5		500	22.48	100
Thallium	7440-28-0		2.5	3.14	2
Vanadium	7440-62-2		5	0.40	2
Zinc	7440-66-6		6	1.57	2

* MDL study cannot be successfully performed on these analytes because of high background levels in matrix (sand).

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: PEST/PCBs
Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
alpha-BHC	319-89-6		1.7	2.15	2.5
gamma-BHC	58-89-9		1.7	1.89	2.5
beta-BHC	319-85-7		1.7	1.35	2.5
delta-BHC	319-86-8		1.7	1.51	2.5
Heptachlor	76-44-8		1.7	2.05	2.5
Aldrin	309-00-2		1.7	1.66	2.5
Heptachlor epoxide	1024-57-3		1.7	1.34	2.5
Gamma-chlordane	5103-74-2		1.7	0.96	2.5
alpha-chlordane	5103-71-9		1.7	1.01	2.5
Endosulfan I	1031-07-8		1.7	1.16	2.5
4,4'-DDE	72-55-9		3.3	1.92	5.0
Dieldrin	60-57-1		3.3	1.91	5.0
Endrin	72-20-8		3.3	1.84	5.0
4,4'-DDD	72-54-8		3.3	1.35	5.0
Endosulfan II	1031-078		3.3	1.27	5.0
4,4'-DDT	50-29-3		3.3	1.52	5.0
Endrin aldehyde	7421-93-4		3.3	2.24	5.0
Methoxychlor	72-43-5		17	8.00	25
Endosulfan sulfate	1031-07-8		3.3	1.24	2.5
Endrin ketone	53494-70-5		3.3	1.18	2.5
Toxaphene	8001-35-2		170	75.9	190
Technical chlordane				56.1	62
AROCLOR 1016	12674-11-2		33		31
AROCLOR 1221	11104-28-2		33		62
AROCLOR 1232	11141-16-5		33		31
AROCLOR 1242	53469-21-9		33	29.9	31
AROCLOR 1248	12672-29-6		33		31
AROCLOR 1254	11097-69-1		33		31
AROCLOR 1260	11096-82-5		33		31
AROCLOR 1262	37324-23-5		33		31
AROCLOR 1268	11100-14-4		33		31

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: PEST/PCB Aroclors
Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQLs µg/L	Achievable (DESA) Limits[2]	
				MDLs µg/L	RLs µg/L
alpha-BHC	319-89-6		0.050	0.001	0.0025
gamma-BHC	58-89-9		0.050	0.001	0.0025
beta-BHC	319-85-7		0.050	0.002	0.0025
delta-BHC	319-86-8		0.050	0.002	0.0025
Heptachlor	76-44-8		0.050	0.001	0.0025
Aldrin	309-00-2		0.050	0.001	0.0025
Heptachlor epoxide	1024-57-3		0.050	0.005	0.0025
Gamma-chlordane	5103-74-2		0.050	0.001	0.0025
Alpha-chlordane	5103-71-9		0.050	0.002	0.0025
Endosulfan I	1031-07-8		0.050	0.002	0.0025
4,4'-DDE	72-55-9		0.10	0.003	0.005
Dieldrin	60-57-1		0.10	0.004	0.005
Endrin	72-20-8		0.10	0.004	0.005
4,4'-ddd	72-54-8		0.10	0..005	0.005
Endosulfan II	1031-078		0.10	0.004	0.005
4,4'-DDT	50-29-3		0.10	0.004	0.005
Endrin aldehyde	7421-93-4		0.10	0.006	0.005
Methoxychlor	72-43-5		0.50	0.032	0.050
Endosulfan sulfate	1031-07-8		0.10	0.004	0.005
Endrin ketone	53494-70-5		0.10	0.004	0.005
Toxaphene	8001-35-2		5.0	0.049	0.1875
Technical chlordane				0.020	0.0625
AROCLOR 1016	12674-11-2		1.0		0.03125
AROCLOR 1221	11104-28-2		1.0		0.0625
AROCLOR 1232	11141-16-5		1.0		0.03125
AROCLOR 1242	53469-21-9		1.0	0.020	0.03125
AROCLOR 1248	12672-29-6		1.0		0.03125
AROCLOR 1254	11097-69-1		1.0	0.014	0.03125
AROCLOR 1260	11096-82-5		1.0		0.03125
AROCLOR 1262	37324-23-5		1.0		0.03125
AROCLOR 1268	11100-14-4		1.0		0.03125

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous

Analytical Group: Sanitary Chemistry

Concentration Level:

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs [5]	Achievable (DESA) Limits	
				MDLs mg/L	**RLs mg/l**
Alkalinity	471-34-1			0.11	1.0
Ammonia	7664-41-7			0.010	0.05
Chloride	16887-00-6			0.54	1.0
COD				8.89	20
Cyanide	57-12-5		10 µg/L	1.29 µg/l	5.0 µg/l
Fluoride (IC)				0.0040o	0.10
Fluoride (ISE)	016984488			.036	1.00
Hexavalent Chromium	018540299			6.21 µg/l	10.0 µg/L
Nitrite (NO2) (as N)	014797650			0.010	0.05
Nitrite (NO2) (as N) IC				0.0030	0.10
Nitrate (NO3) (as N)	014797558			0.010	0.05
Nitrate (NO3) (as N) IC				0.050	0.10
Nitrite + Nitrate (as N)	7727-37-9			0.0020	0.05
O-PO4	14265-44-2			0.0030	0.01
0P04 (IC)				0.039	0.10
Oil and Grease(Hexane extractable Material)				1.280	5.0
TPH(Silica-Gel treated Hexane Extractable material)				4.66	5.0
TSS				N/A	10
BOD	E1640606			N/A	2.0
Total Phenols				7.13 µg/l	10.0 µg/l
Sulfate	14808-79-8			1.34	5.0
Total Phosphorus	77723-14-0			0.0060	0.05
TKN				0.070	0.10
Sulfide				0.0090	0.05
TOC	10-19-5			0.19	1.0

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Semi -Volatile Organic Compounds
Concentration Level: low

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs [5] µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
Benzaldehyde	100-52-7		170		120
Phenol	108-95-2		170		120
Bis(2-chloroethyl)ether	111-44-4		170		120
2-Chlorophenol	95-57-8		170		120
2-Methylphenol	95-48-7		170		120
Bis(2-chloroisopropyl)ether	108-60-1		170		120
Acetophenone	98-86-2		170		120
4-Methylphenol	106-44-5		170		120
N-Nitroso-di-n-propylamine	621-64-7		170		120
Hexachloroethane	67-72-1		170		120
Nitrobenzene	98-95-3		170		120
Isophorone	78-59-1		170		120
2-Nitrophenol	88-75-5		170		120
2,4-dimethylphenol	105-67-9		170		120
Bis(2-chloroethoxy)methane	111-91-1		170		120
2,4-dichlorophenol	120-83-2		170		120
Naphthalene	91-20-3		170		120
4-Chloroaniline	106-47-8		170		120
Hexachlorobutadiene	87-68-3		170		120
Caprolactam	105-60-2		170		120
4-Chloro-3-methylphenol	59-50-7		170		120
2-methyl naphthalene	91-57-6		170		120
Hexachlorocyclopentadiene	77-47-4		170		120
1,2,4,5-Tetrachlorobenzene	95-94-3		170		120
2,4,6-Trichlorophenol	88-06-2		170		120
2,4,5-Trichlorphenol	95-95-4		170		120
1,1'-Biphenyl	92-52-4		170		120
2-Chloronaphthalene	91-58-7		170		120
2-Nitroaniline	88-74-4		330		120
Dimethyl phthalate	131-11-3		170		120
Acenaphthylene	208-96-8		170		120
2,6-Dinitrotoluene	606-20-2		170		120

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs [5] µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
3-Nitroaniline	99-09-2		330		120
Acenaphthene	83-32-9		170		120
2,4-Dinitrophenol	51-28-5		330		800
4-Nitrophenol	100-02-7		330		400
Dibenzofuran	132-64-9		170		120
2,4-Dinitrotoluene	121-14-2		170		120
2,3,4,6-Tetrachlorophenol	58-90-2		170		120
Fluorene	86-73-7		170		120
Diethylphthalate	84-66-2		170		120
4-Chlorophenyl phenyl ether	7005-72-3		170		120
4-Nitroaniline	100-01-6		330		120
4,6-Dinitro-2-Methylphenol	534-52-1		330		400
N-Nitrosodiphenylamine	86-30-6		170		120
4-Bromophenyl phenyl ether	101-55-3		170		120
Hexachlorobenzene	118-74-1		170		120
Atrazine	1912-24-9		170		120
Pentachlorophenol	87-86-5		330		400
Phenanthrene	85-01-8		170		120
Anthracene	120-12-7		170		120
Carbazole	86-74-8		170		120
Di-n-butyl phthalate	84-74-2		170		120
Fluoranthene	206-44-0		170		120
Pyrene	129-00-0		170		120
Butylbenzylphthalate	85-68-7		170		120
3,3-Dichlorobenzidine	91-94-1		170		120
Benzo(a)anthracene	56-55-3		170		120
Chrysene	218-01-9		170		120
Bis(2-ethylhexyl)phthalate	117-81-7		170		120
Di-n-octyl phthalate	117-84-0		170		120
Benzo(b)Fluoranthene	205-99-2		170		120
Benzo(k)Fluoranthene	207-08-9		170		120
Benzo(a)pyrene	50-32-8		170		120
Indeno(1,2,3-cd)pyrene	193-39-5		170		120
Dibenzo(a,h)anthracene	53-70-6-3		170		120
Benzo(g,h,i)perylene	191-24-2		170		120
1,4-Dioxane					

Note: Based on the new CRQLs the MDL study is currently being reanalyzed.

