Request for Proposal for In Situ Thermal Treatment Services Velsicol Burn Pit Superfund Site St. Louis, Michigan

Prepared for



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Acronyms and Abbreviations

ANP	adjacent or nearby properties
bgs	below ground surface
CH2M	CH2M HILL, Inc.
cm/s	centimeters per second
CSM	conceptual site model
DBCP	dibromo-3-chloropropane
DDT	dichlorodiphenyltrichloroethane
DNAPL	dense nonaqueous phase liquid
EPA	U.S. Environmental Protection Agency
EVS	Environmental Visualization System
FAR	Federal Acquisition Regulation
FPS	Former Plant Site
H&S	health and safety
HASP	health and safety plan
ID	identification
ISTT	in situ thermal treatment
MCC	Michigan Chemical Corporation
MDEQ	Michigan Department of Environmental Quality
MIP	membrane interface probe
NAPL	nonaqueous phase liquid
NPL	National Priorities List
OSHA	Occupational Health and Safety Administration
OU	operable unit
PDF	portable document format
РНА	process hazard analysis
PPE	personal protective equipment
PWS	performance work statement
RDI	remedial design investigation
RFP	request for proposal
ROD	Record of Decision
SESC	soil erosion and sedimentation control
site	Velsicol Burn Pit Superfund Site located in St. Louis, Michigan
SRD	Substantive Requirements Documents

TATM	Treatment Area Technical Memorandum
TTZ	target treatment zone
VBPSS	Velsicol Burn Pit Superfund Site
Velsicol	Velsicol Chemical Corporation
VOC	volatile organic compound
Weston	Weston Solutions of Michigan, Inc.

Introduction

This Performance Work Statement (PWS) is divided into two parts. Part 1 contains instructions for responding to the PWS. Part 2 contains details of the PWS that defines the scope of work for the Successful Bidder.

PART 1

Instructions for Completing this Request for Proposal

1.1 Invitation to Bid

Bidders are requested to submit a firm-fixed-price proposal for the design, construction, operation, monitoring, maintenance, and removal of an in situ thermal treatment (ISTT) system at the Velsicol Burn Pit Superfund Site (VBPSS) located in St. Louis, Michigan (site). The ISTT system will be implemented to remove nonaqueous phase liquid (NAPL) and reduce the concentration of volatile organic compounds (VOCs) that remain in groundwater and soil within a selected area of the VBPSS.

Bidders are responsible for understanding the information contained in this RFP. It is each Bidder's responsibility to obtain resolution of any questions or misunderstandings from CH2M HILL, Inc. (CH2M) during the bid period.

Section 1.2 of this document describes proposal evaluation and basis of selection of a Successful Bidder. The Successful Bidder (Subcontractor) will enter into a subcontract agreement with CH2M. The anticipated Subcontract Agreement is included as Appendix A. Appendix B contains the compensation schedule, and Appendix C includes the CH2M forms that are required to be completed by the Bidder.

1.2 Technical Proposal Evaluation and Basis of Selection

The basis of selection for the Successful Bidder will be lowest price and technically acceptable. Technical acceptance for each proposal will be determined by the source selection team based, in part, on Bidder responses to questions in Section 1.8.

1.3 Summary of Work

This RFP pertains only to ISTT application at the VBPSS. As stipulated in the July 2015 Record of Decision (ROD), ISTT will be applied for removing subsurface NAPL that remains at the site from historical disposal operations performed by the Velsicol Chemical Company (Velsicol). The target treatment zone (TTZ), detailed herein, is a lateral area approximately 64,760 square feet with a subsurface volume of approximately 590 cubic yards. Specifics of TTZ selection are described in more detail in the Treatment Area Technical Memorandum (TATM) included in the attached site data package (Appendix D).

The Subcontractor will be responsible for the design, construction, operation, monitoring, maintenance, and removal of an ISTT system. This will include providing all resources, including labor, equipment, materials, lower-tier Subcontractors, supplies, taxes, profits, and royalties (as applicable) to fulfill the performance objectives defined in this PWS. All work will be completed in compliance with current federal, state, and local regulations and in accordance with standard industry practice and applicable technology licenses. Upon satisfactory achievement of this PWS, the Subcontractor will demobilize the ISTT system supplied, properly abandon subsurface infrastructure, and perform site surface restoration.

1.4 Funding and Subcontracting Structure

The U.S. Environmental Protection Agency (EPA) is the lead agency for conducting remedial action at the site and will be the primary funding source for the project. Federal Acquisition Regulation (FAR) flow-down clauses and Davis-Bacon wage determinations apply and are included with the Subcontract Agreement.

CH2M is EPA's prime contractor at the site, and EPA has requested that CH2M procure a qualified Subcontractor to perform the work as described in this document. Michigan Department of Environmental Quality (MDEQ) is the support agency and will review documents, designs, and plans in partnership with EPA.

The distribution of EPA funds for remediation is complex, uncertain, and subject to change. Funds to complete ISTT at the VBPSS have not yet been allocated; however, EPA has directed CH2M to select and procure a thermal treatment subcontractor in accordance with the FAR. The timing for funding release to support full-scale site treatment remains unknown and subject to many factors outside the control of CH2M. Therefore, Bidders are instructed to prepare a firm-fixed-price proposal in response to this RFP that reflects: (1) ISTT system design and (2) ISTT implementation following Subcontractor award under the assumption that full project funding is available. To accommodate the potential that funds to complete only ISTT system design are available following Subcontractor award, a firm-fixed-price proposal to complete only design-related tasks as defined by the PWS is necessary. The compensation schedule (Appendix B) reflects completion of the ISTT system design task as a standalone bid item in the event that funding is only initially available for ISTT system design.

Given uncertainty in funding, a bid hold and cost guarantee of 365 days from date of proposal receipt by CH2M is required.

<u>Regardless of timing for full (or partial) funding release, the Subcontractor selected through this</u> <u>solicitation will design, construct, operate, monitor, and demobilize an ISTT system at the VBPSS.</u>

1.5 CH2M Forms

Forms to be completed and returned to CH2M as part of Bidder response to this RFP are included in Appendix C. All forms will be completed and submitted by Bidders and, where indicated, also for all proposed lower-tier Subcontractors. Note: Where these standard forms say "Contractor," it will mean "Subcontractor." These forms include, but are not limited to, the following:

- **Compensation Schedule:** Use the attached compensation schedule to submit your firm-fixed prices for the bid items included, as described in the PWS. All pricing is to be fully burdened with applicable field and home office costs, inclusive of general, administrative, overhead, profit, and all applicable taxes. (THIS PROJECT IS NOT TAX EXEMPT.)
- Health and Safety (H&S) Questionnaire: Your firm and any lower-tier Subcontractors are required to complete and submit this questionnaire along with:
 - Occupational H&S Administration (OSHA) Logs and Experience Modification Rate letter for the past 3 years
 - Table of Contents from your H&S manual
 - Drug Program Policy, including Random Testing

Failure to provide lower-tier Subcontractor's H&S information at this time will not be grounds for increased cost if you are selected for award and CH2M subsequently rejects your lower-tier Subcontractor(s) for unacceptable or lack of proper H&S information.

- **Proposed Lower-tier Subcontractors**: Use this form to identify any lower-tier Subcontractors and to identify the tasks they will perform.
- Agreement Exceptions: Use this form to identify any exceptions to the proposed terms and conditions provided in Appendix A, which will govern any resultant award. If you have none, simply write "none" on this form and return it with your proposal. CH2M will consider any exceptions to our terms as part of our evaluation criteria. However, CH2M reserves the right, when evaluating a proposal, not to hold any further discussions/negotiations of exceptions to the terms.
- **Representations and Certifications Form:** Use this form to identify your appropriate business status and corresponding questions related to federal acquisition regulations.

1.6 Offeror's Forms and Documents

Offeror's forms to be completed and returned as part of each Bidder's response to this RFP include the following:

- **Bid Bond:** All offers must be accompanied by a bid guarantee of 5 percent of the subcontract price. The subcontract price will be the total price stated in the Bidder's proposal. Note: following selection of your firm to perform the work, both Performance and Payment bonds are to cover 100 percent of the offer and are to be in a form and by a surety satisfactory to CH2M and listed on the U.S. Department of the Treasury's Listing of Approved Sureties (Department Circular 570). Please identify your surety's name and address.
- **Certificate(s) of Insurance:** Submit your standard insurance certificate providing evidence of all coverages, including professional liability coverage. Note if you do not maintain the limits required in this RFP, then please provide a separate line item to meet these requirements.
- Technical Proposal
- OSHA 300 Logs
- Small Business Subcontracting Plan (not required if the Offeror is a small business)

1.7 Technical Submittal

The following information must be included in your response to the RFP.

- 1. **Agreement Exceptions:** Bidder will prepare and make the following a part of its Proposal: "AN ITEMIZED LIST OF ANY AND ALL EXCEPTIONS, ASSUMPTIONS, OR CORRECTIONS NECESSARY TO ALLOW SUBMISSION OF THIS PROPOSAL." The submission of such a list will be the Bidder's acknowledgment that it fully understands all phases of the specified work and accepts the completeness of all documents transmitted with and made part of the final Subcontract.
- Design Document Clarifications: In any instance where the Drawings, Specifications, and other performance related documents are not sufficiently complete to allow the Bidder to submit a complete Proposal without excessive contingencies being applied for indefinite or uncertain items, or with major assumptions being made by the Bidder, the Bidder will contact CH2M for clarification before submitting its proposal.
- 3. Construction Planning Schedule: Bidder will include a Preliminary Construction Planning Schedule with the bid and will submit its bid based on that schedule. The planning schedule will be formatted to include each work task contained in the Compensation Schedule included in Appendix B. The planning schedule will also include the estimated labor hours for each Bid Item. Bidder's Proposal will be based on a 6-day, 60-hour workweek for field activities.

- 4. Summary Work Plan: Bidder will submit with its proposal a Summary Work Plan for all phases of required work. Bidder's Work Plan will be structured to correlate with the fixed-price work item structure as detailed in Section 2 of the PWS and will provide clear and concise descriptive summaries of Bidder's plan to execute all work tasks contained in the PWS. The Summary Work Plan must include responses to the following:
 - What is your firm's overall technical approach to implementing the PWS described herein? Please describe your firm's approach to design, procurement, drilling, electrical/mechanical interconnection, operation, maintenance, and decommissioning. Please describe responsiveness to potential upset conditions that may arise during the course of project completion, such as power outages, equipment failure or malfunction, and emergency response.
 - How many analytical samples will be required? Provide the estimated number and matrix (liquid, soil, gas) of analytical samples required to operate the ISTT system. It is anticipated that the air and wastewater discharge Substantive Requirements Documents (SRD) for the VBPSS will be substantially similar to those issued for NAPL/1,2-dibromo-3-chloropropane (DBCP) Area 1 (included in Appendix E). Please note that verification of ISTT performance, including the sampling of soil and groundwater following treatment operations, will be completed by CH2M and should be omitted from your estimate.
 - How much electricity will be needed? Provide the estimated electricity consumption (in kilowatt-hours) and the expected average and maximum demand load (in kilowatts) during each phase of thermal treatment (initial heating phase, treatment phase, and cool-down phase).
 Specify the expected quantities of electricity, granular activated carbon (if required), natural gas, and potable water in the compensation schedule.
 - What type of waste products will the proposed ISTT system generate? Please specify in the compensation schedule the expected quantities of wastewater and all waste streams to be generated and disposed from both underground and aboveground activities.
 - What temperature will your firm be able to achieve/sustain in the saturated zone? How long will
 it take to achieve these temperatures? Please also identify if supplemental predesign sampling
 or testing is required to support your technical approach to ISTT system design.
 - What is the expected noise level of the treatment equipment at 3 and 150 feet from the treatment compound?
 - How will your firm manage operation and performance of the treatment system? Describe the performance monitoring system(s) integrated to demonstrate diminishing returns is achieved.
 - How many staff will be onsite and for how many hours each day? Will weekend work, after hours, or overtime be required for normal routine system operations?
 - How will your firm deal with system upsets or emergency conditions, such as a power outage? How
 will your firm handle emergency response, if required? What is the minimum projected timeframe
 required for operations staff to reach the site in the event of upset conditions after-hours?
- 5. **Key Onsite Personnel:** With the Summary Work Plan, Bidder will provide an organization chart identifying its proposed Project Manager, Field Superintendent, Dedicated, and Full-time Site H&S Officer, and quality assurance/quality control engineer. Resumes for key onsite personnel will be included as an attachment to the Summary Work Plan. The Successful Bidder may not change the Project Manager and Superintendent proposed for work completion without CH2M's review and written permission.
- 6. Labor Rate Breakdown Schedule: Bidders will furnish with their proposal a completed Labor Rate Breakdown, fully burdened with all applicable cost (i.e., labor, overhead, general admin, applicable

taxes, profit, etc.) for all trades to be used on this project. Bidders will complete a table for each labor craft that will be included on the project (i.e., laborer, operator, pipe fitter, etc.). Rates included in this table, after any negotiations, will be the basis for any possible firm-fixed-price or fixed-unit-rate change order work approved.

- 7. Equipment Rates: Bidders' proposals will include a list of applicable equipment daily, weekly, and monthly fully burdened rates. Bidders will also provide a mobilization-demobilization cost for each piece of major equipment. Mobilization-demobilization will include all decontamination work required to remove a piece of equipment from the site. Equipment rates will not exceed current rates established by the Associated Equipment Distributors or Bidder's standard equipment rates for the work area, whichever is the lower rate. Rates included in this table, after any negotiations, will be the basis for any possible firm-fixed-price or fixed-unit-rate change order work approved.
- 8. **Markups for Other Direct Costs:** Bidders will identify proposed markup to any subcontracts and/or material purchases in the event additional scope is authorized on a firm-fixed-price or fixed-unit-rate basis.
- 9. Work to Be Performed by Others: Bidders will identify all work services provided by others necessary to fulfill the goals and objectives stipulated by the PWS.

1.8 Qualifications and Technical Questions

This section provides technical questions regarding the Bidder's experience and qualifications, as well as its proposed approach(es) to address site-specific issues. Bidders are required to provide responses to each question in the written proposal in addition to a summary table of responses.