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: Semi -Volatile Organic Compounds
Concentration Level: Low

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs	Achievable (DESA) Limits	
				MDLs µg/L	RLs
Benzaldehyde	100-52-7		5 µg/L	0.10	5 µg/L
Phenol	108-95-2		5 µg/L	1.36	5 µg/L
Bis(2-Chloroethyl)ether	111-44-4		5 µg/L	1.38	5 µg/L
2-Chlorophenol	95-57-8		5 µg/L	1.43	5 µg/L
2-Methylphenol	95-48-7		5 µg/L	0.99	5 µg/L
Bis(2-Chloroisopropyl)ether	108-60-1		5 µg/L	1.23	5 µg/L
Acetophenone	98-86-2		5 µg/L	0.9	5 µg/L
4-Methylphenol	106-44-5		5 µg/L	0.81	5 µg/L
N-Nitroso-di-n-propylamine	621-64-7		5 µg/L	0.99	5 µg/L
Hexachloroethane	67-72-1		5 µg/L	1.35	5 µg/L
Nitrobenzene	98-95-3		5 µg/L	1.13	5 µg/L
Isophorone	78-59-1		5 µg/L	0.76	5 µg/L
2-Nitrophenol	88-75-5		5 µg/L	1.08	5 µg/L
2,4-Dimethylphenol	105-67-9		5 µg/L	1.81	5 µg/L
Bis(2-Chloroethoxy)methane	111-91-1		5 µg/L	0.97	5 µg/L
2,4-Dichlorophenol	120-83-2		5 µg/L	0.94	5 µg/L
Naphthalene	91-20-3		5 µg/L	1.05	5 µg/L
4-Chloroaniline	106-47-8		5 µg/L	0.42	5 µg/L
Hexachlorobutadiene	87-68-3		5 µg/L	1.02	5 µg/L
Caprolactam	105-60-2		5 µg/L	1.0	5 µg/L
4-Chloro-3-methylphenol	59-50-7		5 µg/L	0.62	5 µg/L
2-Methyl naphthalene	91-57-6		5 µg/L	0.88	5 µg/L
Hexachlorocyclopentadiene	77-47-4		5 µg/L	0.92	5 µg/L
1,2,4,5-Tetrachlorobenzene	95-94-3		5 µg/L	0.8	5 µg/L
2,4,6-Trichlorophenol	88-06-2		5 µg/L	0.55	5 µg/L
2,4,5-Trichlorphenol	95-95-4		5 µg/L	0.76	5 µg/L
1,1'-Biphenyl	92-52-4		5 µg/L	1.0	5 µg/L
2-Chloronaphthalene	91-58-7		5 µg/L	0.80	5 µg/L
2-Nitroaniline	88-74-4		10 µg/L	0.70	5 µg/L
Dimethyl phthalate	131-11-3		5 µg/L	0.47	5 µg/L
Acenaphthylene	208-96-8		10 µg/L	0.77	5 µg/L
2,6-Dinitrotoluene	606-20-2		5 µg/L	0.79	5 µg/L
3-Nitroaniline	99-09-2		10 µg/L	0.76	5 µg/L

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs	Achievable (DESA) Limits	
				MDLs µg/L	RLs
Acenaphthene	83-32-9		5 µg/L	0.72	5 µg/L
2,4-Dinitrophenol	51-28-5		10 µg/L	0.33	20µg/L
4-Nitrophenol	100-02-7		10 µg/L	0.35	10µg/L
Dibenzofuran	132-64-9		5 µg/L	0.72	5 µg/L
2,4-Dinitrotoluene	121-14-2		5 µg/L	0.48	5 µg/L
2,3,4,6-Tetrachlorophenol	58-90-2		5 µg/L		5 µg/L
Fluorene	86-73-7		5 µg/L	0.61	5 µg/L
Diethylphthalate	84-66-2		5 µg/L	0.39	5 µg/L
4-Chlorophenyl Phenyl Ether	7005-72-3		5 µg/L	0.57	5 µg/L
4-Nitroaniline	100-01-6		10 µg/L	0.34	5 µg/L
4,6-Dinitro-2-Methylphenol	534-52-1		10 µg/L	0.85	10µg/L
N-Nitrosodiphenylamine	86-30-6		5 µg/L	0.61	5 µg/L
4-Bromophenyl Phenyl Ether	101-55-3		5 µg/L	0.58	5 µg/L
Hexachlorobenzene	118-74-1		5 µg/L	0.49	5 µg/L
Atrazine	1912-24-9		5 µg/L	1.5	5 µg/L
Pentachlorophenol	87-86-5		10 µg/L	0.91	10µg/L
Phenanthrene	85-01-8		5 µg/L	0.47	5 µg/L
Anthracene	120-12-7		5 µg/L	0.58	5 µg/L
Carbazole	86-74-8		5 µg/L	1.2	5 µg/L
Di-N-Butyl Phthalate	84-74-2		5 µg/L	0.48	5 µg/L
Fluoranthene	206-44-0		5 µg/L	0.51	5 µg/L
Pyrene	129-00-0		5 µg/L	0.53	5 µg/L
Butylbenzylphthalate	85-68-7		5 µg/L	0.49	5 µg/L
3,3-Dichlorobenzidine	91-94-1		5 µg/L	0.4	5 µg/L
Benzo(a)anthracene	56-55-3		5 µg/L	0.58	5 µg/L
Chrysene	218-01-9		5 µg/L	0.53	5 µg/L
Bis(2-Ethylhexyl)phthalate	117-81-7		5 µg/L	0.68	5 µg/L
Di-n-octyl phthalate	117-84-0		5 µg/L	0.57	5 µg/L
Benzo(b)fluoranthene	205-99-2		5 µg/L	0.41	5 µg/L
Benzo(k)fluoranthene	207-08-9		5 µg/L	0.60	5 µg/L
Benzo(a)pyrene	50-32-8		5 µg/L	0.55	5 µg/L
Indeno(1,2,3-cd)pyrene	193-39-5		5 µg/L	0.50	5 µg/L
Dibenzo(a,h)anthracene	53-70-6-3		5 µg/L	0.42	5 µg/L
Benzo(g,h,i)perylene	191-24-2		5 µg/L	0.35	5 µg/L
*1,4-Dioxane					2 µg/L

* MDL study is being performed

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Volatile Organic Compounds
Concentration Level: Low

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
Dichlorodifluoromethane	75-71-8		5	0.7	5
Chloromethane	74-87-3		5	2.2	5
Vinyl Chloride	75-01-4		5	*	5
Bromomethane	74-83-9		5	1.3	5
Chloroethane	75-00-3		5	0.9	5
Trichlorofluoromethane	75-69-4		5	0.4	5
1,1-Dichloroethene	75-35-4		5	0.7	5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		5	0.8	5
Carbon Disulfide	75-15-0		5	0.8	5
Acetone	67-64-1		10	4.0	10
Methyl Acetate	79-20-9		5	1.6	5
Methylene Chloride	75-09-2		5	0.6	5
trans-1,2-Dichloroethene	156-60-5		5	0.5	5
cis-1,2-Dichloroethene	156-59-2		5	0.6	5
Methyl tert-Butyl Ether	1634-04-4		5	0.3	5
1,1-Dichloroethane	75-34-3		5	0.7	5
2-Butanone	78-93-3		10	1.2	10
Chloroform	67-66-3		5	0.3	5
1,2-Dichloroethane	107-06-2		5	0.5	5
1,1,1-Trichloroethane	71-55-6		5	0.3	5
Cyclohexane	110-82-7		5	0.4	5
Carbon Tetrachloride	56-23-5		5	1.9	5
Benzene	71-43-2		5	0.5	5
Trichloroethene	79-01-6		5	0.6	5
Methylcyclohexane	108-87-2		5	0.8	5
1,2-Dichloropropane	78-87-5		5	0.5	5
Bromodichloromethane	75-27-4		5	0.5	5
cis-1,3-Dichloropropene	10061-01-5		5	0.6	5
trans-1,3-Dichloropropene	10061-02-6		5	0.6	5
1,1,2-Trichloroethane	79-00-5		5	0.3	5
Dibromochloromethane	124-48-1		5	0.5	5
4-Methyl-2-Pentanone	108-10-1		10	0.6	10
Toluene	108-88-3		5	1.2	5

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
1,2-Dibromoethane	106-93-4		5	0.4	5
Chlorobenzene	108-90-7		5	0.8	5
Tetrachloroethene	127-18-4		5	0.5	5
2-Hexanone	591-78-6		10	0.5	10
Ethylbenzene	100-41-4		5	0.6	5
m,p-Xylene	179601-23-1		5	1.1	5
o-Xylene	95-47-6		5	0.7	5
Styrene	100-42-5		5	0.7	5
Bromoform	75-25-2		5	0.6	5
Isopropylbenzene	98-82-8		5	0.6	5
1,1,2,2-Tetrachloroethane	79-34-5		5	0.4	5
1,3-Dichlorobenzene	541-73-1		5	1.1	5
1,4-Dichlorobenzene	106-46-7		5	1.2	5
1,2-Dichlorobenzene	95-50-1		5	1.0	5
1,2-Dibromo-3-Chloropropane	96-12-8		5	0.5	5
1,2,4-Trichlorobenzene	120-82-1		5	1.5	5
1,2,3-Trichlorobenzene	87-61-6		5	1.5	5
Bromochloromethane	74-97-5		5	0.6	5

* MDL Study will be performed

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Volatile Organic Compounds
Concentration Level: Medium

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQL µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
Dichlorodifluoromethane	75-71-8		250		250
Chloromethane	74-87-3		250		250
Vinyl Chloride	75-01-4		250		250
Bromomethane	74-83-9		250		250
Chloroethane	75-00-3		250		250
Trichlorofluoromethane	75-69-4		250		250
1,1-Dichloroethene	75-35-4		250		250
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		250		250
Carbon Disulfide	75-15-0		250		250
Acetone	67-64-1		500		500
Methyl Acetate	79-20-9		250		250
Methylene Chloride	75-09-2		250		250
trans-1,2-Dichloroethene	156-60-5		250		250
cis-1,2-Dichloroethene	156-59-2		250		250
Methyl tert-butyl ether	1634-04-4		250		250
1,1-Dichloroethane	75-34-3		250		250
2-Butanone	78-93-3		500		500
Chloroform	67-66-3		250		250
1,2-Dichloroethane	107-06-2		250		250
1,1,1-Trichloroethane	71-55-6		250		250
Cyclohexane	110-82-7		250		250
Carbon Tetrachloride	56-23-5		250		250
Benzene	71-43-2		250		250
Trichloroethene	79-01-6		250		250
Methylcyclohexane	108-87-2		250		250
1,2-Dichloropropane	78-87-5		250		250
Bromodichloromethane	75-27-4		250		250
cis-1,3-Dichloropropene	10061-01-5		250		250
trans-1,3-Dichloropropene	10061-02-6		250		250
1,1,2-Trichloroethane	79-00-5		250		250
Dibromochloromethane	124-48-1		250		250
4-Methyl-2-pentanone	108-10-1		500		500
Toluene	108-88-3		250		250

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQL µg/kg	Achievable (DESA) Limits[2]	
				MDLs µg/kg	RLs µg/kg
1,2-Dibromoethane	106-93-4		250		250
Chlorobenzene	108-90-7		250		250
Tetrachloroethene	127-18-4		250		250
2-Hexanone	591-78-6		500		500
Ethylbenzene	100-41-4		250		250
m,p-Xylene	179601-23-1		250		250
o-Xylene	95-47-6		250		250
Styrene	100-42-5		250		250
Bromoform	75-25-2		250		250
Isopropylbenzene	98-82-8		250		250
1,1,2,2-Tetrachloroethane	79-34-5		250		250
1,3-Dichlorobenzene	541-73-1		250		250
1,4-Dichlorobenzene	106-46-7		250		250
1,2-Dichlorobenzene	95-50-1		250		250
1,2-Dibromo-3-Chloropropane	96-12-8		250		250
1,2,4-Trichlorobenzene	120-82-1		250		250
1,2,3-Trichlorobenzene	87-61-6		250		250
Bromochloromethane	74-97-5		250		250

Note: Based on the new CRQLs the MDL study is currently being reanalyzed.

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: Volatile Organic Compounds
Concentration Level: Low

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs	Achievable (DESA) Limit	
				MDLs	µg/L RLs
Dichlorodifluoromethane	75-71-8		5 µg/L	0.3	5 µg/L
Chloromethane	74-87-3		5 µg/L	0.54	5 µg/L
Vinyl Chloride	75-01-4		5 µg/L	1.52	5 µg/L
Bromomethane	74-83-9		5 µg/L	1.90	5 µg/L
Chloroethane	75-00-3		5 µg/L	1.01	5 µg/L
Trichlorofluoromethane	75-69-4		5 µg/L	2.18	5 µg/L
1,1-Dichloroethene	75-35-4		5 µg/L	1.12	5 µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		5 µg/L	0.3	5 µg/L
Carbon Disulfide	75-15-0		5 µg/L	1.58	5 µg/L
Acetone	67-64-1		10 µg/L	0.67	10 µg/L
Methyl Acetate	79-20-9		5 µg/L	0.4	5 µg/L
Methylene Chloride	75-09-2		5 µg/L	0.52	5 µg/L
trans-1,2-Dichloroethene	156-60-5		5 µg/L	0.91	5 µg/L
cis-1,2-Dichloroethene	156-59-2		5 µg/L	0.2	5 µg/L
Methyl tert-Butyl Ether	1634-04-4		5 µg/L	0.4	5 µg/L
1,1-Dichloroethane	75-34-3		5 µg/L	0.58	5 µg/L
2-Butanone	78-93-3		10 µg/L	0.7	10 µg/L
Chloroform	67-66-3		5 µg/L	0.44	5 µg/L
1,2-Dichloroethane	107-06-2		5 µg/L	0.55	5 µg/L
1,1,1-Trichloroethane	71-55-6		5 µg/L	0.6	5 µg/L
Cyclohexane	110-82-7		5 µg/L	0.6	5 µg/L
Carbon Tetrachloride	56-23-5		5 µg/L	1.23	5 µg/L
Benzene	71-43-2		5 µg/L	0.46	5 µg/L
Trichloroethene	79-01-6		5 µg/L	0.99	5 µg/L
Methylcyclohexane	108-87-2		5 µg/L	0.7	5 µg/L
1,2-Dichloropropane	78-87-5		5 µg/L	0.44	5 µg/L
Bromodichloromethane	75-27-4		5 µg/L	0.51	5 µg/L
cis-1,3-Dichloropropene	10061-01-5		5 µg/L	0.63	5 µg/L
trans-1,3-Dichloropropene	10061-02-6		5 µg/L	0.4	5 µg/L
1,1,2-Trichloroethane	79-00-5		5 µg/L	0.3	5 µg/L
Dibromochloromethane	124-48-1		5 µg/L	0.2	5 µg/L
4-Methyl-2-Pentanone	108-10-1		10 µg/L	0.64	10 µg/L
Toluene	108-88-3		5 µg/L	0.77	5 µg/L

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method QLs	Achievable (DESA) Limit	
				MDLs	µg/L RLs
1,2-Dibromoethane	106-93-4		5 µg/L	0.2	5 µg/L
Chlorobenzene	108-90-7		5 µg/L	0.59	5 µg/L
Tetrachloroethene	127-18-4		5 µg/L	1.11	5 µg/L
2-Hexanone	591-78-6		10 µg/L	0.68	10 µg/L
Ethylbenzene	100-41-4		5 µg/L	0.59	5 µg/L
m,p-Xylene	179601-23-1		5 µg/L	1.17	5 µg/L
o-Xylene	95-47-6		5 µg/L	0.56	5 µg/L
Styrene	100-42-5		5 µg/L	0.57	5 µg/L
Bromoform	75-25-2		5 µg/L	0.43	5 µg/L
Isopropylbenzene	98-82-8		5 µg/L	0.3	5 µg/L
1,1,2,2-Tetrachloroethane	79-34-5		5 µg/L	0.64	5 µg/L
1,3-Dichlorobenzene	541-73-1		5 µg/L	0.82	5 µg/L
1,4-Dichlorobenzene	106-46-7		5 µg/L	0.84	5 µg/L
1,2-Dichlorobenzene	95-50-1		5 µg/L	0.75	5 µg/L
1,2-Dibromo-3-Chloropropane	96-12-8		5 µg/L	0.7	5 µg/L
1,2,4-Trichlorobenzene	120-82-1		5 µg/L	0.4	5 µg/L
*1,2,3-Trichlorobenzene	87-61-6		5 µg/L		5 µg/L
* Bromochloromethane	74-97-5		5 µg/L		5 µg/L

* MDL study will be performed.

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: Volatile Organic Compounds
Concentration Level: Trace

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQLs	Achievable (DESA) Limits[2]	
				MDLs µg/L	RLs
Dichlorodifluoromethane	75-71-8		0.5 µg/L	0.11	0.5 µg/L
Chloromethane	74-87-3		0.5 µg/L	0.07	0.5 µg/L
Vinyl Chloride	75-01-4		0.5 µg/L	0.12	0.5 µg/L
Bromomethane	74-83-9		0.5 µg/L	0.14	0.5 µg/L
Chloroethane	75-00-3		0.5 µg/L	0.14	0.5 µg/L
Trichlorofluoromethane	75-69-4		0.5 µg/L	0.11	0.5 µg/L
1,1-Dichloroethene	75-35-4		0.5 µg/L	0.10	0.5 µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.5 µg/L		0.5 µg/L
Carbon Disulfide	75-15-0		0.5 µg/L	0.10	0.5 µg/L
Acetone	67-64-1		5.0µg/L	0.36	0.5 µg/L
Methyl Acetate	79-20-9		0.5 µg/L		0.5 µg/L
Methylene Chloride	75-09-2		0.5 µg/L	0.18	0.5 µg/L
trans-1,2-Dichloroethene	156-60-5		0.5 µg/L	0.09	0.5 µg/L
cis-1,2-Dichloroethene	156-59-2		0.5 µg/L	0.06	0.5 µg/L
Methyl tert-butyl ether	1634-04-4		0.5 µg/L	0.03	0.5 µg/L
1,1-Dichloroethane	75-34-3		0.5 µg/L	0.08	0.5 µg/L
2-Butanone	78-93-3		5.0µg/L	0.21	0.5 µg/L
Chloroform	67-66-3		0.5 µg/L	0.07	0.5 µg/L
1,2-Dichloroethane	107-06-2		0.5 µg/L	0.09	0.5 µg/L
1,1,1-Trichloroethane	71-55-6		0.5 µg/L	0.09	0.5 µg/L
Cyclohexane	110-82-7		0.5 µg/L		0.5 µg/L
Carbon Tetrachloride	56-23-5		0.5 µg/L	0.10	0.5 µg/L
Benzene	71-43-2		0.5 µg/L	0.07	0.5 µg/L
Trichloroethene	79-01-6		0.5 µg/L	0.08	0.5 µg/L
Methylcyclohexane	108-87-2		0.5 µg/L		0.5 µg/L
1,2-Dichloropropane	78-87-5		0.5 µg/L	0.04	0.5 µg/L
Bromodichloromethane	75-27-4		0.5 µg/L	0.06	0.5 µg/L
cis-1,3-Dichloropropene	10061-01-5		0.5 µg/L	0.05	0.5 µg/L
trans-1,3-Dichloropropene	10061-02-6		0.5 µg/L	0.04	0.5 µg/L
1,1,2-Trichloroethane	79-00-5		0.5 µg/L	0.08	0.5 µg/L
Dibromochloromethane	124-48-1		0.5 µg/L	0.03	0.5 µg/L
4-Methyl-2-pentanone	108-10-1		0.5 µg/L	0.10	0.5 µg/L
Toluene	108-88-3		0.5 µg/L	0.08	0.5 µg/L

Analyte	CAS Number	Project (PRP) Quantitation Limit [3]	Method CRQLs	Achievable (DESA) Limits[2]	
				MDLs µg/L	RLs
1,2-Dibromoethane	106-93-4		0.5 µg/L	0.04	0.5 µg/L
Chlorobenzene	108-90-7		0.5 µg/L	0.06	0.5 µg/L
Tetrachloroethene	127-18-4		0.5 µg/L	0.09	0.5 µg/L
2-Hexanone	591-78-6		5.0µg/L	0.11	0.5 µg/L
Ethylbenzene	100-41-4		0.5 µg/L	0.06	0.5 µg/L
m,p-Xylene	179601-23-1		0.5 µg/L	0.13	0.5 µg/L
o-Xylene	95-47-6		0.5 µg/L	0.05	0.5 µg/L
Styrene	100-42-5		0.5 µg/L	0.03	0.5 µg/L
Bromoform	75-25-2		0.5 µg/L	0.07	0.5 µg/L
Isopropylbenzene	98-82-8		0.5 µg/L	0.06	0.5 µg/L
1,1,2,2-Tetrachloroethane	79-34-5		0.5 µg/L	0.05	0.5 µg/L
1,3-Dichlorobenzene	541-73-1		0.5 µg/L	0.05	0.5 µg/L
1,4-Dichlorobenzene	106-46-7		0.5 µg/L	0.03	0.5 µg/L
1,2-Dichlorobenzene	95-50-1		0.5 µg/L	0.04	0.5 µg/L
1,2-Dibromo-3-Chloropropane	96-12-8		0.5 µg/L	0.18	0.5 µg/L
1,2,4-Trichlorobenzene	120-82-1		0.5 µg/L	0.06	0.5 µg/L
1,2,3-Trichlorobenzene	87-61-6		0.5 µg/L	0.05	0.5 µg/L
Bromochloromethane	74-97-5		0.5 µg/L	0.10	0.5 µg/L

QAPP Worksheet #19
(UFP-QAPP Manual Section 3.1.1)
For each matrix, analytical group, and concentration level, list the analytical and preparation method/SOP and associated sample volume, container specifications, preservation requirements, and maximum holding time.