1.8.1 Experience and Qualifications

- The site is contaminated by numerous solvents, pesticides, and specialty organic compounds. A compendium of site documents is provided with this RFP; these documents detail the site background and known contaminants present at the site. Please generally describe your firm's experience treating sites contaminated by dense nonaqueous phase liquid (DNAPL), including, but not limited to, benzene, chlorobenzene, 1,2-dichloroethane, DBCP, and halogenated hydrocarbons.
- 2. Describe your firm's experience treating sites with similar geology and hydrogeology.
 - Include in your response to this item how you would handle shallow and perched groundwater inflow to treatment areas to ensure successful thermal treatment of required treatment areas.
 - Include in your response how elevated electrical conductivity within the treatment zone soil may affect performance of your heating technology. In addition, describe what, if any, design strategies would be incorporated to address zones where high electrical conductivity is present.
- 3. Provide references (name, phone, and email) for three thermal treatment projects that your firm has completed external to CH2M. For referenced projects, describe the contaminants of concern, concentrations, impacted media, treatment volume, cleanup goals, and treatment results. Please note previous experience with the Subcontractors included in your proposal. Projects completed under the Comprehensive Environmental Response, Compensation, and Liability Act and to the extent feasible under "fund lead" status should be showcased.
- 4. Describe your approach to client service, the proposed lines of communication between CH2M and your firm, and how you would propose to resolve problems that may be encountered during project implementation.
- 5. Describe your firm's approach and in-house program related to H&S, and steps that your firm will take to ensure that all site work is conducted in a safe manner.

6. Describe your firm's experience installing subsurface infrastructure required for ISTT implementation while using Level B personal protective equipment (PPE).

1.8.2 Additional Technical Questions

- 1. How will your firm eliminate the potential for contaminated vapor migration to ambient air or to subsurface locations outside of the treatment zone? What kind of monitoring mechanism(s) will your firm employ to ensure such migration does not occur?
- 2. What temperature will your firm be able to achieve/sustain in the saturated zone? How long will it take to achieve these temperatures? Please also identify if supplemental pre-design sampling or testing is required to support your technical approach to ISTT system design.
- 3. Does your firm's system design require subsurface fluid injection? If so, please provide the following additional information:
 - Describe the purpose of fluid injection.
 - Describe types of fluid that would be considered for injection.
 - Describe past experiences with fluid injection.
 - Describe past permitting experiences required for fluid injection.

1.9 Bidder Proposal Checklist

In preparation for submitting the Proposal, the Bidder has verified that the following information has been included:

- Compensation schedule completed H&S questionnaire completed with OSHA logs, Experience Modification Rate, and Table of Contents of H&S plan (including anticipated lower-tier Subcontractors) Lower-tier Subcontractor list and tasks Agreement exceptions Technical exceptions Bid bond Insurance certificate Construction planning schedule Summary work plan Key onsite personnel Resumes Contractor labor rate breakdown table (for each craft/trade) Contractor equipment rate list Completed responses for technical questions and firm qualifications Conflict of interest certification Employee confidentiality agreement
- Representations and certifications

Performance Work Statement

2.1 General

The material herein supplements that contained in applicable articles in the Subcontract Agreement and the design specifications.

Project entities are defined as follows:

- Owner: United States Environmental Protection Agency (EPA)
- Engineer (or Contractor): CH2M HILL, Inc. (CH2M), which will be contracted by EPA to act as its representative on this project
- Subcontractor: Successful Bidder, contracted to CH2M

2.2 Site Data Package

A site data package has been assembled to support development of Bidder's proposal and is included as Appendix D. Table 1 summarizes the elements of the site data package.

File Folder	Contents
Soil and Groundwater Data with Location Map	Velsicol Burn Pit data summary table of soil and groundwater collected during the 2004–2006, 2009, and 2012 remedial investigations; sample Location map; and VOC distribution map.
NAPL Data	Data summary table of NAPL characterization data collected during the 2004–2006 remedial investigation and the 2016 remedial design investigation; and data summary table of NAPL gauging of existing site monitoring wells.
AutoCAD Files	Treatment area boundaries and treatment shapes; till unit contour map; and topographic map.
Cross Sections and Cross Section Location Maps	Cross sections and locations based on 2004–2006, 2009, and 2012 remedial investigation data.
Membrane Interface Probe (MIP) Data and Boring Logs	MIP raw data package containing MIP sensor outputs and completed boring logs.
ROD	2015 ROD.
Soil Boring Logs	Boring logs completed during the 2006, 2009, and 2012 remedial investigations.
Well Construction Diagrams	Well construction diagrams completed during the 2006, 2009, and 2012 remedial investigations.
Treatment Area Technical Memorandum	Treatment Area Technical Memorandum – defined ISTT TTZ; includes supporting graphics, mass estimates, and Earth Volumetric Studio modules.
Slug Test Data	Location map for nearby shallow unit slug test and data.
Groundwater Data	Groundwater conductivity data, total dissolved solids, ferrous and total iron in groundwater, major cations and anions, alkalinity, and pH data, if available for monitoring wells in the vicinity of treatment area.

Table 1. Elements of the Site Data Package

Velsicol Burn Pit Superfund Site Performance Work Statement

2.3 Intent

2.3.1 Summary of Intent

The intent of this PWS is to:

- Provide background information on the site.
- Summarize PWS elements.
- Define the performance requirements for the ISTT system.
- Solicit firm-fixed-price proposals for the design, construction, and operation of the ISTT system.
- Outline key work elements provided by others necessary for ISTT implementation.
- Define subcontract requirements.
- Provide measurement and payment terms for the work required from the Subcontractor.

2.3.2 Price

Bidder will provide pricing for each line item in the compensation schedule to furnish all resources required to complete the. The total price must be indicative of all costs required to complete the work.

2.3.3 Basis for Claim of Omission

Work called for or implied on one document but omitted on others will not be considered a valid basis for claim of omission by the Successful Bidder in bidding or in performing work. It is the responsibility of the Bidder alone to bring any such conflicts to the attention of CH2M for resolution.

2.3.4 Subcontract Dates

Subcontract dates will be confirmed following coordination with EPA and MDEQ, if required. The date for Substantial Completion is expected to be <u>within 24 months</u> from start of heating operations. To achieve Substantial Completion, all areas will be treated in accordance with the project specifications. Final Completion must be accomplished within 30 calendar days from the accepted Substantial Completion date, at which time all work, including final site cleanup, demobilization of the site temporary facilities and controls (decontamination pad, liquid waste storage facilities, etc.), and project documentation, will be completed. All invoices must be submitted to CH2M within 45 calendar days from the accepted Final Completion date (i.e., Final Completion +15 days).

2.4 Project Background and Treatment Area

2.4.1 Project Background

The VBPSS (CERCLIS No. MIN000510389) is approximately 5 acres and is located in a low-lying area in the northwest portion of the City of St. Louis, Michigan (Figure 1, provided at end of Part B). The VBPSS is located approximately 1,200 feet northwest of the Pine River, within the boundary of the Hidden Oaks Golf Course. The VBPSS is located across the river from the Velsicol Chemical Superfund Site (EPA ID No. MID000722439), herein referred to as the Velsicol Site. The Velsicol Site consists of three operable units (OUs): OU1 (the Former Plant Site [FPS] and the adjacent and nearby properties), OU2 (the Pine River sediments adjacent to the FPS), and OU3 (downriver sediments).

The Burn Pit was an offsite disposal area and is directly related to the Velsicol Site. Although contamination at both sites has waste-generator commonality, remediation of each Comprehensive Environmental Response, Compensation, and Liability Act site will occur independently of the other. Velsicol operated the Burn Pit for disposal and volume reduction of industrial solid and liquid wastes. Municipal solid waste from the City of St. Louis was also reportedly disposed within the Burn Pit.

Disposal practices are poorly documented; however, historical records indicate that liquid waste was burned weekly in an open pit. The Burn Pit was proposed for the National Priorities List (NPL) in the early 1980s. Prior to final listing of the Burn Pit, Velsicol excavated the Burn Pit in accordance with a cleanup plan established under the 1982 Consent Judgement. Excavated material from the Burn Pit was transported to the FPS, consolidated with chemical plant demolition debris, and then covered with soil for its final disposition.

MDEQ historically considered the Burn Pit to be a part of the Velsicol Site. Previous remedial investigation data for the Burn Pit were published in the remedial investigation reports for the Velsicol Site (Weston Solutions of Michigan, Inc. [Weston] 2006, 2009). Because the Burn Pit had been proposed for the NPL previously, EPA requested that MDEQ remove information pertaining to the Burn Pit from the draft feasibility study for the Velsicol Site. The Burn Pit Site was re-evaluated, and EPA scored the Burn Pit separately from the Velsicol Site for final listing on the NPL as a separate site. In March 2010, the Burn Pit (then referred to as the Gratiot County Golf Course) was placed on the NPL (75 *Federal Register* 9782 [March 4, 2010]).

2.4.2 Site History

Since 1978, EPA and MDEQ have conducted multiple environmental investigations within and surrounding the Burn Pit. The following paragraphs provide a brief overview of the investigation history and characterization activities completed within the VBPSS.

EPA and MDEQ performed a preliminary assessment, site inspection, and site characterization investigation from 1978 through 1983. In response to investigation findings and in fulfillment of a 1982 Consent Judgment remedy, approximately 68,000 cubic yards of contaminated material were removed from the Burn Pit and transported to the FPS for disposal beneath a compacted clay cap.

From 2004 to 2006, MDEQ continued characterization of residual contamination in the shallow groundwater unit above the till layer related to historical waste disposal operations. The soil and groundwater data confirmed the presence of contaminants that exceeded applicable risk-based standards. Investigation activities and results are detailed in the *Remedial Investigation Report for Operable Unit One Velsicol Chemical Corporation Superfund Site St. Louis, Gratiot County, Michigan* (Weston 2006).

In 2009, MDEQ conducted an additional site investigation that identified contaminated soil and groundwater within the shallow unit at concentrations exceeding one or more of MDEQ's Part 201 generic criteria. The investigation also confirmed the presence of light NAPL and DNAPL in the shallow aquifer at monitor wells BA-2S and BA-10S. Detailed descriptions of the investigation activities and results are included in the *Remedial Investigation Addendum Report for Operable Unit One Velsicol Chemical Corporation Superfund Site St. Louis, Gratiot County, Michigan* (Weston 2009).

In 2012, CH2M conducted an additional site investigation to characterize the nature and extent of DNAPL and chemical of concern impacts to soil and groundwater in the shallow unit underlying and downgradient of the VBPSS. Detailed descriptions of the investigation activities and results are included in the *Remedial Investigation Report Velsicol Burn Pit Superfund Site, Remedial Investigation/Feasibility Study, St. Louis, Gratiot Country, Michigan* (CH2M 2013). Collectively, the investigation findings were integrated by EPA and culminated in a feasibility study that selected ISTT for remediation of the site (*Focused Feasibility Study Velsicol Burn Pit, OU1, St. Louis, Michigan* [CH2M 2014]). In 2014, EPA completed the proposed plan for the site. The ROD was signed by EPA and MDEQ in July 2015.

In 2016, CH2M performed sitewide synoptic groundwater level and DNAPL gauging events (in May and August) to support ISTT remedial design efforts. Measurable NAPL was observed in five site monitoring wells, including historical locations (BA-2S and BA-10S) and three additional wells (CMW-2S, CMW-3D, and CMW-5D). Approximately 5 feet of NAPL was measured in CMW-3D and CMW-5D.

In August 2016, a DNAPL sample was collected from CMW-3D and CMW-5D and submitted for chemical and physical analysis. Sampling was performed to support development of the VBPSS conceptual site model (CSM) to predict the removal efficacy of DNAPL by ISTT, which is the treatment system selected by the ROD.

The results of the detailed DNAPL analysis required refinement of the VBPSS CSM. CH2M proposed a laboratory-scale treatability study to help address technology selection and design efforts. Treatability study test media (DNAPL) were collected in December and sent to the Applied Sciences Laboratory in Corvallis, Oregon. Detailed descriptions of the NAPL gauging and sampling activities and results are included in the *Velsicol Burn Pit Superfund Site, Operable Unit 1 (Source Area) Treatability Study Approach Technical Memorandum* (CH2M 2016).

In 2017, CH2M completed a laboratory-scale treatability study to evaluate the efficacy of DNAPL removal from site soil using ISTT processes. Treatability testing observations and results are described in the *In Situ Thermal Treatment System Treatability Study Results – Velsicol Burn Pit Superfund Site, St. Louis, Michigan* (CH2M 2017).

2.4.3 Site Geology and Hydrogeology

EPA and MDEQ have completed extensive subsurface investigations of the shallow unit near the VBPSS. Shallow unit subsurface conditions at the VBPSS over the vertical interval slated for treatment are summarized, with increasing depth from ground surface, as follows:

- Sand: The subsurface consists of approximately 0.5 foot of sandy topsoil, underlain by fine to medium sands with occasional layers of coarse sand and silty sand. Boring results indicate that this lithology is generally continuous across the southern portion of the VBPSS and is present to depths ranging from approximately 0 to 20 feet below ground surface (bgs), with occasional instances of sand at depths of 20 feet bgs. Soil that was stained or contained NAPL (based on field screening methods), or exhibited both characteristics, was frequently encountered in this unit. Within the sand unit, groundwater is typically encountered at depths ranging from approximately 3 to 15 feet bgs.
- **Clay**: The subsurface across the northern portion of the VBPSS consists of silty to sandy clays from approximately 0 to 12 feet bgs. This clay also underlies the sand and contains intermittent layers of varying thickness of silt, fine sand, and gravel. Boring results indicate that the lithology is consistent across the VBPSS and is present at depths ranging from approximately 15 to 30 feet bgs.
- **Glacial Till**: A till unit is present at depth from approximately 30 feet bgs; however, some historical soil boring logs indicate that till can be found from approximately 20 to 25 feet bgs. The till consists primarily of greyish brown, hard silty clay to clayey silt with trace to little amounts of fine sand and trace amounts of gravel. Sand and silty sand seams were occasionally encountered within the till.