Title:
Revision Number:
Revision Date:
Page ___ of ___

Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous	TCL Volatiles	Low Medium	DW-1 (*Ref: EPA 524.2)* C-89 (*Ref: EPA 624*)	3 X40ml 6 X 40ml (QC)	VOA vial with Teflon-lined septum	Cool, 4ºC ; HCL to pH < 2 $Na_2S_2O_3$, if Res CL present	Preserved w/HCL: 14 days: Unpreserved: 7 days
Soil	TCL Volatiles	Low- Medium	C-123 (*Ref:* SOM01.1)	1 x 100g or 4 X Encore Same(QC)	Glass, wide mouth or Encore samplers	Cool, 4ºC or Frozen (-10 to -14)	14 days
Aqueous	TCL Semi-Volatiles	Low	C-90 *(Ref: EPA 625)*	2 X 1000ml 2 X1000 ml(QC)	Amber Glass	Cool, 4ºC ; $Na_2S_2O_3$, if Res CL present	To extraction: 7 days;40 days to analysis
Soil	TCL Semi-Volatiles	Low	C-90 *(Ref: EPA 625)*	1 x 250g 1 x 250g(QC)	Glass, wide mouth	Cool, 4ºC	To extraction: 14 days;40 days to analysis
Aqueous	Pesticides/PCBs	Low	C-91 *(Ref: EPA 608)*	2 X 1000ml 2 X1000 ml(QC)	Amber Glass	Cool, 4ºC	To extraction: 7 days;40 days to analysis
Soil	Pesticides/PCBs	Low	C-91 *(Ref: EPA 608)*	1 x 100g 1 x 100g(QC)	Glass, wide mouth	Cool, 4ºC	To extraction: 14 days;40 days to analysis

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous	TAL Metals/Mercury	Low	C-109, C-116 (*Ref: EPA 200.7)* C- 110, C-112 (*Ref: EPA 245.1*)	1 X 500ml 1 X 250ml(QC)	Rigid Plastic	HNO3 to pH <2	6 months Hg- 28days
Soil	TAL Metals/Mercury	Low	C-109, C-116 (*Ref: EPA 200.7)* C- 110, C-112 (*Ref: EPA 245.1)*	1 X 250ml 1 X 250ml(QC)	Rigid Plastic	HNO3 to pH <2	6 months Hg- 28days
Soil	TCLP Metals/Mercury	Low	C-107, C-109, C-116 (*Ref: EPA 200.7)* C-107, C- 110, C-112 (*Ref: EPA 245.1)*	1 X 1000ml 1 X 1000ml(QC)	Rigid/Glass, wide mouth	Cool, 4ºC	To extraction: 6 months Hg- 28days;6 months Hg- 28days to analysis
Soil	TCLP - Volatiles	Low-medium	C-106, C-89 *(Ref: EPA 624)*	2 X 100g or 1 x 100g And 2 x Encore Same (QC)	Glass, wide mouth and/ or Encore samplers	Cool, 4ºC or Frozen (-10 to-14)	To extraction: 14 days; 14 days to analysis
Soil	TCLP – Semi-Volatiles	Low	C-107, C-90 (*Ref: EPA 625)*	1 X 1000g 1 x 1000g (QC)	Amber Glass	Cool, 4ºC	To (TCLP_extraction): 14 days; 7 days after (TCLP_extraction); 40 days after 2nd extraction.
Soil	TCLP – Pesticides	Low	C-107, C-91 *(Ref: EPA 608)*	1 X 250g 1 x 250g (QC)	Glass, wide mouth	Cool, 4ºC	To (TCLP_extraction): 14 days; 7 days after (TCLP_extraction); 40 days after 2nd extraction.
Soil	Cyanide	Low	C-28 (*Ref:* EPA 335.4)	1 X 20g 1 X 50g (QC)	Rigid/Glass, wide mouth	Cool, 4ºC	14 days
Soil	TOC	N/A	C-88 (*Ref: SM 5310 B*)	1 x 50g 1 X 50g (QC)	Glass, wide mouth	Cool, 4ºC	28 days
Soil	pH	N/A	C-24 *(Ref: EPA 4500-H+ B*)	1 X 100g 1 X 250g(QC)	Rigid Plastic, widemouth	Cool, 4ºC	As soon as possible

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous	BOD	N/A	C-21 (*Ref: SM 5210 B*)	1 X 2000 ml or 2 X 1000ml (QC)	Rigid Plastic	Cool, 4ºC ;	48 hours
Aqueous	Ammonia	N/A	C-80 (*Ref: EPA 350.1*)	1 X 250 ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days
Aqueous	Chloride	N/A	C-22 (*Ref: EPA 405.1*) C-94 (*Ref: EPA 300)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	None	28 days
Aqueous	COD	N/A	C-53 (*Ref: EPA 410.4)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days
Aqueous	Fluoride	N/A	C-93 (*Ref: USGS-I-4327-85)* C-94 (*Ref: EPA 300)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	None	28 days
Aqueous	Nitrite	N/A	C-79 (*Ref: EPA 353.2)* C-94 (*Ref: EPA 300)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC	48 hours
Aqueous	Nitrate	N/A	C-79 (*Ref: EPA 353.2)* C-94 (*Ref: EPA 300)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC	48 hours
Aqueous	Nitrite+ Nitrate	N/A	C-79 (*Ref: EPA 353.2)* C-94 (*Ref: EPA 300)*	1 X 50 ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC	28 days
Aqueous-Grab	Oil +Grease	N/A	C-95 (*Ref: EPA 1664A)*	1 X 1000 ml 3 X 1000ml (QC)	Glass	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous-Grab	Total Petroleum Hydrocarbon	N/A	C-95 (*Ref: EPA 1664A)*	1 X 1000 ml 3 X 1000ml (QC)	Glass	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days
Soil	Total Petroleum Hydrocarbon	N/A	C-95 (*Ref: EPA 1664A)*	250g 250g (QC)	Glass, wide mouth	Cool, 4ºC	28 days
Aqueous	Total Phenols	N/A	C-29 (*Ref: EPA 420.4)*	1 X 250ml 1 X 250ml (QC)	Glass	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days
Aqueous	Sulfate	N/A	C-19 (*Ref: ASTM D516-02)* C-94 (*Ref: EPA 300.0*)	1 X 100ml 1 X 50ml (QC)	Rigid Plastic	Cool, 4ºC	28 days
Aqueous	Sulfide	N/A	C-115 (*Ref: SM 4500-S^2D)*	1 X 100ml 1 X 250ml (QC)	Rigid Plastic	Cool, 4ºC ; ZnAcetate +NaOH pH > 9	7 days
Aqueous	Total Phosphorus	N/A	C-68 (*Ref: EPA 365.1)*	1 X 50ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days
Aqueous	TKN	N/A	C-40 (*Ref: EPA 351.2)*	1 X 50ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC ; H_2SO_4 to pH < 2	28 days

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous	Turbidity	N/A	C-81 (*Ref: EPA 351.2)*	1 X 100ml 1 X 250ml (QC)	Rigid Plastic	Cool, 4ºC	48 hours
Aqueous	Total Suspended Solids(TSS)/Volatile Suspended Solids(VSS)	N/A	C-33 (*Ref: SM 2540 D)*	1 X 250ml 1 X 500ml (QC)	Rigid Plastic	Cool, 4ºC	7 days
Aqueous	Total Dissolved Solids (TDS)	N/A	C-37 (*Ref: SM 2540 C)*	1 X 250ml 1 X 500ml (QC)	Rigid Plastic	Cool, 4ºC	7 days
Aqueous	Total Organic Carbon (TOC)	N/A	C-83 (*Ref: SM 5310 B)*	1 X 50ml 1 X 100ml (QC)	Rigid Plastic	Cool, 4ºC	28 days
NAPL	Ignitability	N/A	C-23 (*Ref: SW846 Method 1010)*	1 X 250ml 1 X 250ml (QC)	Glass, wide mouth or Metal Can	None	None
Aqueous	Specific Conductance	N/A	C-36 (*Ref: EPA 120.1)*	1 X 100ml 1 X 250ml (QC)	Rigid Plastic	Cool, 4ºC	28 days
Aqueous	Hexavalent Chromium	N/A	C-96 (*Ref: USGS-I-1230-85)*	1 X 250ml 1 X 500ml (QC)	Rigid Plastic	Cool, 4ºC/ Cool, 4ºC pH= 9.3-9.7 Ammonium Sulfate Buffer solution	24 hours/ 28 days

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Aqueous	Alkalinity	N/A	C-18 (*Ref: SM 2320 B)*	1 X 100ml 1 X 250ml (QC)	Rigid Plastic	Cool, 4ºC	14 days
Aqueous	Total Coliform/ Fecal Coliform	N/A	B-6/B-8 (*Ref: SM 9221B/9221E)*	1 X 150ml 1 X 150ml (QC)	Rigid Plastic, wide mouth	Cool, 4ºC ; $Na_2S_2O_3$, if Res CL present	6 hours
Sewage Sludge	Total Coliform /Fecal Coliform	N/A	B-6/B-8 (*Ref: SM 9221B/9221E)* *B-5/B-7* (*Ref: SM 9222B/9222E)* Colilert-18 *(Ref: SM9223B)*	1 X 250g 1 X 250g (QC)	Rigid Plastic, wide mouth	Cool, 4ºC	24 hours
Aqueous	Heterotrophic Plate Count	N/A	B-32 (*Ref: EPA 9215B)* *B-38 (Ref: Simplate IDEX)*	1X125 ml	Rigid Plastic, wide mouth	Cool, 4ºC ; $Na_2S_2O_3$, if Res CL present	8 hours
Soil/Sediment	Grain (Particle) Size	N/A	Bio 8.3 *Ref: ASTM D422-63)*	1 X 16oz/500g/500ml 1 X 16oz/500g/500ml (QC)	Rigid Plastic/ Glass wide mouth	Cool, 4ºC	None

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #23 **Title:**
(UFP-QAPP Manual Section 3.2.1) **Revision Number:**

Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
Bio 8.3	Grain (Particle)Size, Rev 2.0, 3/07	Definite	Grain (Particle)Size	Soil Hydrometer	DESA	N
B-5/B-7	Total Coliform/ Fecal Coliform, Rev 2.0, 2/07	Definite	Total Coliform/ Fecal Coliform	N/A	DESA	N
B-6/B-8	Total Coliform/ Fecal Coliform, Rev 2.0, 2/07	Definite	Total Coliform/ Fecal Coliform	N/A	DESA	N
C-18	Alkalinity, , Rev 2.0, 3/07	Definite	Alkalinity	Auto Titrator System	DESA	N
C-19, C-94	Sulfate, Rev 2.0, 3//07, Anions by Ion Chromatography, Rev 2.0, 3/07	Definite	Sulfate	Spectrophotometer, AutoAnalyzer, IC	DESA	N
C-21	BOD/CBOD, Rev 2.0, 3/07	Definite	BOD	DO meter	DESA	N
C-22, C-94	Chloride, Rev 2.0, 3//07, Anions by Ion Chromatography, Rev 2.0, 3/07	Definite	Chloride	Titration unit, AutoAnalyzer,, IC	DESA	N
C-23	Ignitability, Rev 1.0, 1/06	Definite	Ignitability	Auto flash Point Test Instrument	DESA	N
C-24	pH, Rev 2.0, 3/07	Definite	pH	pH meter	DESA	N
C-28	Cyanides, Total, Rev 2.0, 3/07	Definite	Cyanide	AutoAnalyzer	DESA	N

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
C-29	Total Phenols, Rev 2.0, 3/07	Definite	Total Phenols	AutoAnalyzer	DESA	N
C-33	Total Suspended Solids(TSS)/Volatile Suspended Solids(VSS), Rev 2.0, 2/07	Definite	Total Dissolved Solids (TDS)	N/A	DESA	N
C-36	Specific Conductance, Rev 2.0, 3/07	Definite	Specific Conductance	Conductivity Meter	DESA	N
C-37	Total Dissolved Solids (TDS) , Rev 2.0, 2/07	Definite	Total Dissolved Solids (TDS)	N/A	DESA	N
C-40	TKN, Rev 2.0, 2/07	Definite	TKN	AutoAnalyzer	DESA	N
C-53	COD, Rev 2.0, 3/07	Definite	COD	COD Reactor, Spectrophotometer	DESA	N
C-68	Total Phosphorus, Rev 2.0, 12/06	Definite	Total Phosphorus	AutoAnalyzer	DESA	N
C-79, C-94	Nitrite, Nitrate, Nitrite+ Nitrate Rev 2.0, 2//07, Anions by Ion Chromatography, Rev 2.0, 12/06	Definite	Nitrite	AutoAnalyzer, IC	DESA	N
C-80	Ammonia, Rev 2.0, 12/06	Definite	Ammonia	AutoAnalyzer	DESA	N
C-81	Turbidity, Rev 2.0, 3/07	Definite	Turbidity	Turbidimeter	DESA	N

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
C-83	Total Organics in Aqueous, Rev 2.0, 3/07	Definite	Total Organics Carbon	TOC analyzer	DESA	N
C-88	Total Organics in Soil, Rev 1.0, 1/05	Definite	Total Organics Carbon	TOC analyzer	DESA	N
C-89	Analysis of Volatile Organic Compounds in Aqueous, Soil/Sediment and Waste Oil/Waste Organic Solvents Samples by Purge and Trap GC/MS, Rev 2.0, 3/07	Definite	TCL Volatiles(Aqueous)	GC-MS	DESA L	N
C-123	Analysis of Volatile Organic Compounds by Automated Closed System by Purge and Trap GC/MS, Rev 2.0, 3/07	Definite	TCL Volatiles(Low Soil)	GC-MS	DESA Laboratory	N
DW-1	Volatile Organics in Drinking Water by Purge and Trap by GC/MS, Rev 2.0, 3/07	Definite	TCL Volatiles (Trace)	GC-MS	DESA Laboratory	N
C-90	Analysis of Base/Neutral and Acid Compounds in Aqueous, Soil/Sediment and Waste Oil/Waste Organic Solvent Samples, Rev 2.0, 3/07	Definite	TCL Semi-Volatiles	GC-MS	DESA Laboratory	N
C-91	Analysis of Pesticides and PCBs in Aqueous, Soil/Sediments and Waste Oil/Transformer Fluid Matrices, Rev 2.0, 3/07	Definite	Pesticides/ PCBs	GC-ECD	DESA Laboratory	N

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
C-93, C-94	Fluoride, Rev 1.0, 1/05, Anions by Ion Chromatography, Rev 2.0, 12/06	Definite	Fluoride	AutoAnalyzer, Ion Selective Electrode, IC	DESA Laboratory	N
C-95	Oil +Grease, Total Petroleum Hydrocarbon Gravimetric, SPE, Rev 2.0, 03/07	Definite	Oil +Grease	SPE apparatus	DESA Laboratory	N
C-96	Hexavalent Chromium, Rev 2.0, 3/07	Definite	Hexavalent Chromium	Spectrophotometer	DESA Laboratory	N
C-109	Determination of Trace Elements in Aqueous Trace Metals in Aqueous, Soil/Sediment/Sludge- ICP-AES, Rev 2.0, 3/07	Definite	TAL Metals	ICP-AES	DESA Laboratory	N
C-110	Mercury Analysis in Water and Soil/Sediments By CVAAS, Rev 2.0, 3/07	Definite	Mercury	CVAA	DESA Laboratory	N
C-112	Trace Metals in Aqueous, Soil/Sediment/Sludge, Waste Oil/Organic Solvent and Biological tissue by Inductively Coupled Plasma-Mass Spectrometry, Rev 2.0, 3/07	Definite	TAL Metals	ICP-MS	DESA Laboratory	N
C-115	Sulfide, Rev 1.0, 3/07	Definite	Sulfide	Spectrophotometer	DESA Laboratory	N

QAPP Worksheet #24
(UFP-QAPP Manual Section 3.2.2)
Identify all analytical instrumentation that requires calibration and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.

Title:
Revision Number:
Revision Date:
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Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
ICP-AES	See SOP C-109	See SOP C-109	See SOP C-109	See SOP C-109	Assigned Laboratory personnel	SOP C-109
ICP-MS	See SOP C-112	See SOP C-112	See SOP C-112	See SOP C-112	Assigned Laboratory personnel	SOP C-112
CVAAS	See SOP C-110	See SOP C-110	See SOP C-110	See SOP C-110	Assigned Laboratory personnel	SOP C-110
IC	See SOP C-94	See SOP C-94	See SOP C-94	See SOP C-94	Assigned Laboratory personnel	SOP C-94
Spectrophotometer	See SOP C-96	See SOP C-96	See SOP C-96	See SOP C-96	Assigned Laboratory personnel	SOP C-96
Colorimetric/AutoAnalyzer	See SOP C-28 Per manufacture's manual	See SOP C-28	See SOP C-28	See SOP C-28	Assigned Laboratory personnel	SOP C-28
GC-ECD	See SOP C-91	See SOP C-91	See SOP C-91	See SOP C-91	Assigned Laboratory personnel	SOP C-91
GC-MS	See SOP C- 90, C-89	See SOP C- 90, C-89	See SOP C- 90, C-89	See SOP C- 90, C-89	Assigned Laboratory personnel	SOP C- 90, C-89
TOC Analyzer	See SOP C-88, Per manufacture's manual	See SOP C-88	See SOP C-88	See SOP C-88	Assigned Laboratory personnel	SOP C-88
pH Electrode	See SOP C-24	See SOP C-24	See SOP C-24	See SOP C-24	Assigned Laboratory personnel	SOP C-24

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23). Details can be found in Equipment Calibration# SOP C-19

QAPP Worksheet #25 **Title:**
(UFP-QAPP Manual Section 3.2.3) **Revision Number:**
Identify all analytical instrumentation that requires maintenance, testing, or inspection and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet. **Revision Date:**
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Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
See list of Instrument given in Worksheet #24	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19	See LQMP, G-10, G-11, G-12, G-19

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26
(UFP-QAPP Manual Appendix A)
Use this worksheet to identify components of the project-specific sample handling system. Record personnel, and their organizational affiliations, who are primarily responsible for ensuring proper handling, custody, and storage of field samples from the time of collection, to delivery, to final sample disposal. Indicate the number of days field samples and their extracts/digestates will be archived prior to disposal.

Title:
Revision Number:
Revision Date:
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Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization):
Sample Packaging (Personnel/Organization):
Coordination of Shipment (Personnel/Organization):
Type of Shipment/Carrier:
SAMPLE RECEIPT AND ANALYSIS (Details in SOP G-25)
Sample Receipt (Personnel/Organization): OSCAR/DESA Laboratory
Sample Custody and Storage (Personnel/Organization): OSCAR/DESA Laboratory
Sample Preparation (Personnel/Organization): Laboratory Personnel/DESA Laboratory
Sample Determinative Analysis (Personnel/Organization): Laboratory Personnel/DESA Laboratory
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection):
Sample Extract/Digestate Storage (No. of days from extraction/digestion): up to 60 days
Biological Sample Storage (No. of days from sample collection):
SAMPLE DISPOSAL (Details in SOP G-6)
Personnel/Organization: DESA Laboratory
Number of Days from Analysis: 60 days

QAPP Worksheet #27
(UFP-QAPP Manual Section 3.3.3)
Describe the procedures that will be used to maintain sample custody and integrity. Include examples of chain-of-custody forms, traffic reports, sample identification, custody seals, sample receipt forms, and sample transfer forms. Attach or reference applicable SOPs.