Data obtained during previous remedial investigation activities indicate that there are two waterbearing lenses within the shallow unit (i.e., the sand and clay), consisting of interbedded silty to clayey sands and silty clays. The lenses range in thickness from less than 1 foot to greater than 15 feet. The 2012 remedial investigation data confirmed that the upper lenses are generally perched and apparently pinched out radially from the VBPSS at lower elevations. The perched water lenses are considered a "component" of the shallow unit with some unique characteristics. Depth to groundwater measurements in monitoring wells range from 2 to 29 feet bgs (elevations of 738 to 754 feet above mean sea level; CH2M 2014).

Groundwater flow in the shallow unit varies, depending on the aerial location and screened depth interval of each well. The groundwater flow direction in the shallow unit is predominantly southeast toward the Pine River. However, the general surface topography appears to control the perched water movement in the upper portion of the shallow unit within and downgradient of the VBPSS. Within the shallow unit, perched water apparently moves northwest. Recent chemical data, however, indicate that the groundwater flow velocity and contaminant transport diminishes near the north-northwestern excavation limit of the VBPSS. This observation may be attributed to several factors, including pinchout of the perched lens or areas where the 1982 excavation activities allowed perched unit groundwater to combine with the shallow unit in the west-central VBPSS. The major components influencing groundwater flow direction appear to be topography and the Pine River. Groundwater flow velocity estimates in this unit range from 1.09 to 1.49 feet per day (Weston 2009).

Slug tests performed during the 2012 remedial investigation (CH2M 2013) on seven shallow unit monitoring wells indicate that the hydraulic conductivity of the upper water-bearing unit in the eastern portion of the VBPSS ranges from 0.02 foot per day to 0.68 foot per day. The estimated groundwater flow velocity in the upper portion of the upper water-bearing unit in the western portion of the VBPSS ranges from 2.49 feet per day to 2.80 feet per day. The estimated groundwater flow velocity in the lower portion of the upper water-bearing unit directly above the till ranges from 0.02 foot per day to 1.48 feet per day (CH2M 2013).

2.4.4 Conceptual Site Model Summary

Contaminants observed in the VBPSS are consistent with historical operations of the former Velsicol Chemical Corporation. During facility operations, benzene and 1,2-dichloroethane were key ingredients used in the synthesis of multiple market chemicals and intermediates, according to historical production records. Many of the products produced by the facility were halogenated with bromine. Within the VBPSS, industrial wastes from manufacturing were routinely burned for disposal. However, since many poly-halogenated hydrocarbons have low combustibility, it is plausible that only a small fraction of liquid waste disposed was actually burned. Rather, the more volatile components of the liquid waste (e.g., benzene and 1,2-dichloroethane) were preferentially burned, leaving behind very dense, halogen-rich refractory organic liquids that promoted density-driven vertical migration into the subsurface.

This hypothesis is generally supported in the comparison of properties for DNAPL recovered in VBPSS monitoring wells (Treatment Area Tech Memo Table 1). In addition to CMW-3D and CMW-5D density measurements (2.0141 and 1.7781 grams per cubic centimeter, respectively), a third DNAPL sample obtained in limited quantities returned a density of 2.341 grams per cubic centimeter. These results illustrate that there are significant spatial differences in the distribution of DNAPL density across the VBPSS. These differences could be attributed to the types of wastes disposed, varying levels of weathering, or perhaps differences in the extent of combustion that occurred following disposal and open burning operations. The latter conclusion is generally supported by extended analytical data, which illustrates that DNAPL with the greatest density (CMW-3D) exhibited the highest flashpoint and was not combustible under laboratory conditions. Conversely, DNAPL from CMW-5D was considerably lower in density and flashpoint measurement and exhibited combustibility.

Collectively, the physical and chemical properties of DNAPL support a CSM where density-driven flow has resulted in product accumulation on the underlying till. Within the limits of the 1982 removal action, DNAPL occurrence beyond the excavation depth is expected. As described previously, VBPSS DNAPL samples obtained were extremely dense; however, both samples also exhibited high viscosity, which would limit the potential for vertical migration through the dense till underlying the shallow aquifer unit. As such, the accumulation of DNAPL on the till surface and local concentration in till surface lows is both anticipated and observed based on site investigation data.

Following environmental release, the chemical and physical properties of waste liquid mixtures were likely altered by varying intensities of combustion during open burning and historical disposal operations. The concentration of halides by preferential removal of combustible components produced DNAPL with high density, high viscosity, and reduced volatility. Incomplete waste combustion conversely would favor DNAPL composed of more volatile compounds (e.g., benzene and 1,2-dichloroethane) that possess measurable water solubility and significantly greater subsurface mobility in groundwater. Hydrocarbons with high halogen content also tend to be relatively insoluble in water. Therefore, mixtures of dense halogenated hydrocarbons, such as those present at the VBPSS, would not be subject to dissolution and advective transport with natural groundwater flow. This condition generally explains why groundwater contamination associated with the VBPSS is dominated by benzene and 1,2 dichloroethane, which have moderate to high water solubility, respectively.

2.4.5 Target Treatment Zone

A wide range of data was compiled and analyzed in support of TTZ selection. Details of the data evaluation approach and supporting lines of evidence applied to define the TTZ are provided in TATM included in the Site Data Package (Appendix D). Based on the results presented in the TATM, NAPL is present in the subsurface over an area of approximately 64,760 square feet (TATM Figure 9). The area shown on this figure will comprise the TTZ for ISTT application in the VBPSS.

As depicted in the TATM, the proposed TTZ is located in the southeast corner of the Velsicol Trust Parcel and extends to the east for approximately 270 feet and is covered with vegetation. If necessary for ISTT system construction, surface vegetation will be removed by others. The proposed TTZ is within the limits of the Hidden Oaks Golf Club. There is no perimeter fence to deter would-be trespassers from accessing the treatment area or physical barriers to screen site activities from onlookers. The Subcontractor will provide temporary fencing with privacy screen that is compatible with the Subcontractor's ISTT technology around the ISTT treatment area to prevent access by unauthorized personnel. The temporary fencing is subject to review and approval by the Contractor. In addition, the Subcontractor will supply a silent alarm system interlocked to heating equipment operation. Alarm system monitoring will be furnished by the Subcontractor.

Access to the VBPSS is limited to a dirt road that is not capable of supporting the transport of heavy equipment likely needed for system construction. Site access improvements and utility service to support ISTT system construction will be completed by others. Utilities to be provided at Subcontractor request are limited to the following: primary electrical power, potable water, communications, and natural gas. A 5-million British thermal unit natural gas meter will be supplied with a service pressure of approximately 10 pounds per square inch. The Subcontractor will confirm the natural gas requirements for ISTT operations and is responsible for providing and installing a regulator downstream of the gas service meter to adjust the delivery pressure as needed for equipment operation. The Subcontractor will identify ISTT system utility requirements and any ancillary site improvements that are not included in its proposal but are needed to support its completion of this PWS.

2.5 Statement of Work

2.5.1 Overview

The Subcontractor will design, install, construct, operate, and monitor an ISTT system at the VBPSS. Subcontractor operation of the supplied ISTT equipment will be performed to demonstrate a diminishing return standard, as defined in this PWS. The Subcontractor will be responsible for the design, supply, construction, operation and maintenance, and removal of the ISTT system and all supporting ancillary systems and treatment equipment to fulfill the criteria defined by this PWS. The Subcontractor will be solely responsible for preparing a detailed design of the proposed system. The design will be prepared under the supervision of a Registered Professional Engineer (registration in the State of Michigan is not required). Design drawing and supporting resources will be reviewed by EPA, MDEQ, and CH2M for conformance to contract documents. The Subcontractor's system design will be incorporated into a larger design document by CH2M. The Subcontractor will furnish all labor, equipment, materials, lower-tier Subcontractors, supplies, and all else necessary to safely and efficiently remove NAPL from the TTZ. The ISTT system furnished for this project will include the following:

- Heating equipment
- Process monitoring and recording equipment
- Insulating thermal/vapor cap designed for heating to the ground surface, maintaining pneumatic control and minimizing fugitive emissions
- Vapor extraction equipment
- Power distribution and control equipment
- Aboveground piping
- Permitting support
- Utility specification and sizing requirements
- Vapor treatment equipment to meet discharge standards presented in the air SRD (see Appendix E). The SRD presented in Appendix E represents the discharge standards for ISTT in NAPL/DBCP Area 1, which was completed in 2018. The air SRD for the VBPSS will be obtained by CH2M with Subcontractor support during the ISTT system design. Actual discharge standards may change during SRD development for the VBPSS.
- Water treatment equipment to meet discharge standards presented in the wastewater discharge SRD (see Appendix E). The SRD presented in Appendix E represents the discharge limits for ISTT in NAPL/DBCP Area 1, which was completed in 2018. The wastewater discharge SRD for the VBPSS will be obtained by CH2M with Subcontractor support during the ISTT system design. It is anticipated that the wastewater discharge SRD for the VBPSS will be similar to the wastewater discharge SRD developed for NAPL/DBCP Area 1; therefore, for bidding purposes, the Subcontractor will assume that the proposed water treatment equipment must meet the discharge limits summarized in Appendix E. Actual discharge limits, parameters, and sampling frequency may change during SRD development for the VBPSS.
- Operation, including monitoring, computerized systems, and power requirements.
- Maintenance.
- Site security, consisting of temporary fencing, privacy screen, and silent alarm.
- Surface restoration and demobilization of all system components.

All work will be completed in compliance with current federal, state, and local regulations and in accordance with standard industry practice and applicable technology licenses. Construction and Operation permits (or permit equivalencies) required to deliver services defined by this PWS will be completed by CH2M. Upon successful demonstration and concurrence of diminishing returns to project stakeholders, the Subcontractor will demobilize the ISTT system supplied, remove and abandon subsurface infrastructure by cutting off subsurface structures 3 feet bgs and grouting in place, and restore the site to pretreatment conditions, including removal of the thermal/vapor cap and seeding all areas disturbed by the Subcontractor.

Existing monitoring wells requiring removal as a part of this scope of work will be abandoned by others prior to the start of the work.

2.5.2 Project Submittals

The Subcontractor will prepare comprehensive written documentation that details the design, implementation, and operation of the ISTT system for the site. CH2M will review design documents prepared by the Subcontractor. The Subcontractor will be solely responsible for the design, successful installation, and operation of the remediation system. Subcontractor submittals to be prepared are defined in the following subsections and in the attached specifications (Appendix F), as noted.

2.5.2.1 Design Report

Two iterations of the design report will be prepared by the Subcontractor corresponding to a preliminary design (60 percent) and a final design. The Preliminary deliverable will be revised and updated as details for the ISTT system design are finalized. A Registered Professional Engineer will stamp final design drawings supplied by the Subcontractor.

The design report will contain the following components:

- A summary of site conditions, cleanup objectives, selected heating technology, and the technical approach applied in ISTT system design.
- A comprehensive description of system equipment, components, controls, and proposed safeguards to be integrated into the system design.
- A process and material flow diagram that summarizes the basis for system design, including, but not limited to, the required energy input, and the projected mass and material flows associated with key components of remediation system operation.
- The daily volume of water injected for heating system operation (if applicable).
- A process and instrumentation diagram summarizing system piping, valves, instruments, and controls.
- An electrical one-line diagram, supplemental electrical details pertinent to system configuration and all utility service requirements needed for implementation of the ISTT system and any support facilities.
- A start-up plan summarizing how system start-up and shakedown will be performed. Include pertinent information that could impact the schedule, such as oxidizer start-up time.

2.5.2.2 Process Hazard Analysis

The Subcontractor will perform a Process Hazard Analysis (PHA) with CH2M, EPA, and MDEQ representatives prior to final design approval. The PHA will include a comprehensive review of the 60 percent ISTT system design by project stakeholders to evaluate safety and operability concerns for the treatment equipment. Completion of the PHA will require participation of the Subcontractors design personnel, operations staff, and the project manager. The PHA will be completed at the project site (St. Louis, Michigan) and timed to correspond with stakeholder review of the 60 percent design documents.

The Subcontractor will document system review and findings and will identify all modifications integrated into final design to improve safety and reliability of the ISTT system proposed for the site. The PHA results and corresponding resolution of action items identified will be summarized in tabular form and documented through memorandum to CH2M and the Subcontractor's project design files.

2.5.2.3 Project Work Plan

The Subcontractor will develop a site-specific work plan, explaining its approach for completing the project, as detailed in specification Section 01 11 00, Summary of Work (Appendix F). At the discretion

of the Subcontractor, required content of the design report and project work plan may be combined into a single submittal. The project work plan, at a minimum, will include the following information:

- Project organization
- Lines of communication
- Resources (e.g., personnel, materials, equipment, etc.)
- List of required lower-tier Subcontractors, and scope of services supplied by each
- Project schedule
- Permit schedule
- Subcontractor quality control plan outlining quality assurance/quality control procedures, and as described in the subsection below
- Sampling and analysis plan
- Mobilization
- Site preparation
- Abandonment approach for subsurface infrastructure installed with the ISTT system upon completion
- Site restoration
- Demobilization

Subcontractor Quality Control Plan

The Subcontractor will submit a quality control plan that will detail how the Subcontractor will ensure construction of the ISTT system will comply with the requirements of the Subcontract. The requirements of the Subcontractor quality control plan are outlined in specification Section 01 45 16.13, Subcontractor Quality Control (Appendix F).

2.5.2.4 Site-Specific Health and Safety Plan

The Subcontractor will submit a health and safety plan (HASP) for CH2M review and approval, as outlined in specification Section 01 11 00, Article 1.09 (Appendix F). The HASP will discuss the Subcontractor's approach to managing personnel exposure to DBCP, which is a known male sterility agent. DBCP is present in the subsurface and has been detected in NAPL at the site; therefore, the Subcontractor's approach to field activities necessary for ISTT system installation and operation must account for potential exposure of site workers to DBCP, including the use of Level B PPE, when appropriate. To the extent practicable, design and construction strategies that minimize the generation of subsurface soil cuttings should be considered. At minimum, the HASP will include all requirements of OSHA 1910.120 (HAZWOPER), plus an activity hazard analysis for each task related to ISTT system construction, operations, maintenance, and demolition of the treatment system.