Title:
Revision Number:
Revision Date:
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Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to):

Sample Custody Procedures (receipt of samples, archiving, disposal):

See LQMP, SOP G-25(OSCAR)

Sample Identification Procedures:

See LQMP, SOP G-25(OSCAR)

Chain-of-custody Procedures:

See LQMP, SOP G-25(OSCAR)

QAPP Worksheet #28 (Semi volatiles)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
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QC Samples Table

Matrix	Aqueous/ Soil
Analytical Group	SVOC
Concentration Level	
Sampling SOP	
Analytical Method/ SOP Reference	C-90 (Ref: EPA 625)
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all DFTPP tune criteria	Check Instrument Reanalyze, Retune	Laboratory personnel	Sensitivity	Pass all DFTPP tune criteria
Initial Calibration	SOP C-90	% RSD +/- 35% Allowed to fail 10% of total number of analytes but % RSD not be more than 60%	Check Instrument, Reanalyze	Laboratory personnel	Accuracy/ Precision	% RSD +/- 35% Allowed to fail 10% of total number of analytes but % RSD not be more than 60%

Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch of ≤ 20 samples	Min RRF 0.05 Max %D +/- 20% 10% of total analytes allowed to fail but not more than 60%	Reanalyze, Qualify data	Laboratory personnel	Accuracy	Min RRF 0.05 Max %D RRF +/- 20% 10% of total analytes allowed to fail but not more than 60%
Method Blank	1 per extraction batch of ≤ 20 samples	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
LCS/LFB	2 per extraction batch of ≤ 20 samples	Limits listed in Table3 in SOP C-90 for aqueous, manufacture's limits for soil % RPD < 30	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy/ Precision	Limits listed in Table3 in SOP C-90 for aqueous, manufacture's limits for soil % RPD < 30
Matrix spikes	1 per extraction batch of ≤ 20 samples	Limits listed in Table3 in SOP C-90	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy	Limits listed in Table3 in SOP C-90
Internal Standards	Each sample, standard, blank	Factor of two (-50% to -100%)	Check Instrument Analyse / Qualify data	Laboratory personnel	Quantitation	Factor of two (-50% to -100%)
Surrogates	Each sample, standard, blank	30%-120% for Base Neutrals 20-120% for Acids	Reinject, Qualify data as per SOP C-90	Laboratory personnel	Extraction efficiency, Accuracy	30%-120% for Base Neutrals 20-120% for Acids

QAPP Worksheet #28 (Metal+ Mercury) **Title:**
(UFP-QAPP Manual Section 3.4) **Revision Number:**
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions. **Revision Date:**
Page ___ of ___

QC Samples Table

Matrix	Aqueous/Soil
Analytical Group	Metals & Mercury
Concentration Level	Trace/Low
Sampling SOP	
Analytical Method/ SOP Reference	C-109,C-112, C-110 (Ref: EPA 200.7, 200.8, 245.1)
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning/System Stability(ICP-MS)	As per C-112	Pass all the tune/stability criteria	Check Instrument Reanalyze, Retune	Laboratory personnel	Sensitivity	Pass all the tune/stability criteria
Initial Calibration Verification	Immediately following each calibration ,after every 10 samples and at the end of each analytical run	90%-110%	Check Instrument, Reanalyze	Laboratory personnel	Accuracy	90%-110%

Continuing Calibration Check Standard (Alternate check standard)	Every 10 samples and at the end of each analytical run	80%-120%	Reanalyze, Qualify data	Laboratory personnel	Accuracy	80%-120%
Initial Calibration Blank(ICB)	After ICV	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
Continuing Calibration Blank(CCB)	After every CCV	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
Low Level Check Standard	At Beginning and end of each analytical run	± 30% of the true value	Check Instrument, Re-calibrate	Laboratory personnel	Accuracy	± 30% of the true value
Interference Check Sample(ICP-200.7)	At Beginning and end of each analytical run	< RL Except Al ,Fe, Ca, K, Mg and Na	As per C-109	Laboratory personnel	Precision	< RL Except Al ,Fe, Ca, K, Mg and Na
Method blank	1 per extraction batch of ≤ 20 samples	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
LCS/LFB	2 per extraction batch of ≤ 20 samples	Limits: Average Recovery ± 20% aqueous, ± 25% Soil) % RPD < 20(Aq), % RPD <25(Soil)	Qualify data	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery ± 20% aqueous, ± 25% Solids) % RPD < 20(Aq), % RPD <25(Soil
Matrix spikes	1 per extraction batch of ≤ 20 samples	Limits ± 20% aqueous, ± 25% Soil)	Qualify data	Laboratory personnel	Accuracy	Limits ± 20% aqueous, ± 25% Soil)
Serial Dilution Test(ICP-200.7)	Matrix spike sample	RPD < 20 %	Qualify data	Laboratory personnel	Precision	RPD < 20 %
Internal Standards(ICP-MS 200.8)	Each sample, standard, blank	Range of 0.60-1.87 of the original response in the calibration blank	Check Instrument Analyse / Qualify data	Laboratory personnel	Quantitation	Range of 0.60-1.87 of the original response in the calibration blank

QAPP Worksheet #28 (Microbiology)
(UFP-QAPP Manual Section 3.4)

Title:
Revision Number:
Revision Date:
Page ___ of ___

QC Samples Table

Matrix	Aqueous/Soilds
Analytical Group	Microbiology
Concentration Level	N/A
Sampling SOP	
Analytical Method/ SOP Reference	See notes
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Sterility or Performance Testing	Each lot of pre-prepared, ready to use medium or batch of medium prepared in the Laboratory, sample containers on a non-selective media	No growth	Investigate source of contamination Prepared Media is discarded	Laboratory personnel	Media selectivity, sensitivity Contamination	No growth
Method Blank	1 per preparation batch of 20 samples	No growth	Investigate source of contamination	Laboratory personnel	Contamination	No growth
Control Sample (LCS)-positive control	1 per preparation batch of 20 samples	Growth promotion	Reanalyzed	Laboratory personnel	Media selectivity, sensitivity	Growth promotion
Duplicate counts (Membrane Filtration or Heterotrophic Plate count)	Monthly on one positive sample for each month the test is performed	10% (different analyst) 5% (same analyst)	Qualify data	Laboratory personnel	Precision	10% (different analyst) 5% (same analyst)

Laboratory SOPs: B-5/B-7(*SM 9222B/D);* B-6/B-8(*SM 9221B/E*) , B-32; (*Ref: EPA 9215B); B-38(Ref: Simplate IDEX)*

QAPP Worksheet #28 (Pesticides/PCBs)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
Page ___ of ___

QC Samples Table

Matrix	Aqueous/Soil
Analytical Group	Pesticides/PCBs
Concentration Level	
Sampling SOP	
Analytical Method/ SOP Reference	C-91 (Ref: EPA 608)
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Performance (PEM)	Beginning of each analytical run	Total breakdown <30%	Check Instrument	Laboratory personnel	Sensitivity Contamination	Total breakdown <30%
Initial Calibration	C-91 (Ref: EPA 608)	% RSD +/- 25% Not more than 10% of total analytes failure RSD not more than 30%	Check Instrument, Reanalyze	Laboratory personnel	Accuracy/ Precision	% RSD +/- 25% Not more than 10% of total analytes failure RSD not more than 30%
Continuing Calibration Check Standard (Alternate check standard)	Beginning and the end of each analytical run	Max %D RRF +/- 25%	Reanalyze, Qualify data	Laboratory personnel	Accuracy	Max %D RRF +/- 25%
Method Blank	1 per extraction batch	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL

LCS/LFB	2 per extraction batch	Limits: Average Recovery 50-150% % RPD < 30	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery 50-150% % RPD < 30
Matrix spikes	1 per extraction batch	Limits 30-150%	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy	Limits 30-150%
Surrogates	Each sample, standard, blank	Limits 30%-150%	Reinject, Qualify data	Laboratory personnel	Extraction efficiency, Accuracy	Limits 30%-150%

QAPP Worksheet #28 (Sanitary Chemistry)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
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QC Samples Table

Matrix	Aqueous/Soil
Analytical Group	Sanitary Chemistry
Concentration Level	Low/Medium
Sampling SOP	
Analytical Method/ SOP Ref	See notes below
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration Verification (ICV)	Immediately after initial calibration	90%-110% of the true value except for TOC (± 15%)	Recalibrate	Corrective Action by Laboratory personnel	Accuracy/ Precision	90%-110% of the true value
Initial calibration Blank(ICB)	Immediately after ICV	< RL	Investigate source of contamination		Sensitivity Contamination	< RL
Continuing Calibration Verification (CCV) (Alternate check standard)	After every ten samples and at the end of the analytical run.	90%-110% of the true value	Reanalyze, Qualify data		Accuracy	90%-110% of the true value
Continuing Calibration Blank (CCB)		< RL	Investigate source of contamination		Sensitivity Contamination	< RL
Method Blank	1 per extraction /analytical batch					
Laboratory Control Sample (LCS/LFB)	2 per extraction batch of ≤ 20 samples	Limits: Average Recovery meet standard manufacturer's limits; % RPD < 20	Reanalyze, Qualify data		Accuracy/ Precision	Limits: Average Recovery meet standard manufacturer's limits; % RPD < 20
Matrix spike (MS)	1 per extraction batch of ≤ 20 samples	Limits 80-120%	Qualify data		Accuracy	Limits 80-120%

Laboratory SOPs: C-28,C-29,C-40, C-53,C-68,C-79, C-80,C-83, C-88, C-94,C-96 (Ref: EPA 335.4, 420.4, 351.2, 410.4, 365.1, 353.2, 350.1, SM 5310 B, EPA 300.0, I-1230-85)

QAPP Worksheet #28 (Sanitary Chemistry)
(UFP-QAPP Manual Section 3.4)

Title:
Revision Number:
Revision Date:
Page ___ of ___

QC Samples Table

Matrix	Aqueous/Soil
Analytical Group	Sanitary Chemistry
Concentration Level	
Sampling SOP	
Analytical Method/ SOP Reference	See notes below
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per analytical batch of 20 samples	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
Control Sample (LCS/LFB)	2 per analytical batch of 20 samples	Limits: Average Recovery within the standard manufacture's limits or method limits; % RPD < 20	Reanalyzed or Qualify data	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery within the standard manufacture's limits % RPD < 20
Sample Duplicates - TSS,TDS, Specific Conductance, Turbidity, pH, Ignitability	1 per analytical batch of 20 samples	% RPD < 20	Affected sample Qualified	Laboratory personnel	Precision	% RPD < 20
Matrix spike (MS) - Alkalinity, Sulfate, Chloride, BOD/ cBOD	1 per extraction batch of 20 samples	Limits 80-120%	Affected sample Qualified	Laboratory personnel	Accuracy	Limits 80-120%

Laboratory SOPs: C-18,C-19,C-21, C-22, C-23, C-24, C-33, C-36, C-37, C-81
(Ref: SM 2320 B, ASTM D516-02, SM 5210 B, SM4500CI-C, SW 846 1010, SM 4500-H+ B, SM 2540 D, EPA 120.1, SM 2540 C, EPA 180.1)

QAPP Worksheet #28 (Volatiles-Low)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
Page ___ of ___

QC Samples Table

Matrix	Aqueous/Soil
Analytical Group	VOC
Concentration Level	Low(Aq)/Medium (soil
Sampling SOP	
Analytical Method/ SOP Reference	C-89 (Ref: EPA 624)
Sampler's Name	
Field Sampling Organization:	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all PBFB tune criteria	Check Instrument Reanalyze, Retune	Corrective Action by Laboratory personnel	Sensitivity	Pass all PBFB tune criteria
Initial Calibration	SOP C-89	% RSD +/- 35% Not more than 10% of total analytes failure % RSD not more than 60%	Check Instrument, Reanalyze		Accuracy/ Precision	% RSD +/- 35% Not more than 10% of total analytes failure % RSD not more than 60%
Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch of 20 samples	Max %D RRF +/- 30% Not more than 10% of total analytes failure % D not more than 60%	Reanalyze, Qualify data	Laboratory personnel	Accuracy	Max %D RRF +/- 30% Not more than 10% of total analytes failure % D not more than 60%
Method Blank	1 per extraction batch of 20 samples	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
Trip Blank	1 per cooler containing VOC samples	Client Defined	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	

LCS/LFB	2 per extraction batch of 20 samples	Limits: Average Recovery 70-130% % RPD < 20	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery 70-130% % RPD < 20
Matrix spikes	1 per extraction batch of 20 samples	Table 4 of C-89 compound specific (full range- 17-259%)	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy	Table 4 of C-89 compound specific (full range- 17-259%)
Internal Standards	Each sample, standard, blank	Factor of two(-50% to + 100%) from the initial/continuing calibration	Check Instrument Analyse / Qualify data	Laboratory personnel	Quantitation	Factor of two(-50% to + 100%) from the initial/continuing calibration
Surrogates	Each sample, standard, blank	Limits 70%-130%	Reinject, Qualify data	Laboratory personnel	Extraction efficiency, Accuracy	Limits 70%-130%

QAPP Worksheet #28 (Volatiles-Low)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
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QC Samples Table

Matrix	Soil
Analytical Group	VOC
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	C-123 (Ref: EPA 624)
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all PBFB tune criteria	Check Instrument Reanalyze, Retune	Laboratory personnel	Sensitivity	Pass all PBFB tune criteria
Initial Calibration	SOP C-123	% RSD +/- 50% Min RRF 0.010	Check Instrument, Reanalyze	Laboratory personnel	Accuracy/ Precision	% RSD +/- 50% Min RRF 0.010
Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch of 20 samples	Max %D listed in Table 4A of C-123	Reanalyze, Qualify data	Laboratory personnel	Accuracy	Max %D listed in Table 4A of C-123
Method Blank	1 per extraction batch of 20 samples	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL

Trip Blank	1 per cooler containing VOC samples	Client Defined	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	
LCS/LFB	2 per extraction batch of 20 samples	Limits: Average Recovery 70-130% % RPD < 20	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery 70-130% % RPD < 20
Matrix spikes	1 per extraction batch of 20 samples	Table 8 of C-123 compound specific (full range- 17-259%)	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy	Table 8 of C-123 compound specific (full range- 17-259%)
Internal Standards	Each sample, standard, blank	Factor of two(-50% to + 100%) from the initial/continuing calibration	Check Instrument Analyse / Qualify data	Laboratory personnel	Quantitation	Factor of two(-50% to + 100%) from the initial/continuing calibration
Surrogates	Each sample, standard, blank	Table 7 of C-123	Reinject, Qualify data	Laboratory personnel	Extraction efficiency, Accuracy	Table 7 of C-123

QAPP Worksheet #28 (Volatiles- Trace)
(UFP-QAPP Manual Section 3.4)
Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Title:
Revision Number:
Revision Date:
Page ___ of ___

QC Samples Table

Matrix	Aqueous
Analytical Group	VOC
Concentration Level	Trace
Sampling SOP	
Analytical Method/ SOP Reference	DW-1 (Ref: EPA 524.2)
Sampler's Name	
Field Sampling Organization	
Analytical Organization	USEPA Region 2 Laboratory
No. of Sample Locations	

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all PBFB tune criteria	Check Instrument Reanalyze, Retune	Laboratory personnel	Sensitivity	Pass all PBFB tune criteria
Initial Calibration	SOP DW-1	% RSD +/- 20% Not more than 10% of total analytes failure	Check Instrument, Reanalyze	Laboratory personnel	Accuracy/ Precision	% RSD +/- 20% Not more than 10% of total analytes failure
Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch	Max %D RRF +/- 30% Not more than 10% of total analytes failure	Reanalyze, Qualify data	Laboratory personnel	Accuracy	Max %D RRF +/- 30% Not more than 10% of total analytes failure

Method Blank	1 per extraction batch	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	< RL
Trip Blank	1 per cooler containing VOC samples	Client Defined	Investigate source of contamination	Laboratory personnel	Sensitivity Contamination	
LCS/LFB	2 per extraction batch	Limits: Average Recovery 70-130% % RPD < 20	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy/ Precision	Limits: Average Recovery 70-130% RPD 20%
Matrix spikes	1 per extraction batch	Limits 70-130%	Qualify data unless high recovery and/or Not Detected)	Laboratory personnel	Accuracy	Limits 70-130%
Internal Standards	Each sample, standard, blank	+/- 40% from the initial/continuing calibration	Check Instrument Analyse / Qualify data	Laboratory personnel	Quantitation	+/- 40% from the initial/continuing calibration
Surrogates	Each sample, standard, blank	Limits 80%-120%	Reinject, Qualify data	Laboratory personnel	Extraction efficiency, Accuracy	Limits 80%-120%

QAPP Worksheet #29
(UFP-QAPP Manual Section 3.5.1)
Identify the documents and records that will be generated for all aspects of the project including, but not limited to, sample collection and field measurement, on-site and off-site analysis, and data assessment.

Title:
Revision Number:
Revision Date:
Page ___ of ___

Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Chains-of-Custody	Internal Chains-of-Custody		Sample acceptance checklist	Customer Service Survey Cards
Packing Slips and Sample Tags	Sample Preparation Log		PT Sample Results	Telephone Logs
Request Forms and Associated Correspondence	Standard Traceability Record		Training Records	Procurement Request Forms
	Instrument Analysis Log			
Sample Acceptance Checklist	QC summary checklist with all relevant information		MDL Study Records	Equipment Maintenance Logs
LIMS Sample Receipts	Sample Analysis Data		Initial DOC / CDOC Records	Validated Computer Software Records
Automated OSCAR Logs	Instrument Calibration Data		Internal Audit Reports	
sample identification numbers	Instrument/ Computer Printouts		Corrective Action Reports	
	Definition of Qualifiers		External Assessment	
	Cover Letter		NELAC Accreditation	
	Approval Form			
	Case Narrative			
	Final Report			

QAPP Worksheet #31
(UFP-QAPP Manual Section 4.1.1)
Identify the type, frequency, and responsible parties of planned assessment activities that will be performed for the project.

Title:
Revision Number:
Revision Date:
Page ___ of ___

Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
PT	Semiannually	External	NELAC	PT provider	Laboratory Personnel	Laboratory Personnel	Laboratory QA Officer
NELAC	Every two years	External	NELAC	Florida DOH	Laboratory QA Officer	Laboratory Personnel	Florida DOH
INTERNAL AUDIT	Monthly	Internally	DESA Laboratory	Laboratory QA Officer	Laboratory Personnel	Laboratory Personnel	Laboratory QA Officer

QAPP Worksheet #32

(UFP-QAPP Manual Section 4.1.2)
For each type of assessment describe procedures for handling QAPP and project deviations encountered during the planned project assessments.

Title:
Revision Number:
Revision Date:
Page ___ of ____

Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Proficiency Testing (PT)	Letter with PT failure indicated	Laboratory QA Officer	30 days after the audit	Investigate the reason for the PT failure	Laboratory QA Officer	45 days after the CA report
NELAC	Audit Report with Non-conformance to QAPP, SOPs, NELAC+LQMP	Laboratory Management	30 days after the audit	Investigate and have a corrective action plan for the deficiencies	Florida DOH	30 days after receiving notification
INTERNAL	Audit Report with Non-conformance to QAPP, SOPs, NELAC Regulations	Laboratory Management	30 days after the audit	Investigate and have a corrective action plan for the deficiencies	Laboratory QA Officer	45 days after the CA report

QAPP Worksheet #34
(UFP-QAPP Manual Section 5.2.1)
Describe the processes that will be followed to verify project data. Manual (Section 5.1). Describe how each item will be verified, when the activity will occur, and what documentation is necessary, and identify the person responsible. *Internal* or *external* is in relation to the data generator.

Title:
Revision Number:
Revision Date:
Page ___ of ___

Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain of Custody	Chain-of-custody forms will be verified against the sample cooler they represent. Sample Acceptance Checklist is completed. The OSCAR staff supervisor utilizes the analyses request information and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form Details can be found in Quality Management Plan, SOP G-25	Internal	OSCAR Personnel DESA Laboratory
Analytical data package/ Final Report	The procedures for data review : 1- Data reduction/review by Primary Analyst. 2- Review complete data package (raw data) by independent Peer Reviewer 3- The Sample Project Coordinator reviews the project documentation for completeness followed by a QA review by the QAO 4- Final review by Branch Chief/Section Chief prior to release, this review is to ensure completeness and general compliance with the objectives of the project. This final review typically does not include a review of raw data. Details can be found in the Quality Management Plan.	Internal	Primary Analyst, Peer Reviewer, Sample Project Coordinator, Quality Assurance Officer, Section Chief/ Branch Chief. DESA Laboratory

QAPP Worksheet #35

UFP-QAPP Manual Section 5.2.2
Describe the processes that will be followed to validate project data. Validation inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). Describe how each item will be validated, when the activity will occur, and what documentation is necessary and identify the person responsible. Differentiate between steps IIa and IIb of validation.