2.5.2.5 Soil Erosion and Sedimentation Control Plan

If required, a soil erosion and sedimentation control (SESC) plan will be developed by the Subcontractor, as outlined in specification Section 01 57 13, Temporary Erosion and Sediment Control (Appendix F). The SESC plan will incorporate the use of best management practices for earth-disturbing activities associated with the work and procedures to control soil erosion and potential spills. The SESC plan will also detail erosion control inspections that will be performed during construction activities. This document will be submitted to CH2M for approval prior to starting work onsite. If the Subcontractor

determines that a SESC plan is not necessary for the work, a written explanation of why it is not needed will be submitted to CH2M for approval.

2.5.2.6 System Operations and Maintenance Plan

Prior to system commissioning, the Subcontractor will provide a comprehensive operations and maintenance plan for the ISTT system. Standard operating procedures will be documented for all tasks related to operations and maintenance of the treatment system, including (at a minimum) procedures for system startup and shutdown, emergency shutdown, vapor and water treatment system sampling, equipment inspection, and routine maintenance. The operations and maintenance plan will also include the following information:

- System commissioning plan documenting the proposed approach to system startup, checkout, and confirmation of design functionality
- Proposed ambient air monitoring
- Ground-level voltage monitoring program (if applicable)
- Lockout-tagout procedure, including safety procedures including cross references to specific protocols, standard operating procedures, and safety measure/procedures
- Process monitoring requirements, data collection methods, and field forms
- Estimated total number of analytical samples by matrix (liquid, solid, gas)
- Emergency response procedures, lines-of-communication, and target response time
- Safety data sheets
- Project team contacts list and staffing plan
- Projected duration of system operation
- Contingency measures (including operation of a backup generator in event of power failure during operation of the treatment system)
- Sampling methods for collection of hot vapor, water, and soil during system operation
- Malfunction abatement plan, as described in the air SRD included in Appendix E

2.5.2.7 Operations Status Report

During operation of the treatment system, the Subcontractor will prepare and electronically distribute a weekly summary of system operation to the project team in accordance with specification Section 1 78 23, Operation and Maintenance Data (Appendix F). In general, process data contained in this deliverable will provide a high-level summary of system operation that can be used to update stakeholders on system progress. The Subcontractor will compile and present energy and contaminant mass balances as a function of system operation time to support the analysis of system performance. Additional information will include temperature data, process sampling results, ambient air and noise monitoring results, waste disposal information, and system uptime/downtime data. Upset conditions and corresponding actions will also be reported. Please note that a link to a frequently updated website can be offered in lieu of a distributed report provided that temporal operational summaries, not just real-time process data, are accessible for review.

In addition to the weekly electronic summary report prepared, the Subcontractor will support EPA in the production, preparation, and presentation of system operations data through a publicly accessible internet page. The page format, construction, maintenance, and storage will be completed by others; however, EPA will require assistance from the Subcontractor to populate the project page. At a

minimum the Subcontractor should plan for the weekly production and electronic transmittal of the following elements to summarize these operations:

- Subsurface temperatures within the designated treatment areas at each depth interval where monitoring is performed. Temperature monitoring results will be presented graphically and interpolated between monitoring locations. The Subcontractor will assume that images are presented in JPEG format in accordance with provisions established by the Joint Photographic Experts Group, which created the standard.
- Subsurface pressures within the designated treatment areas. Pressure-monitoring results to demonstrate pneumatic capture of the treatment areas will be presented graphically and interpolated between monitoring locations. The Subcontractor will assume that images are presented and transmitted to EPA in JPEG format as previously described.
- Subsurface hydrostatic pressure measurements within the designated treatment areas. Hydrostatic pressure monitoring results to demonstrate hydraulic capture of the treatment areas will be presented graphically and interpolated between monitoring locations. The Subcontractor will assume that images are presented and transmitted to EPA in JPEG format as previously described.

2.5.2.8 Final Report

The Subcontractor will furnish a draft final report to CH2M within 60 days of demobilization from the site. The draft final report will include a narrative describing system design, installation, operation, sampling, and decommissioning, and will provide as-built system drawings. The draft final report will provide all system data, including process operations measurements, contaminant mass removed, energy consumed, and other relevant data.

The draft final report will document system performance to successfully demonstrate that diminishing returns were achieved by ISTT system operation. Supplemental information pertinent to the construction and operation of the treatment system, such as construction logs, quality assurance/quality control inspections, boring logs, system drawings, equipment specifications, process monitoring records, operations logs, and system photographs, will also be incorporated into the draft final report. Supporting process monitoring data will be supplied in electronic database format. The draft final report will be sent to the CH2M Project Manager electronically and in hard copy. Following CH2M review, the Subcontractor will finalize the document and supporting material and produce the final report in Adobe portable document format (PDF) format. The Subcontractor will also supply the final report components (i.e., text, figures, photographic operations logs, and the system operations database) in native file format; drawings will be formatted for display on B-size paper (11 by 17 inches) and provided as PDFs.

2.5.3 ISTT System Design Conditions

The ISTT system provided by the Subcontractor will be designed to remove mobile and potentially mobile NAPL from the shallow outwash unit within the TTZ defined for the VBPSS. The primary objectives for ISTT implementation are to (1) minimize the migration of site-related contaminants from unsaturated and saturated media to the shallow unit, till unit, and lower unit, and (2) reduce the mass and distribution of NAPL-impacted material and prevent NAPL migration into surface water and lower-unit groundwater.

Despite significant subsurface investigation efforts to define the TTZ, uncertainty in both the mass and distribution of contaminants within the VBPSS remain. Thermal treatment within the VBPSS must reduce both the mass and mobility of subsurface NAPL. A performance standard premised on mass removal and diminishing returns was selected for use during ISTT in the VBPSS. The diminishing returns concept builds upon multiple lines of evidence to demonstrate that the practical (and technical) capacity of a treatment system to remove subsurface contaminants has been reached. The approach is suited for

sites where contamination mass is unknown or exhibits a high degree of spatial variability; both characteristics are prominent features within the VBPSS.

Operational strategies incorporating diminishing returns are well established and will allow project stakeholders the required flexibility to determine the optimal timeframe for system shutdown while simultaneously balancing technology performance, Remedial Action Objectives attainment, and total project costs. Given the nature of site-related contaminants, EPA may elect to extend thermal treatment operations beyond demonstration of diminishing returns to reduce groundwater leachability of contaminants from soil within the target treatment area. To support this objective the Subcontractor will collect and analyze interim soil standards using EPA Method 132, simulated precipitation leaching procedure, to assess contaminant leachability from areas where ISTT is applied. At their sole discretion, EPA may elect to continue or terminate operation of the ISTT system based on leachability results or demonstration of diminishing returns (described in the following section).

Mass recovery rate as a function of time will serve as the primary line of evidence in determining when to terminate active treatment within the VBPSS. In support of contaminant mass removal data, introduction of thermal energy to the subsurface and corresponding spatial temperature distribution with the TTZ will be recorded in real time. Tracking subsurface temperature concurrently with mass removal, therefore, will also be part of the basis by which diminishing returns are demonstrated for ISTT system operation. Diminishing returns for system operation would be further documented through detailed operational measurements and observations, including, but not limited to, contaminant recovery rate, cumulative mass recovered, subsurface temperature, pressure and other parameters such as energy input and removed from the treatment area. For the purposes of ISTT system design and cost proposal development, the Subcontractor will assume that active heating and treatment operations will occur until performance monitoring data demonstrate that:

- Treatment of the source area using ISTT has reached an asymptotic rate of contaminant (NAPL) recovery
- Additional input of subsurface energy will not increase NAPL mass removal rate
- Extended operation of the ISTT system offers no further reduction in NAPL mobility, mass, or potential for migration from the TTZ defined for the VBPSS

2.5.3.1 ISTT System Design

The Subcontractor will design the ISTT system and supporting ancillary process components to:

- Provide sufficient energy to increase soil and groundwater temperatures to remove NAPL from the TTZ to the maximum extent practicable.
- Measure and record subsurface temperature throughout the TTZ using an appropriate sensing strategy. The number monitoring points will be based on the layout of the heating system.
 Placement will favor locations that represent geometric centers of the heating array designed; subsurface temperature monitoring locations will be sufficient to provide a representative temperature throughout the horizontal and vertical extent of the TTZ.
- Control pneumatic gradient to prevent the lateral or vertical migration of steam, vapors, or water to the ground surface or outside the TTZ.
- Control hydraulic gradient in the treatment area to prevent the lateral and vertical migration of fluids out of the TTZ. The cumulative mass balance of water introduced to the treatment area will be less than cumulative water removed during treatment operations. The Subcontractor will provide weekly reports on water balance.

- Capture and treat extracted vapors to remove, recover, or destroy the target chemical of concern, and provide for disposal or reclamation of spent media, if applicable. Spent media must be removed from the site within 7 days.
- Provide a thermal/vapor cap for thermal insulation, controlling vapors and fugitive emissions, and minimizing stormwater infiltration minimization, within each treatment zone.
- Treat extracted vapor by thermal oxidation processes, including all necessary gas conditioning and exhaust scrubbing equipment to meet air discharge requirements.
- Provide instrumentation and control systems to allow timely data acquisition, reporting, interpretation, and decision making to verify that the operational requirements are maintained; record total power consumed by system operations and delivered to the subsurface; record subsurface temperature and applied vacuum; and notify the operator of shut down alarms.
- Establish alarms and sensing strategies to indicate system malfunction. Alarms will be sent sequentially to at least two Subcontractor personnel for response and action. Response to alarms will be within 2 hours of alarm notification.
- Include design provisions and equipment protection features necessary to allow for uninterrupted cold-weather operation and standby (as required) for the ISTT system constructed onsite.
- Provide overhead lighting of Subcontractor-supplied ISTT system equipment.

2.5.3.2 Injection Wells

If required, the Subcontractor will satisfy all substantive requirements for an underground injection control permit from MDEQ for liquid that might be added to the soil and groundwater by operation of the ISTT system. The Subcontractor design will supply the locations of each injection well along with the specifics on the fluid being injected and its origin, volume, and duration. Injection of fluids besides potable water will require complete analytical characterization and supply of safety data sheets as applicable. Potential addition of any chemical agents to improve performance must be identified during planning and formalized during heating system design.

2.5.3.3 Access Control

The Subcontractor design will establish an exclusion zone with fencing and privacy screen to prevent unauthorized entry to the TTZ by site workers. Required equipment or hardware to establish access control will be provided by the Subcontractor. Equipment and remediation areas will have prominently displayed signs that state "Danger - High Voltage." The Subcontractor will supply a mechanism for automatic shutdown of subsurface heating equipment upon unauthorized entry into the designated treatment areas. Operation of vapor and water extraction equipment should not be interrupted by activation of the heating system interlock.

2.5.3.4 Emergency Shutdown

The Subcontractor design will integrate and strategically place emergency stop switches capable of deactivating all electrical equipment used in the ISTT system. All emergency stop locations will be prominently identified and clearly marked. At least one shutdown will be located in a remote area to allow emergency equipment shutdown from outside the TTZ.

2.5.3.5 Backup Power

The Subcontractor design will supply and integrate a backup power source capable of operating ISTT system controls, process data monitoring systems, subsurface extraction equipment, and all unit operations required for the treatment of extracted vapor and water in the event primary power from the utility is interrupted. An automatic transfer switch, integrated with the treatment system control

equipment, will be provided to sequence generator startup and remotely notify operations staff of system power outage.

2.5.3.6 Utilities

The Subcontractor will provide technical support to CH2M in sizing and establishing the necessary utilities (e.g., electrical power, natural gas, and potable water supply) to construct and implement the ISTT system designed. A 5-million British thermal unit natural gas meter will be supplied with a service pressure of approximately 10 pounds per square inch. The Subcontractor will confirm the natural gas requirements for ISTT operations and is responsible for providing and installing a regulator downstream of the gas service meter to adjust the delivery pressure as needed for equipment operation. Primary power for the ISTT application in accordance with Subcontractor demand specifications will be provided by others. The Subcontractor will remain responsible for the design, specification, and supply of all electrical switchgear, transformers, and distribution equipment necessary to operate the ISTT system. The Subcontractor will assume that its responsibility for electrical equipment supply starts at fused disconnects on the primary power supply. Similarly, the supply of natural gas and potable water for the ISTT system will be based on Subcontractor design specifications. The Subcontractor will assume that gas and water utility service to the treatment equipment will be terminated near or within the TTZ; each service will be supplied with an isolation valve (provided by others) to facilitate Subcontractor equipment connection. The Subcontractor will remain responsible for design specification and supply of all downstream appurtenances for distribution and control of all utilities provided.

Utility services (power, water, gas) costs will be directly paid by CH2M.

2.5.4 ISTT System Installation

The following are requirements for the installation of the ISTT system:

- The presence of DBCP in subsurface materials at the VBPSS is known. Level B PPE is therefore required for any intrusive fieldwork performed at the VBPSS.
- The Subcontractor will implement heat stress prevention and monitoring procedures during activities where heat stress is a potential hazard. The heat stress prevention and monitoring program will be consistent with the most recent edition of the American Conference of Governmental Industrial Hygienists threshold limit values for Physical Agents in the Work Environment, Heat Stress, and Heat Strain.
- The Subcontractor will furnish and install required electrical interconnects and supporting hardware to transform, control and regulate primary site power to operate the ISTT system designed and installed.
- The Subcontractor will furnish and install supporting equipment and piping interconnects to convey, control and regulate the natural gas supply to applicable ISTT system equipment supplied by the Subcontractor.
- A separate gas meter to determine the volume of natural gas used by the ISTT system will be supplied by Consumers Energy.
- One or more process areas will be provided by others for installation of Subcontractor-supplied equipment required for ISTT implementation. The process areas will provide secondary containment and be graded to drain to one or more collection sumps. The Subcontractor will include all required equipment and controls to capture, convey, treat, or divert stormwater or process-related liquids that accumulate within the curbed process areas provided.
- As part of the bid, the Subcontractor must provide pertinent design information (e.g., maximum surface slope, distributed load requirements, dead load requirements, etc.) and material of

construction for the process areas (concrete, composite mat system, etc.) the Subcontractor requires to support its equipment.

• The Subcontractor will include all necessary materials, labor, and equipment to convey water treated by the ISTT system for discharge to the Pine River at a designated location. In support of CH2M design efforts, the weekly volume of water generated and treated for discharge must be provided in bidder's submittal. The Subcontractor will provide means to measure and record discharge flow, pH, and temperature.

2.5.5 ISTT System Operation

The following are requirements for the operation of the ISTT system:

- The Subcontractor will operate the ISTT system to reduce the mass and mobility of NAPL within the TTZ, collect pertinent process data, and successfully demonstrate diminishing returns for system operations as defined within this PWS. The system will be operated without the following:
 - Increases in current known onsite or offsite VOC concentrations to the atmosphere in excess of air discharge requirements, attributable to the work.
 - Increases in groundwater VOC concentrations within underlying aquifer units.
 - Causing a danger or harm to any occupants of the Site or offsite areas.
 - Releasing any detectable quantity of Site-related contamination to the environment, except in accordance with applicable laws, regulations, and permit equivalencies requirements.
- The Subcontractor will supply all personnel and equipment to operate and maintain the ISTT system. A local operations presence is required.
- The Subcontractor will take all steps, readings, or measurements deemed necessary to safely perform required work. The Subcontractor will be solely responsible for interpreting all information to determine and implement all appropriate safety measures necessary to protect any personnel who may encounter the treatment system, including, without limitation, its employees, agents, Subcontractors, property owners, tenants, visitors, EPA, CH2M, other government agencies, and emergency responders or their respective personnel. Hazard mitigation must be in place to prevent burns from contact with hot subsurface equipment used in ISTT system operation.
- The Subcontractor will operate the ISTT system for the duration necessary to demonstrate diminishing returns as specified by this PWS and to the satisfaction of EPA and MDEQ representatives, who are considered to be the primary project stakeholders.
- Operation of the treatment system will include measurement of the following parameters:
 - The power and energy input to the subsurface
 - Subsurface temperatures throughout the TTZ and outside this area to assess potential impact to surrounding infrastructure or detect migration of groundwater or heated vapor from the TTZ
 - Subsurface vacuum readings to verify and demonstrate pneumatic control of the TTZ
 - Static water-level measurements within and outside the TTZ to verify and demonstrate hydraulic control of the TTZ
 - The vapor flow rate and cumulative mass of contaminants recovered from the subsurface from the TTZ
 - The volume of groundwater (and NAPL) extracted

- The volume of condensate extracted in subsurface vapor
- The analytical parameters required for treated groundwater and condensate discharge
- The analytical parameters required for treated vapor discharge
- The pH and volume of blow down (discharge) from the thermal oxidizer caustic scrubber
- The volume of caustic consumed during operation of the thermal oxidizer
- The volume of natural gas consumed during operation of the thermal oxidizer
- Upon demonstration and concurrence of stakeholders that diminishing returns have been achieved, operation of the ISTT system will be terminated. To assess and confirm efficacy of the remedial action, CH2M will collect post-treatment soil samples within and surrounding the thermal treatment areas. Boring locations and sample intervals will be selected by CH2M. As required, the Subcontractor will support CH2M sampling efforts as needed through the removal and relocation of system infrastructure.

2.5.6 ISTT System Demobilization

The following are requirements for the demobilization of the ISTT system:

- The Subcontractor will remove all subsurface infrastructure furnished or installed for ISTT system
 operation. The Subcontractor will abandon all borings and subsurface system infrastructure by
 cutting off subsurface structures 3 feet bgs and grouting the infrastructure in place. System
 infrastructure constructed without structural casing material will be abandoned by grouting in place.
 CH2M will be responsible for coordinating transport and disposal of the soil cuttings, and the
 Subcontractor will not include these costs in the proposal. The Subcontractor will remove the
 treatment system and all related equipment, materials, and waste from the site, and any portion of
 the site altered or damaged by the work will be restored to the original condition, to the extent
 practicable, at the completion of remediation.
- The Subcontractor will remove the equipment pad and insulating thermal/vapor cap, and will restore the area to its original condition.
- The Subcontractor will decontaminate any field, testing, laboratory, or other equipment that becomes contaminated by known or suspected hazardous materials or other regulated contaminants at the site and will properly dispose of any residual contaminants offsite.

2.5.7 General Project Considerations

- Starting with the Notice to Proceed, the Subcontractor will submit weekly progress reports to CH2M on the actual progress of the work and updated schedules, as well as copies of all correspondence and other materials delivered to or received from regulatory authorities, utilities, and any third parties.
- Under no circumstances will Change Orders include, and the Subcontractor will be solely responsible for, the cost arising from the following:
 - The additional cost for the redesign, modifications, or replacement of system piping, equipment, or components to remove, collect, treat, transport, or dispose vapors and liquids generated from the work caused by defects in the design, construction, or operation of the ISTT system.
 - The supplemental cost to analyze, redesign, or modify any aspect of the supplied system to establish or maintain pneumatic and hydraulic control of the TTZ during system operation.

- The cost for all Subcontractor-supplied equipment and personnel in the event power to the system must be interrupted for the Subcontractor to correct defects, if any, in the design, materials, piping, equipment, etc.
- The Subcontractor will be responsible for additional costs that are a result of the Subcontractor's activities that are not in compliance with federal, state, and local regulation, including but not limited to the treatment, storage, disposal, and handling of contaminated media and hazardous waste that were current as of the completion date of the design. In no event will the Subcontractor be deemed the owner or generator of any wastes generated by this project, except for spills and releases caused by the Subcontractor or Subcontractor's lower-tier Subcontractors.

2.6 Work Not Included

- Disposal of general garbage, trash, and solid waste generated during normal execution of the work will be supplied by others. Disposal of general trash will be minimized to the extent practicable through Subcontractor sorting and diversion of all materials that can be recycled or reused.
- The transportation and disposal of solid and liquid wastes generated by the operation of the treatment system will be supplied by others. The Subcontractor will estimate the quantity of all waste to be generated on the compensation schedule.
- The Subcontractor will remain responsible for the decontamination, cleaning, or demolition of any temporary storage vessels mobilized to the site for ISTT system implementation or containerization of decontamination wastes.
- Waste characterization for materials excavated or collected during ISTT construction, operation, maintenance, or demolition, including debris, soil, sediment, and liquids, will be provided by others. The Subcontractor will estimate the quantity of all waste to be generated on the compensation schedule.
- Analytical services required for treatment system operation and validation of ISTT system performance will be supplied by others. Unless otherwise directed, the Subcontractor will be responsible for collection of all process and performance-monitoring samples during system operation. As requested in this PWS, an estimate of the total samples to be analyzed, the projected analytical methods and the sample matrices (liquid, solid, gas) to be evaluated will be prepared and presented in the Subcontractor's proposal.
- Utility services for electrical power, natural gas, and potable water will be provided by others to the project site. As previously described, the Subcontractor will identify during ISTT design the required specifications for utilities supplied to the project site.
- Road access to support ISTT implementation in the VBPSS will be provided by others. Adjacent to the treatment area, a gravel laydown area will be established for placement of Subcontractor-supplied temporary facilities.
- One or more process areas will be provided by others for installation of Subcontractor-supplied equipment required for ISTT implementation. The process areas will provide secondary containment and be graded to drain to one or more collection sumps. The Subcontractor will include all required equipment and controls to capture, convey, treat, or divert stormwater or process-related liquids that accumulate within the curbed areas. As part of the bid, the Subcontractor must provide pertinent design information (e.g., maximum surface slope, distributed load requirements, dead load requirements, etc.) and material of construction for the process pads (e.g., concrete, composite mat system, etc.) that the Subcontractor will require to support its equipment.

 As previously referenced, the process area(s) will be graded to drain to one or more collection sumps for stormwater collection. Fluids (including stormwater) that accumulate in the collection sumps during ISTT system construction, operation, and demolition will be managed by the Subcontractor.

2.7 Work Included

The Bid Items listed in this section and presented in the Bid Schedule will constitute all items to be specifically paid under this Contract.

Incidental Work Items: A general description of work to be performed under this contract is provided by the Work Summary and Bid Items listed herein. However, this PWS is not to be misconstrued by the Bidder as being a complete description of all work necessary to implement ISTT in the VBPSS. The Bidder is responsible for reading all portions of this PWS and for including all costs for incidental items required to complete construction tasks, regardless of whether an incidental item or task is specifically referenced in the general description of the Bid Item.

Under each applicable pay item, incidental items include, but are not limited to, furnishing adequate and competent labor; participation in preconstruction meeting, safety meetings, project planning and progress meetings, and a project closeout meeting; protection of utilities not otherwise directed to be replaced or abandoned; H&S and PPE; signs; all survey work, including that required for system component layout (horizontal and vertical controls) and to record "as-built" locations and elevations of all installed work; site supervision and supervision of and coordination with other Subcontractors; coordination with regulators during onsite inspections (if necessary); weather delays; and site cleanup and trash removal. Submittals incidental to the work include material/product specifications, technical data, sample calculations, certifications, warranties, equipment manuals/procedures, test results, shop drawings, and record drawings. Incidental work items also include the supply, operation, and maintenance of the following:

- All equipment, tools, supplies, and materials
- Remedial work zones
- Temporary office space
- Temporary construction fence with privacy screen that is compatible with Subcontractor's ISTT technology
- Temporary sanitary facilities
- Temporary safety shower(s) and eyewash station(s) that adhere to placement and construction standards defined by American National Standards Institute 358.1-2009
- Decontamination pad
- Traffic control measures
- Temporary utilities
- All other temporary facilities needed to accomplish the work

The <u>construction and removal</u> of the bulleted items above are covered under Mobilization and Demobilization Bid Items, respectively.

2.7.1 Compensation Schedule Item Descriptions

2.7.1.1 Bid Item 1.0—System Design

Description

Work for this Bid Item includes the preparation and submittal of design drawings, calculations, and supporting text for the basis of design document that will be prepared by CH2M. The Subcontractor's performance of work on this project may require acquisition of license(s) to apply processes that may be under patents by their inventors. CH2M does not require the use of any specific patent(s) or license(s) as a condition of satisfactory performance of the work. The Subcontractor will determine the applicability of any and all patents to the Subcontractor's proposed remedy and will obtain any licenses required. The Subcontractor will provide copies of any required licenses to CH2M prior to final design completion. The Subcontractor will also identify and pay applicable fees, royalties, and other costs associated with patents applicable to the proposed technologies applied and will provide certification to CH2M that applicable patent fees, licensing fees, and royalties have been paid. At no time will the Subcontractor knowingly infringe on patents applicable to the work described herein.

At a minimum, the ISTT design package prepared will include, but is not limited to, a system narrative, a site plan, a process flow diagram, a process and instrumentation diagram, and construction details of subsurface system components. The design package will include the projected energy balance for the proposed system and identify the type and required capacity of utilities needed to support ISTT implementation. If supplemental pre-design sampling or testing is required to support the Subcontractor's technical approach to ISTT design, the specific data requirements will be identified in the Subcontractor's proposal. The Subcontractor will include all costs for sample collection and testing necessary to develop and finalize the ISTT system design. Because the presence of DBCP in subsurface materials is known, Level B PPE is required for any intrusive fieldwork performed at the VBPSS.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment as per the total value listed for this Bid Item on the Proposal Form will be made upon review and acceptance of the work by CH2M. Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.2 Bid Item 2.0—Work Plans, Schedules, and Permits or Permit Equivalents

Description

Work for this Bid Item includes the preparation and submittal of work plans, schedules, and all supporting documents identified under Project Submittals (Section 5.2). Work plans and schedules are expected to include, but are not limited to, the following:

- Project Work Plan, as outlined in specification Section 01 11 00, Summary of Work (Appendix F)
- Subcontractor Quality Control Plan, as outlined in specification Section 01 11 00, Summary of Work and 01 45 16.13, Subcontractor Quality Control Plan (Appendix F)
- Site-Specific HASP, as outlined in specification Section 01 11 00, Summary of Work (Appendix F)
- SESC Plan, if required, as outlined in specification Section 01 57 13, Temporary Erosion and Sediment Control (Appendix F)
- Operations and Maintenance Plan

• Schedule, including identification of critical path or long lead procurement requirements, as outlined in specification Section 01 32 00, Construction Progress Documentation (Appendix F)

CH2M will lead the effort to obtain permit equivalents for air and water discharges. This Bid Item will also include Subcontractor support to CH2M in identification, preparation, and submittal of all related permits required (or permit equivalencies) to complete the work. The Subcontractor will support CH2M with coordinating the review of permit applications and for allocating sufficient time for such review and approval by CH2M, EPA, oversight agencies, and other relevant stakeholders. CH2M

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment as per the total value listed for this Bid Item on the Proposal Form will be made upon review and acceptance of the work by CH2M Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.3 Bid Item 2.1—Mobilization

Description

Work for this Bid Item includes mobilization of all resources necessary, including personnel, equipment, materials and temporary facilities for work execution. Temporary facilities and controls are expected to include, but not be limited to, furnishing and installing a trailer to be used by the Subcontractor and lower-tier support. The Subcontractor will be responsible for providing the office/trailer space with electrical power and communications and for establishing temporary onsite sanitary and safety-related wash systems.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment as per the total value listed for this Bid Item on the Proposal Form will be made upon review and acceptance of the work by CH2M. Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.4 Bid Item 2.2—Site Controls

Description

As previously noted, CH2M will establish designated areas for equipment/material storage areas (i.e., laydown areas), waste staging, and remediation-derived-waste management; as needed, storage areas will be prepared with stone or gravel surfaces to allow full-time access. The Subcontractor will connect applicable equipment to utility services provided by CH2M and establish control zones to maintain site security, safety, and worker protection measures as stipulated by the HASP.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment as per the total value listed for this Bid Item on the Proposal Form will be made upon review and acceptance of the work by CH2M Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.5 Bid Item 3.0—Furnish and Install Underground ISTT System Components

Description

This Bid Item includes the supply and installation of all subsurface components of the Subcontractordesigned ISTT system. It is assumed that all site construction work will be conducted under the observation of a CH2M Construction Manager and/or Site Engineer/Geologist. The Subcontractor may engage lower-tier Subcontractors as necessary to complete the installation of underground ISTT system components. All contractual and safety requirements of this project will flow down to all lower-tier Subcontractors. Compliance with all flow-down requirements will be the responsibility of the Subcontractor.