Revision Number:
Revision Date:

Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
	Chain of Custody	Chain-of-custody forms will be verified against the sample cooler they represent. Sample Acceptance Checklist is completed. The OSCAR staff supervisor utilizes the analyses request information and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form Details can be found in Quality Management Plan, SOP G-25	OSCAR Personnel DESA Laboratory
	Analytical data package/ Final Report	The procedures for data review : 1- Data reduction/review by Primary Analyst. 2- Review complete data package (raw data) by independent Peer Reviewer 3- The Sample Project Coordinator reviews the project documentation for completeness followed by a QA review by the QAO 4- Final review by Branch Chief/Section Chief prior to release, this review is to ensure completeness and general compliance with the objectives of the project. This final review typically does not include a review of raw data. Details can be found in the Quality Management Plan.	Primary Analyst, Peer Reviewer, Sample Project Coordinator, Quality Assurance Officer, Section Chief/ Branch Chief. DESA Laboratory

* DESA performs the validation.

Appendix D Field Forms

ANSETS Form
Daily Sign-In Sheet
Daily Status Report
Drum Tracking Log
Equipment Calibration Logs
Field Change Request Form
Low Flow Sampling Form
MultiRAE Calibration
Onsite Screening Tracking Log
Sample Tracking Log
Subcontractor Laboratory Sample Tracking Log

ANSETS Data Requirement

Date:		**Sampling Start Date:** **Sampling End Date:**	
Project Numbers			
Project Number:	**Regional Account Number:**	**DAS Number:**	**Assoc. CLP Case No:**
Site Information			
Site Name:		**City:**	**State:**
CERCLIS ID:	**Operable Unit:**	**Action:**	**Funding Lead:**
Responsible EPA Project Individual:		**Sampling Organization:**	CDM

Analytical Services Information	
If field analytical services are used during this project write "field analysis" in the Laboratory Name Column. If fixed laboratory is used write the name of the laboratory in the Laboratory Name Column. Please specify in this box all field analytical techniques used.	**COST:**

Laboratory Name (include location if multiple lab locations)	**No. Samples**	**Matrix**	**Analysis**	Requested Turnaround (Days)
Completed by:		**Organization:**		**Date:**

DAILY SIGN-IN SHEET
Matteo & Sons, Inc. Site

Date	Print Name	Signature	Affiliation	Time On-Site	Time Off-Site

DAILY STATUS REPORT

Matteo & Sons, Inc. Site

DATE: _____ **WEATHER:** _____

Personnel Onsite: _____

_____

_____

_____

_____

Samples Collected (List locations): _____

_____

_____

_____

_____

Borings Completed (Include total footage drilled for each boring): _____

_____

_____

_____

_____

Number of Drums Generated (Names): _____

_____

_____

_____

_____

Miscellaneous (Equipment needs, health and safety issues, visitors onsite, etc.): _____

_____

_____

_____

SIGNATURE: _____ **DATE:** _____

DRUM TRACKING LOG

SITE NAME: MATTEO & SONS, INC. SITE

Drum #	Boring/MW#	Date Drilled/ Sampled	Related Sample #	Description of Drum Contents	Signature

GENERAL EQUIPMENT CALIBRATION LOG
MATTEO & SONS, INC. SITE

Instrument (make/model/serial #): _____ **Manufacturer:** _____ **Rental Company:** _____

Upon receipt, all parts are included and this instrument is in working order: _____
(signature/date)

Calibration Date	Initial Setting	Standard/ Gas Used (Concentration)	Lot Control No. Expiration Date	Adjustments Made	Final Reading	Comments Pass/Fail	Signature

MATTEO & SONS, INC. SITE
FIELD CHANGE REQUEST (FCR) FORM

REQUEST NO: _____ DATE: _____

FCR TITLE: _____

DESCRIPTION: _____

_____

_____

_____

_____

_____

REASON FOR DEVIATION:

_____

_____

_____

_____

_____

_____

_____

RECOMMENDED/MODIFICATION: _____

_____

_____

IMPACT ON DATA QUALITY OBJECTIVES: _____

_____

_____

_____

_____

_____

_____

_____

Signatures: _____ _____

(FTL) Date

_____ _____

Sharon Budney - CDM Project Manager (PM) Date

Distribution: Larry Granite, EPA Remedial Project Manager
Sharon Budney, CDM PM
Jeniffer Oxford, CDM Quality Assurance Coordinator
Field Team Leader
Project File

MATTEO & SONS, INC. SITE
LOW FLOW GROUNDWATER SAMPLING PURGE RECORD

DATE: **WELL #:**

SAMPLERS: **DEPTH OF PUMP INTAKE:** **ft TIC or ft BGS (circle one)**

WEATHER CONDITIONS: **SCREENED/OPEN BOREHOLE INTERVAL:** **ft TIC or ft BGS (circle one)**

SAMPLE ID: **SAMPLE TIME:** **SAMPLE FLOW RATE:** **ml/minute**
CLP ID:

	Instrument Type/Model: Complete and/or Circle at right				**YSI Model #_____/ Horiba U-22 (circle one) Other (specify)_____**					**Instrument:**
CURRENT TIME	**VOLUME PURGED**	**DEPTH TO WATER**	**FLOW RATE**	**DRAWDOWN (± 0.3 FT)**	**pH (± 0.1 SU)**	**SPECIFIC CONDUCTIVITY (± 3%)**	**DISSOLVED OXYGEN (± 10%)**	**TEMP. (± 10%)**	**REDOX POTENTIAL (± 10 mV)**	**TURBIDITY (± 10%)**
24-Hour	gallons / liters (circle one)	ft TIC / ft BGS (circle one)	Units:	ft TIC / ft BGS (circle one)	SU	S/cm, mS/cm[c]/ or µS/cm (circle one)	mg/L **(not %)**	Units: °C	mV	NTUs

Drawdown is not to exceed 0.3 feet. Flow rate should not exceed 500 ml/min during purging or 250 ml/min during sampling. Readings should be taken every three to five minutes. The well is considered stabilized and ready for sampling when the indicator parameters have stabilized for three consecutive readings by the measurements indicated in parenthesis.

Typical values: DO = 0.3 - 10 mg/L Redox Potential = -100 - +600 mV Turbidity = 0 - >500 NTUs
Spec. Conductivity (µS/cm) = 0.01 - 5,000; up to 10,000 in industrial, ~55,000 in high salt content water. Note: 1,000 µS/cm = 1 mS/cm

TIC = Top of Inner Casing BGS = Below Ground Surface

Instrument Calibration Log
RAE Systems
MultiRAE + (4 gas + PID)
MATTEO & SONS, INC. SITE

Calibration Completed By	Date	Rental Company	Rental Company Number	Instrument Serial Number	Time Instrument On[1]	Warm Up 5 to 10 Minutes[2]

Calibration Gas	Manufacturer	Lot No./Expiration Date	Concentration(s)
			CO: H_2S: LEL: O_2:
			Isobutylene:

Fresh Air Calibration	Carbon Monoxide (CO) Reading	VOC[3] Reading (zero)	H_2S Reading (zero)	LEL Reading (zero)	Oxygen (O_2)
Expected Reading[4]	Zero	Zero	Zero	Zero	20.9%
Actual Reading					

Multiple Sensor Calibration	CO Reading	H_2S Reading	LEL Reading	O_2 Reading	VOC Sensor Calibration	VOC Reading
Expected Reading[5]					Expected Reading	
Actual Reading					Actual Reading	

Instrument OK? YES (Calibration Completed) NO (Problem with instrument, detail in comments)

Calibration Check[6]	Completed (Circle one): YES NO		
Time:	Date:	Calibration Completed By:	
Calibration Gas	Same as Above (Circle one)? YES NO (IF NO COMPLETE INFORMATION BELOW)		
	Manufacturer	Lot No./Expiration Date	Concentration(s)
			CO: H_2S: LEL: O_2:
			Isobutylene:

[1] Note time instrument is turned on for initial warm up
[2] While instrument is warming up, make sure inlet tubing is connected to a hydrophobic filter and fill one Tedlar bag with isobutylene and one with four gas mix
[3] VOC – volatile organic compounds, H_2S – hydrogen sulfide, LEL – lower explosive limit
[4] Instruments should read zero after fresh air calibration is complete, write down actual readings below headings
[5] Write concentration from calibration gas on this line
[6] Complete at the end of the day

Instrument Calibration Log
RAE Systems
MultiRAE + (4 gas + PID)
MATTEO & SONS, INC. SITE

Calibration Check Readings:				
CO:	H_2S:	LEL:	O_2:	VOC:

Comments/Corrective Action: _____

MATTEO & SONS, INC. SITE
ONSITE SCREENING TRACKING LOG

SITE NAME: _____

SAMPLE ID	SAMPLE DATE	SAMPLE TIME	MATRIX	DUPLICATE (Y/N)	OFFSITE (Y/N)	COMMENTS

MATTEO & SONS, INC. SITE
SAMPLE TRACKING LOG

Trace VOC LAB: _____ **INORGANIC CLP LAB:** _____

CLP CASE NO: _____ **ORGANIC CLP LAB:** _____ **SUBCONTRACT LAB:** _____

SAMPLE ID	SAMPLE DATE	SAMPLE TIME	MATRIX	DEPTH (feet)	Trace VOC CLP NO.	ORGANIC CLP NO.	INORGANIC CLP NO.	SUBCONTRACT ANALYSIS	QA/QC

ANALYSIS SUMMARY: _____

_____

SUBCONTRACTOR LABORATORY SAMPLE TRACKING LOG

SITE NAME: MATTEO & SONS, INC. SITE

DATE SHIPPED OR RECEIVED	NUMBER OF SAMPLES SHIPPED (OR SUPPLIES RECEIVED)	ANALYTICAL PARAMETERS REQUIRED	NUMBER OF COOLERS SHIPPED