The Subcontractor will locate and install extraction wells, injection wells, heaters, electrodes, grounding loops, and any other subsurface infrastructure required to remediate the TTZ using the provided ISTT system. Soil cuttings and other solid waste generated during installation of the ISTT system components will be contained in Department of Transportation-approved open-top 55-gallon drums or water-tight and covered roll-off boxes provided by the Subcontractor (offsite transportation and disposal by CH2M). The Subcontractor will estimate the quantity of all waste to be generated by all of its activities on the compensation schedule.

Infrastructure installed for liquid or vapor extraction will be constructed by a driller licensed to operate in Michigan and in accordance with local and state well-construction regulations and procedures. Drilling work will be completed under the observation of and to the satisfaction of CH2M.

The licensed drilling contractor will be responsible for submitting construction logs for all subsurface components (heaters, monitoring points, extraction wells, etc.) to CH2M. The operability or function of all subsurface infrastructure required for heating, contaminant extraction, performance monitoring, and treatment zone containment will be verified and documented by the Subcontractor following installation to the satisfaction of CH2M. Deficiencies in the operation or construction of subsurface infrastructure installed under this Bid Item will be corrected at the Subcontractor's expense. It is further assumed that the Subcontractor will make any and all design and/or field modifications to the underground components of the ISTT system required by regulatory agencies, stakeholders, or CH2M.

Following infrastructure installation, the Subcontractor (or lower-tier designee) will fully develop newly installed wells designated to extract groundwater from within or outside the TTZ. Development water will be collected, conveyed, and stored for offsite disposal by the Subcontractor (or lower-tier designee). Water generated onsite during well installation, development, and equipment decontamination will be placed in containers provided by the Subcontractor (or lower-tier designee) and approved by CH2M. The Subcontractor will estimate the quantity of all waste to be generated on the compensation schedule.

In addition to ISTT heating and extraction infrastructure, the Subcontractor will provide and install equipment to monitor subsurface pressure, temperature, and static water levels during remedy implementation. Provisions for subsurface pressure, temperature, and static water level monitoring are required within and outside the TTZ to assess system performance, support documentation of diminishing returns as previously described, and provide Subcontractor demonstration of pneumatic and hydraulic containment of the TTZ during ISTT system operation.

For the purposes of this RFP, it is assumed the Subcontractor will provide requisite drilling services and corresponding safety systems for installation of all subsurface ISTT components (including applicable PPE and monitoring systems). Prior to subcontract award, CH2M reserves the right to separate and subcontract drilling services included under this Bid Item directly with a qualified drilling Subcontractor.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment for this Bid Item will be made at 30 percent of the firm fixed price after the following conditions are satisfied: (1) EPA acceptance of the final design package, (2) funding for this line item has been committed by EPA to CH2M, and (3) CH2M has issued the award to the Subcontractor for this line item. Bidders are reminded that the design and implementation tasks are discrete and separate awards. Completion and approval of the final design does not obligate EPA or CH2M to pay the bidder for materials or any other item if any of the foregoing conditions are not met. A 60 percent payment of the firm fixed price will be made upon delivery and acceptance of subsurface equipment installation at the job site, and 10 percent upon successful completion of ISTT System Commissioning and Startup.

2.7.1.6 Bid Item 3.1—Furnish and Install Aboveground ISTT System Components

Description

This Bid Item includes the supply and installation of all aboveground components of the Subcontractordesigned ISTT system. It is assumed that all site construction work will be conducted under the observation of CH2M personnel. The Subcontractor may engage lower-tier Subcontractors as necessary to complete the installation of underground ISTT system components. All contractual and safety requirements of this project will flow down to all lower-tier Subcontractors. Compliance with all flowdown requirements will be the responsibility of the Subcontractor.

The Subcontractor will provide and install all aboveground treatment equipment, tanks, hoses, conveyance piping, pumps, blowers, valves, controls, meters, gauges, heat exchangers, cooling towers, electrical power distribution, controls, mechanical connections, aboveground thermal insulation, freeze-protection systems, vapor barriers, and all necessary process equipment to treat fluids extracted during ISTT system operation. Process equipment provided is expected to achieve water and vapor discharge limitations specified by MDEQ and defined by system design documents. One or more process areas will be provided by others for installation of Subcontractor-supplied equipment required for ISTT implementation. The process areas will provide secondary containment and be graded to drain to one or more collection sumps. The Subcontractor will include all required equipment and controls to capture, convey, treat, or divert stormwater or process-related liquids that accumulate within the curbed areas.

As part of the bid, the Subcontractor must provide pertinent design information (e.g., maximum surface slope, distributed load requirements, dead load requirements, etc.) and material of construction for the process pads (concrete, composite mat system, etc.) the Subcontractor requires to support their equipment. The Subcontractor will be responsible for the collection, conveyance, treatment, and storage of fluids that accumulate in the sump. At the Subcontractor's discretion, provisions for the diversion and discharge of clean stormwater collected on the pad (without treatment) may be integrated to ISTT system design.

Given uncertainty in the actual mass of subsurface contamination as outlined in Appendix D, the Subcontractor will supply a thermal oxidizer for the treatment of vapor extracted from the TTZ. Thermal oxidizer operation with natural gas should be assumed. Vapor treatment processes will be augmented by conditioning and scrubbing operations as deemed necessary and provided by the Subcontractor. The Subcontractor will connect the vapor treatment system to an emissions stack located within the treatment compound in accordance with the substantive requirements document for air discharge to be obtained by CH2M.

The Subcontractor will provide a central programmable logic controller system that monitors, records, and controls critical system functions. The programmable logic controller system will be equipped with an auto-dialer that calls out in the event of an upset or shutdown condition. Non-critical system parameters (e.g., pressure, flow, temperature) may be monitored and recorded manually. Equipment

installed will be secured with temporary fencing, including privacy screen. To prevent unauthorized entry, theft, or vandalism during system operation, a silent alarm system with continuous remote monitoring will also be provided by the Subcontractor.

If the Subcontractor's storage vessels supplied exceed secondary containment capacity, then the Subcontractor will supply a temporary containment solution to ensure storage is sufficient to retain the liquid-phase contents of the largest tank within the treatment area. The secondary containment systems will be compatible with all process flows, including NAPL, in the event of a spill or leak from the treatment system.

The Subcontractor will provide a tank suitable for collection of NAPL that may be generated during operation of the vapor extraction process equipment. This tank will be installed within the temporary secondary containment area and clearly labeled. The Subcontractor will be responsible for transferring NAPL from the tank to a container suitable for transport and disposal, or substituting the existing tank with a new, empty tank, at a frequency in accordance with applicable hazardous waste regulations. The transport and disposal of the accumulated waste will be provided by others; Bidders will not include these costs in the proposal. The Subcontractor will be responsible for notifying CH2M when the NAPL tank needs to be emptied or changed.

There are no installed utilities that service the treatment area. Utility services will be established to the site based on Subcontractor-supplied specifications. As necessary for operation of the ISTT system, the Subcontractor will select, supply, and install an electrical transformer of sufficient capacity to provide electrical power to the treatment zone and ancillary treatment equipment. Specification, installation, and interconnection of a temporary electrical transformer, if required, will be performed by the Subcontractor and conducted in accordance with the requirements of the local public utility. The Subcontractor will include applicable costs for transformer rental, purchase, transport, placement, interconnections, inspection, permitting, and any required installation testing in bid pricing. For the purposes of Bid Item development, the Subcontractor will assume primary power is supplied to the project site by others; Subcontractor scope of supply will begin downstream of the primary disconnects.

The Subcontractor will provide, install and interconnect an emergency generator that will provide power to critical equipment in the event of a site power failure. The treatment system will be designed so that key pumps, blowers, and treatment equipment continue operating during a loss of utility power. Under no circumstances will the release of contaminants to the environment be acceptable at any time. Specification, installation, and connection of the generator will be conducted in accordance with the requirements of the local utility and all applicable national or local electrical codes. The Subcontractor will provide secondary containment for the generator and its associated fuel tank, with operating costs included under Bid Item 3.4.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment for this Bid Item will be made at 30 percent of the firm fixed price after all of the below conditions are satisfied: (1) acceptance by EPA of the final design package, (2) funding for this line item has been committed by EPA to CH2M, and (3) CH2M has issued the award to the Subcontractor for this line item. Bidders are reminded that the design and implementation tasks are discrete and separate awards, and completion and approval of the final design does not obligate EPA or CH2M to pay the bidder for materials or any other item if any of the foregoing conditions are not met. A 60 percent payment of the firm fixed price will be made upon delivery and acceptance of aboveground equipment installation at the job site, and 10 percent upon successful completion of ISTT System Commissioning and Startup.

2.7.1.7 Bid Item 3.2—Commissioning and Startup of ISTT System

Description

This Bid Item includes the Subcontractor supply of labor and all supporting materials and expenses to commission the constructed ISTT system. Commissioning will be a period during which all mechanical and electrical system installations are inspected, tested, and documented, and any deficiencies repaired. The Subcontractor will commission the treatment system prior to full operation per standard engineering practice to the satisfaction of CH2M and in accordance with substantive requirements documents for air and water mandated by regulatory agencies and stakeholders. Upon completion, the Subcontractor will furnish CH2M with written documentation of the system checks completed to confirm operability and functionality of installed components. The operation of critical safety systems, including emergency stops and access controls, will be tested, documented, and verified functional in the presence of CH2M field staff. The operation of critical process-related alarms will also be demonstrated to CH2M for functional verification. Commissioning tasks will also include pressure testing of all vapor and liquid piping systems.

The startup period will be a rolling 2-week period of system operation as defined by subsurface heating, with corresponding treatment of extracted fluids. During the startup period, the Subcontractor will provide continuous operation of the system for a minimum of 98 percent of the startup period. An operations orientation for CH2M and Emergency Services personnel regarding installed equipment hazards, procedures for operations team contact, and emergency shutdown of system components will also be included under this Bid Item.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable. Completion of this bid item will also trigger release of residual payments for supply and installation of both aboveground and belowground components of the ISTT system.

2.7.1.8 Bid Item 3.3—Operate ISTT System

Description

This Bid Item includes the Subcontractor cost to maintain and operate all components furnished in the ISTT system until the time when diminishing returns as defined in Section 5 of this PWS are achieved. To fulfill treatment objectives, CH2M anticipates that the operational period will be divided into three distinct phases that correspond to payment milestones that align with remedial goals. In the first phase, the TTZ will be heated to the target temperature followed by a ROD-defined treatment period of 90 calendar days where the TTZ will be maintained at the target treatment temperature.

If after 90 days of treatment at the target temperature the removal of contaminant mass has ceased to the point where the criteria that define diminishing returns can be demonstrated, then operation of the ISTT will be transitioned to the final stage as described in the following paragraph. Conversely, if continued contaminant mass removal is demonstrated after 90 days of treatment at the target temperature, operation of the ISTT system will be continued at the discretion and direction of the project stakeholders. Phase 2 of system operations will be completed at will, with total treatment duration controlled entirely by the mass removal characteristics measured in each area heated. Upon successful demonstration of diminishing returns as stipulated by the ROD and acceptance among the EPA and MDEQ representatives, the final phase of operations will be initiated.
In the final stage of system operation, subsurface energy input will cease; however, fluid extraction and treatment systems will remain operational for a fixed cool-down period of 21 calendar days. Following completion of cool-down operations, Subcontractor-supplied infrastructure mobilized for ISTT implementation will be shut down, decontaminated, and removed from the site.

Treatment phases outlined above were selected to establish fixed and unit costs for ISTT system operations. Under the proposed strategy, the Subcontractor will provide fixed costs for Phase 1 and Phase 3 of ISTT system operation. Phase 2 operations would be completed under a weekly unit rate structure to allow sufficient treatment time to demonstrate that diminishing returns for the system is achieved. In establishing fixed and unit rates, the Subcontractor will include all costs for consumable materials required to operate the ISTT system components supplied in Bid Item 3.2, including temporary operation of the emergency generator package (as required). For each operational phase, the Bidder's proposal will specify the estimated utilities to operate the ISTT system, including electricity required (in kilowatt-hours), and estimated days necessary to operate the proposed ISTT system to achieve specified treatment objectives in Section 5. CH2M will bear the direct cost for subject utilities; however, bidders are requested to estimate demands by project phase to support preparation of total project cost forecasts for EPA.

During all phases of system operation, the Subcontractor will demonstrate that hydraulic and pneumatic control are maintained to ensure contaminants mobilized by subsurface heating are captured by the vapor or liquid extraction and treatment systems to the satisfaction of CH2M and all regulatory stakeholders. Groundwater temperature, static water elevation, and subsurface pressure within and outside the treatment zone will be the metrics by which hydraulic and pneumatic control are documented. These metrics will be documented every two weeks, at a minimum, and provided to CH2M. The Subcontractor will be responsible for any modification of ISTT system equipment or operation required to maintain hydraulic and pneumatic control during treatment operations.

During all phases of system operation, the Subcontractor will monitor system temperatures, pressures, flow rates, vapor concentration, power consumption, run time, and other key process parameters. The Subcontractor will monitor ambient air quality daily (using a photoionization detector or equivalent) and ambient noise levels (using a decibel meter) on a weekly basis. The Subcontractor will maintain records of all operational data and maintenance activities. The Subcontractor will maintain a spreadsheet of key system parameters, updated daily, for the purpose of performing mass and energy balance calculations; a permanent record of key operational data and maintenance activities will also be maintained in a project logbook. In addition, the Subcontractor will provide georeferenced kriged, color-contoured graphics for temperature (by depth) and pressure data, in a format suitable for upload to the EPA's geographic information system web viewer weekly. The specifications pertaining to web viewer format will be determined based on the system monitoring configuration of the system installed by the Subcontractor. The Subcontractor will provide this data to CH2M at any time upon request during and after the period of ISTT system operation.

The intent of ISTT system operation and shutdown criteria is established by the ROD, and the incremental cost of real-time monitoring for contaminant mass flow could yield significant cost savings during operation in Phase 2. All areas treated by ISTT will be subjected to a minimum treatment duration of 90 days at the target temperature. However, if additional treatment of an area is not warranted based on mass removal data, real-time measurement strategies would allow for the most rapid transition to shut down operation and maximize cost efficiencies for the project. <u>Bidders therefore are encouraged to integrate sampling strategies and analytical equipment in their technical approach that can provide contaminant-specific mass-removal data in real time to optimize operation of the ISTT system provided.</u>

The Subcontractor will be responsible for collecting liquid-phase and vapor-phase process samples at a frequency to be specified in water and vapor discharge permits (or permit equivalencies), respectively.

The air and wastewater discharge SRDs for NAPL/DBCP Area 1 are included in Appendix E. For bidding purposes, the Subcontractor will assume that the proposed water treatment equipment must meet the discharge limits summarized in Appendix E. Actual discharge limits, parameters, and sampling frequency may change during SRD development for the VBPSS. All samples collected during system operation will be analyzed through a Contract Laboratory Program-compliant laboratory. Samples will be analyzed by the laboratory under direct contract with CH2M, and the cost for analysis will be direct-billed to CH2M (CH2M will coordinate with the necessary laboratories). Bidders will estimate the quantity, type of samples (media), analysis, and preferred turnaround-times required as defined within Bidder instructions (Qualifications and Technical Questions). However, bidders will not include the costs for laboratory analysis of performance samples in the bid price for the work. The laboratory results for all process samples will be provided to both CH2M and the Subcontractor in electronic data deliverable format.

Operation of the ISTT system may result in the generation of waste streams, besides groundwater or condensate, using Subcontractor-supplied equipment. As previously described, CH2M will be responsible for coordinating transport and disposal of recovered NAPL, consumable process equipment such as filters, and all solid material that is removed from Subcontractor-supplied equipment. The Subcontractor will collect, contain, and store process waste in accordance with the approved Waste Management Plan, which will be provided by CH2M.

The Subcontractor will prepare and distribute to the project team an electronic summary of system operation and performance and an updated schedule of upcoming events (rolling 2-week look-ahead schedule) weekly. Additionally, the Subcontractor will participate in biweekly teleconferences to update the project team on system operation and performance. Call frequency may be altered following system startup to best suit the needs and schedules of the project team.

Components of the ISTT system that fail during operation and prevent demonstration of diminishing returns or compliance with treated effluent discharge standards will be replaced at the Subcontractor's cost. The Subcontractor will be responsible for promptly notifying CH2M if the treatment system does not perform according to the approved design. At CH2M's discretion, the Subcontractor will be given the opportunity to take corrective actions to remedy the problems. At any time during system operation, CH2M reserves the right to terminate system operation for any reason with no obligation for payment beyond the performance milestones described above.

Measurement

This Bid Item will be measured through a combination of fixed and unit operations (weekly) rates.

Payment

Payment for this Bid Item will be made monthly through the end of the operational period defined by the fixed durations specified under Phase 1 and Phase 3 of this the PWS. Payment for at-will system operation authorized at the discretion of EPA will also be made monthly. Regardless of measurement strategy considered, the system operating duration will commence immediately after system acceptance is demonstrated by completion of the startup and commissioning activities and extend until Phase 3 shutdown operations are completed.

2.7.1.9 Bid Item 3.4—Performance Verification

Description

This Bid Item includes the Subcontractor cost to support CH2M in accessing efficacy of the ISTT system operation and evaluating the leachability of contaminants in soil after treatment in the VBPSS after diminishing returns are demonstrated. Since treatment duration within the TTZ may differ, CH2M will require Subcontractor support to prepare the site for final sampling. Anticipated Subcontractor support

includes the following: temporary removal or protection of remediation system components for sampling equipment access, deactivation of extraction systems, and physical or electrical isolation of subsurface heating systems. The Subcontractor will coordinate closely with CH2M staff during implementation of the final sampling events to ensure worker safety by assuring that thermal energy input has been dissipated to safely allow subsurface soil sampling and minimize standby time for the drilling Subcontractor.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment for this Bid Item will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable.

2.7.1.10 Bid Item 4.0—Restoration: Surface

Description

Work for this Bid Item includes supply of equipment, labor, and materials required by the Subcontractor to restore the surface of the site to pre-existing conditions. Once diminishing returns has been demonstrated in all treatment areas, the Subcontractor will decommission and remove from the site all treatment equipment furnished and installed for ISTT system operation. The Subcontractor will decontaminate all nondisposable equipment with a portable pressure washer or steam cleaner prior to removal from the site.

Decontamination water will be collected and pumped through liquid-phase granular activate carbon for contaminant removal and containerized for disposal in 55-gallon drums by the Subcontractor. Transport and disposal of containerized decontamination water will be provided by others; Bidders will include the projected volume of water generated by decontamination activities but not the disposal costs in the proposal.

The Subcontractor will remove all surface infrastructure furnished, installed, or mobilized to the site for ISTT system operation, including the equipment pad and thermal/vapor cap. The Subcontractor will repair any damage caused by the Subcontractor to site facilities or improvements.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable. Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.11 Bid Item 4.1—Restoration: Subsurface

Description

Work for this Bid Item includes supply of equipment, labor, and materials required by the Subcontractor to restore the subsurface to pre-existing conditions. Once diminishing returns have been demonstrated and cool-down operations of Phase 3 have been completed, the Subcontractor will decommission and remove from the site all treatment equipment furnished and installed for ISTT system operation.

The Subcontractor will remove all subsurface infrastructure furnished or installed for ISTT system operation. The Subcontractor will abandon all borings and subsurface system infrastructure by cutting off subsurface structures 3 feet bgs and grouting the infrastructure in place. System infrastructure

constructed without structural casing material will be abandoned by grouting in place. CH2M will be responsible for coordinating transport and disposal of the soil cuttings, and the Subcontractor will not include these costs in the proposal.

Regardless of abandonment method used, the Subcontractor will grout the boreholes to ground surface with neat cement grout. The Subcontractor will allow for "topping off" the boreholes with additional neat cement grout after a period of 24 hours to account for shrinkage or loss of cement in the subsurface. The Subcontractor may engage lower-tier Subcontractors as necessary to complete this work. All abandonment work will be conducted by a Michigan-licensed driller and under the observation of, and to the satisfaction of, CH2M. The Subcontractor will be responsible for submitting drilling permits and fees associated with all well abandonment work in accordance with local and state regulations and procedures (see Optional Line Item 1 in Appendix B).

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable. Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.12 Bid Item 5.0—Demobilization and Reporting

Description

Work for this Bid Item includes the removal and transport of all equipment, tools, supplies, materials, and personnel from the site upon completion of the work. This Bid Item also includes removal of all temporary facilities and controls required for completion of the work. Temporary facilities and controls include, but are not limited to, the Subcontractor separate temporary onsite office/trailer space and temporary power; onsite sanitary/shower and other temporary utilities; Subcontractor equipment/material storage areas (i.e., laydown areas); and water storage facilities.

To document completion of the defined treatment objective, the Subcontractor will prepare and submit a final report detailing performance of the ISTT system installed and operated at the site. The final report will include a description of the system installed, document project milestones and summarize process and analytical data collected by the Subcontractor during ISTT system operation. The final report will document performance of the heating, vapor extraction, and ancillary treatment systems installed; discussion of system modifications to fulfill treatment objectives will also be included, if warranted. The final report is intended to chronicle corrective action at the site by the ISTT system from start to finish, including construction, operation, site restoration, and demobilization activities.

Measurement

This Bid Item will be measured on a firm-fixed-price basis.

Payment

Payment will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable. Progress payments will be made as described in the Contract based upon estimated percent complete as determined by CH2M.

2.7.1.13 Bid Item 6.0—Payment Bond

Description: Payment Bond. This bid item includes the Subcontractor cost to provide a Payment Bond in the full amount of the subcontract value before project activities begin.

Measurement: This Bid Item will be measured on a lump-sum basis.

Payment: Payment for this Bid Item will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable.

2.7.1.14 Bid Item 6.1—Performance Bond

Description: Performance Bond. This bid item includes the Subcontractor cost to provide a performance bond in the full amount of the subcontract value before project activities begin. This bid item is considered mandatory and is a requirement of the bidders completed proposal.

Measurement: This Bid Item will be measured on a lump-sum basis.

Payment: Payment for this Bid Item will be made upon review and acceptance by CH2M for the total value listed for this Bid Item on the Proposal Form, as applicable.

2.8 Value-Added Contributions

Bidders are encouraged to develop, prepare, and submit proposals to use materials, equipment, or methods that differ from those specified in the Bid Documents, if, in the Bidder's opinion, it would improve cost efficiencies in ISTT system installation or operation, as specified herein. Strategies to carry out the work under contract conditions different from those specified in the Bid Documents, in the form of a value-added contributions to ISTT system design or delivery, are also of interest to CH2M.

Value-added contributions are intended to identify methods for performing contract requirements more economically. Contributions must offer considerable opportunities for savings while being consistent with the functional requirements of the Bid Documents. Bidder participation in the identification of value-added contributions is voluntary; participation if elected must include the following:

- Preparation a Base Bid consistent with the exact requirements of this PWS.
- Identification of value-added contributions, the basis for efficiency improvement (such as different materials, equipment, methods, or conditions), and supporting discussion, which includes the following:
 - A description of the difference between the existing Contract requirement and the proposed requirement and the advantages or disadvantages of each, including any objective test data
 - A list of the Contract requirements that must be changed, including Specification changes
 - A description and estimate of benefits or cost efficiencies gained if CH2M elects to implement Bidder value-added consideration(s)
 - Any actions or scheduling that must be implemented in order to achieve maximum cost reduction related to the Value Engineering Change Proposal.

CH2M may accept or reject in whole or in part any value-added contribution proposed, without explanation or consideration, at CH2M's discretion. Additionally, value-added changes proposed that result in less than \$10,000 savings will not be considered.

Works Cited

CH2M HILL, Inc. (CH2M). 2013. Report Velsicol Burn Pit Superfund Site, Remedial Investigation/Feasibility Study, St. Louis, Gratiot Country, Michigan.

CH2M HILL, Inc. (CH2M). 2014. Focused Feasibility Study Velsicol Burn Pit, OU1, St. Louis, Michigan.

CH2M HILL, Inc. (CH2M). 2016. Velsicol Burn Pit Superfund Site, Operable Unit 1 (Source Area) Treatability Study Approach Technical Memorandum.

CH2M HILL, Inc. (CH2M). 2017. In Situ Thermal Treatment System Treatability Study Results – Velsicol Burn Pit Superfund Site, St. Louis, Michigan.

Weston Solutions of Michigan, Inc. (Weston). 2006. *Remedial Investigation Report for Operable Unit One Velsicol Chemical Corporation Superfund Site St. Louis, Gratiot County, Michigan*.

Weston Solutions of Michigan, Inc. (Weston). 2009. *Remedial Investigation Addendum Report for Operable Unit One Velsicol Chemical Corporation Superfund Site St. Louis, Gratiot County, Michigan.*

Figure



400 800 Feet

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\\BROOKSIDE\GIS_SHARE\ENBG\00_PROJ\E\EPA\VELSICOL_SUPERFUNDSITE\REPORTS\VELSICOLBURNPIT_OU1_ISTT_RD_2016\MAPFILES\LM_2017_REQUESTS\REVISED_TATM_FIGURES\FIGURE_01_VELSICOL_BURNAREA_SITELOCATIONMAP.MXD MPETERSH 4/21/2017 2:28:42 PM

Figure 1 Site Location Map *Velsicol Burn Pit Superfund Site St. Louis, Michigan*



Appendix A Subcontract Agreement Files to be included for distribution to Bidders

Appendix B Compensation Schedule

ATTACHMENT B-COMPENSATION SCHEDULE

In-Situ Thermal Treatment System

Velsicol Burn Pit Superfund Site, St. Louis, Michigan

Proposals shall include all Fixed Unit Rate (FUR) or Lump Sum (LS) estimated prices to perform the complete scope of work and as detailed in the Performance Work Statment. Quantities presented below are not guaranteed; therefore, only actual quantities will be reimbursed. Bid prices shall include all labor, equipment, materials, allowances, taxes, contingencies, and insurance, overhead, and profit to complete the activities specified in the Performance Work Statement. Submitted pricing shall be valid for 365 days.

Bid Item	Bid Item Description	Estimated Quantity	Unit Rate	Lump Sum Price
1.0	System Design	1	LS	\$
2.0	Work Plans, Schedules and Permits	1	LS	\$
2.1	Mobilization	1	LS	\$
2.2	Site Controls	1	LS	\$
3.0	Furnish and Install Underground ISTT System Components	1	LS	\$
	Estimate of Solid Waste Generated		tons	
	Estimate of Liquid Waste Generated		gallons	
3.1	Furnish and Install Aboveground ISTT System Components	1	LS	\$
3.2	Commissioning and Startup of ISTT System	1	LS	\$
3.3	Operate ISTT System	1	LS	\$
3.3	Operate ISTT System - Weekly Unit Rate		weekly	\$
	Total Electrical Power Required		kWh	
	Total Natural Gas Required		M Therms	
	Total Potable Water Required		gallons	
	Estimate of Total Liquid Waste Generated		gallons	
	Total Granular Activated Carbon Required (Liquid)		lbs	
	Total Granular Activated Carbon Required (Vapor)		lbs	
	Estimate of Solid Waste Generated		tons	
3.4	Performance Verification	1	LS	\$
4.0	Restoration: Surface	1	LS	\$
4.1	Restoration: Subsurface	1	LS	\$
5.0	Demobilization and Reporting	1	LS	\$
6.0	Payment Bond	1	LS	\$
6.1	Performance Bond	1	LS	\$
	Total Base Bid Subtotal (Bid Items 1.0 through 6.1)			\$
8.0	Value Added Contributions (Note 3)			
	Cost offset associated with reduction of insurance provisions	1	LS	\$
	Cost offset associated with removal of Waiver of Subrogation	1	LS	\$
		1	LS	\$
		1	LS	\$
		1	LS	\$
Optional Line Item 1:	Well Abandonment		LF	\$
Optional Line Item 2:	Additional Insurance Requirements (if Bidder cannot meet limits required in RFP)	1	LS	\$

Notes:

1. Unit Rates and Lump Sum Costs shall remain fixed for the duration of the project.

2. No provisions for escalation will be allowed.

3. Bidders are instructed to respond to the base bid and present a base bid subtotal. Cost offsets associated with the items in Bid Item No. 8 can be summarized on this form and described in more detail in the Value Added Contribution section of the bid.

Abbreviations: LS = Lump Sum; kWh = kilowatt hours; lbs = pounds; M Therms=million therms

Signature of Authorized Contractor Representative

Name of Contractor

Appendix C CH2M Forms Files to be included for distribution to Bidders

Appendix D Site Data Package Files to be included on DVD for distribution to Bidders

Site Data Package

Files included on DVD for distribution to Bidders.

Elements of the Site Data Package

Velsicol Burn Pit Superfund Site Performance Work Statement

File Folder	Contents
Soil & GW Data with Location Map	Velsicol Burn Pit Data summary table of soil and groundwater collected during the 2004 – 2006, 2009, and 2012 remedial investigations. Sample Location map. VOC distribution map.
NAPL Data	Data summary table of NAPL characterization data collected during the 2004–2006 remedial investigation and the 2016 remedial design investigation. Data summary table of NAPL gauging of existing site monitoring wells.
AutoCAD Files	Treatment area boundaries and treatment shapes. Till unit contour map. Topographic map.
Cross Sections and Cross Section Location Maps	Cross sections and locations based on 2004 – 2006, 2009, and 2012 remedial investigation data.
MIP Data and Boring Logs	Membrane Interface Probe (MIP) raw data package containing MIP sensor outputs and completed boring logs.
ROD	2015 Record of Decision.
Soil Boring Logs	Boring logs completed during the 2006, 2009, and 2012 remedial investigations.
Well Construction Diagrams	Well construction diagrams completed during the 2006, 2009, and 2012 remedial investigations
Treatment Area Technical Memorandum	Treatment Area Technical Memorandum – defined ISTT target treatment zone. Includes supporting graphics, mass estimates, and Earth Volumetric Studio modules.
Slug Test Data	Location map for nearby shallow unit slug test and data.
Groundwater Data	Groundwater conductivity data, total dissolved solids, ferrous and total iron in groundwater, major cations and anions, alkalinity, and pH data, if available for monitoring wells in the vicinity of treatment area.
Soil Geotech Parameters	Available grain-size analysis data from soil borings in the vicinity of the treatment area.

Appendix E Substantive Requirements Documents

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Special Conditions	5
Emission Unit Summary Table	5
Special Conditions for EUREMEDIATION	5
Appendix A	9

Common Abbreviations / Acronyms

	Common Acronyms	Pollutant / Measurement Abbreviations			
AQD	Air Quality Division	acfm	Actual cubic feet per minute		
BACT	Best Available Control Technology	BTU	British Thermal Unit		
CAA	Clean Air Act	°C	Degrees Celsius		
CAM	Compliance Assurance Monitoring	со	Carbon Monoxide		
CEM	Continuous Emission Monitoring	CO ₂ e	Carbon Dioxide Equivalent		
CFR	Code of Federal Regulations	dscf	Dry standard cubic foot		
COM	Continuous Opacity Monitoring	dscm	Dry standard cubic meter		
Department/ department	Michigan Department of Environmental Quality	°F gr	Degrees Fahrenheit Grains		
EU	Emission Unit	HAP	Hazardous Air Pollutant		
FG	Flexible Group	Hg	Mercury		
GACS	Gallons of Applied Coating Solids	hr	Hour		
GC	General Condition	HP	Horsepower		
GHGs	Greenhouse Gases	H_2S	Hydrogen Sulfide		
HVLP	High Volume Low Pressure*	kW	Kilowatt		
ID	Identification	lb	Pound		
IRSL	Initial Risk Screening Level	m	Meter		
ITSL	Initial Threshold Screening Level	mg	Milligram		
LAER	Lowest Achievable Emission Rate	mm	Millimeter		
MACT	Maximum Achievable Control Technology	MM	Million		
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts		
MAP	Malfunction Abatement Plan	NMOC	Non-methane Organic Compounds		
MDEQ	Michigan Department of Environmental	NO _x	Oxides of Nitrogen		
MODO	Material Safety Data Sheet	ng	Nanogram		
NA	Not Applicable	РМ	Particulate Matter		
NAAOS	National Ambient Air Quality Standards	PM10	microns in diameter		
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM2.5	Particulate Matter equal to or less than 2.5		
NSPS	New Source Performance Standards	pph	Pounds per hour		
NSR	New Source Review	ppm	Parts per million		
PS	Performance Specification	ppmv	Parts per million by volume		
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight		
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute		
PTI	Permit to Install	psig	Pounds per square inch gauge		
RACT	Reasonable Available Control Technology	scf	Standard cubic feet		
ROP	Renewable Operating Permit	sec	Seconds		
SC	Special Condition	SO ₂	Sulfur Dioxide		
SCR	Selective Catalytic Reduction	TAC	Toxic Air Contaminant		
SNCR	Selective Non-Catalytic Reduction	Temp	Temperature		
SRN	State Registration Number	THC	Total Hydrocarbons		
TEQ	Toxicity Equivalence Quotient	tpy	Tons per year		
USEPA/EPA	United States Environmental Protection	μg	Microgram		
VE	Visible Emissions	μm	Micrometer or Micron		
ν⊏		voc	Volalie Organic Compounds Year		
		יע	i oui		

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

GENERAL CONDITIONS

Remedial actions performed under the Comprehensive Environmental Compensation and Liability Act (CERCLA) are relieved from administrative permitting requirements as stipulated by CERCLA Law, Chapter 103, Subchapter I, Section 9621(e). Under CERCLA, an air discharge permit is not required for the operation of remediation systems, in this instance the site specific operation of the in-situ thermal treatment system and associated vapor treatment system at the Velsicol Chemical Superfund Site to remediate non-aqueous phase liquid/1,2-dibromo-3-chloropropane Area 1 (NAPL/DBCP Area 1). However, as identified in the June 2012 Record of Decision (ROD) Michigan Air Pollution Rules (Michigan Administrative Code R 336.1101-2910) are considered Applicable or Relevant and Appropriate Criteria (ARARs) for this remedial action. As such, the substantive requirements of the statue must be met and this Substantive Requirement Document (SRD) serves as the mechanism for compliance with this ARAR. In this document the term "permittee" refers to the SRD holder and is retained to be consistent with other similar documents. Additionally, the Michigan rule citations contained herein are included for reference, and only those presenting substantive requirements are relevant.

- The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. (R 336.1201(1))
- 2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. (R 336.1201(4))
- 3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R 336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. (R 336.1201(6)(b))
- 4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. (R 336.1201(8), Section 5510 of Act 451, PA 1994)
- 5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to R 336.1219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of R 336.1219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environmental Quality. (R 336.1219)
- 6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. (R 336.1901)
- 7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). (R 336.1912)

- 8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.
- 9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.
- 10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.
- 11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R 336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R 336.1303. (R 336.1301)
 - a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
 - b) A visible emission limit specified by an applicable federal new source performance standard.
 - c) A visible emission limit specified as a condition of this Permit to Install.
- Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R 336.1370(2). (R 336.1370)
- 13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R 336.2001 and R 336.2003, under any of the conditions listed in R 336.2001. (R 336.2001)

SPECIAL CONDITIONS

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Process Equipment & Control Devices)	Flexible Group ID				
EUREMEDIATION	Soil and groundwater remediation process using electrically generated heat to volatilize subsurface contaminants by boiling groundwater. Steam and contaminant vapors will be recovered from the subsurface using multiphase extraction wells. The extracted vapor will be cooled and moisture separators will be used to remove water and condensed contaminants. Remaining vapor will be directed to a thermal oxidizer. Exhaust from the oxidizer will be quenched and directed through a caustic scrubber for acid gas neutralization. Following the scrubber, the exhaust will pass through one of two dual stage activated carbon systems. If the thermal oxidizer is offline, both carbon systems would be used to provide emission control.	NA				
Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1290.						

The following conditions apply to: EUREMEDIATION

DESCRIPTION: Soil and groundwater remediation process using electrically generated heat to volatilize subsurface contaminants by boiling groundwater. Steam and contaminant vapors will be recovered from the subsurface using multiphase extraction wells. The extracted vapor will be cooled and moisture separators will be used to remove water and condensed contaminants. Remaining vapor will be directed to a thermal oxidizer. Exhaust from the oxidizer will be quenched and directed through a caustic scrubber for acid gas neutralization. Following the scrubber, the exhaust will pass through one of two dual stage activated carbon systems. If the thermal oxidizer is offline, both carbon systems would be used to provide emission control.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT: Thermal oxidizer, caustic scrubber, and dual stage activated carbon.

I. EMISSION LIMITS

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Testing / Monitoring Method	Underlying Applicable Requirements
1. VOC	0.03 tpy	12-month rolling time period as determined at the end of each calendar month.	EUREMEDIATION	SC VI.6	R 336.1225 R 336.1702(a)

II. MATERIAL LIMITS

N/A

III. PROCESS/OPERATIONAL RESTRICTIONS

- The permittee shall not operate EUREMEDIATION unless a malfunction abatement plan (MAP) as described in Rule 911(2) has been submitted to the AQD District Supervisor at least 30 days prior startup of EUREMEDIATION, and is implemented and maintained. The MAP shall, at a minimum, specify the following:
 - a) A complete preventative maintenance program including identification of the supervisory personnel responsible for overseeing the inspection, maintenance, and repair of air-cleaning devices, a description of the items or conditions that shall be inspected, the frequency of the inspections or repairs, and an identification of the major replacement parts, including carbon canisters, that shall be maintained in inventory for quick replacement.
 - b) An identification of the source and air-cleaning device operating variables that shall be monitored to detect a malfunction or failure, the normal operating range of these variables, and a description of the method of monitoring or surveillance procedures.
 - c) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

If at any time the MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the MAP within 45 days after such an event occurs. The permittee shall also amend the MAP within 45 days, if new equipment is installed or upon request from the District Supervisor. The permittee shall submit the MAP and any amendments to the MAP to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the MAP or amended MAP shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to achieve compliance with all applicable emission limits. (R 336.1224, R 336.1225, R 336.1702(a), R 336.1910, R 336.1911)

IV. DESIGN/EQUIPMENT PARAMETERS

- The permittee shall not operate EUREMEDIATION unless the thermal oxidizer, caustic scrubber, and activated carbon system are installed, maintained, and operated in a satisfactory manner. Satisfactory operation of the thermal oxidizer includes maintaining a minimum combustion chamber temperature of 1,750°F, a 60 minute average combustion chamber temperature of 1,800°F based on instantaneous or block average readings collected at least every 15 minutes, and a minimum residence time of 2 seconds as calculated based on measured vapor flowrates through the system and the volume of the combustion chamber. Satisfactory operation of the thermal oxidizer and/or scrubber includes maintaining the pH between 6.0 and 8.0. In the event of a malfunction of the thermal oxidizer and/or scrubber, the permittee shall use both activated carbon systems to control the emissions while the thermal oxidizer and/or scrubber are not operating. (R 336.1225, R 336.1224, R 336.1702(a), R 336.1910)
- 2. The permittee shall install, calibrate, maintain and operate in a satisfactory manner a device to monitor and record the temperature of the combustion chamber of the thermal oxidizer on a continuous basis. Monitoring and recording of data "on a continuous basis" is defined as an instantaneous data point recorded at least once every 15 minutes. The permittee may record block average values for 15 minute or shorter periods calculated from all measured data values during each period. The device shall generate an alarm if the temperature falls below 1,750°F. (R 336.1225, R 336.1702(a), R 336.1910)
- 3. The permittee shall install, calibrate, maintain and operate in a satisfactory manner a device to monitor and record the pH of the caustic scrubber liquid on a continuous basis. Monitoring and recording of data "on a continuous basis" is defined as an instantaneous data point recorded at least once every 15 minutes. The permittee may record block average values for 15 minute or shorter periods calculated from all measured data values during each period. The device shall generate an alarm if the pH falls below 6.0 or goes above 8.0. (R 336.1224, R 336.1225, R 336.1910)

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. (R 336.1201(3))

1. The permittee shall test, in a satisfactory manner, in-use the dual-stage activated carbon system for breakthrough of the first canister at least once per week. The permittee shall evaluate breakthrough via Summa canister sampling followed by laboratory analysis; by use of a hand-held instrument capable of detecting concentrations at the levels expected; or an equivalent method. The permittee shall conduct an initial test and shall record the initial reading as soon as the process has reached a steady state condition, but not later than 12 hours after start-up of the process. Breakthrough is considered a reading at the point between the first and second canisters that is 20 percent or more of the influent concentration into the first canister. If breakthrough is detected, the permittee shall switch to the other activated carbon system and replace the carbon in the first canister and reverse the operating order of the vessels. The permittee shall repeat the initial test each time a carbon canister is replaced and shall use the resulting influent concentration to establish breakthrough. The permittee shall submit any request for a change in the testing frequency to the AQD District Supervisor for review and approval. (R 336.1225, R 336.1702(a), R 336.1910)

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. (R 336.1201(3))

- 1. The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any monitoring/recordkeeping special condition. (R 336.1225, R 336.1224, R 336.1702(a))
- The permittee shall monitor and record, in a satisfactory manner, the flow rate and the total VOC concentration of the effluent stream of the first stage activated carbon canister. This shall be done on a weekly basis. The permittee shall submit any request for a change in the sampling frequency to the AQD District Supervisor for review and approval. (R 336.1225, R 336.1702(a), R 336.1910)
- The permittee shall keep, in a satisfactory manner, records of each change of carbon and of each measurement of the influent concentration into the first stage contactor. The permittee shall keep all records on file and make them available to the Department upon request. (R 336.1225, R 336.1702(a), R 336.1910)
- 4. The permittee shall monitor and record the temperature of the combustion chamber of the thermal oxidizer on a continuous basis. Monitoring and recording of data "on a continuous basis" is defined as an instantaneous data point recorded at least once every 15 minutes. The permittee may record block average values for 15 minute or shorter periods calculated from all measured data values during each period. (R 336.1225, R 336.1702(a), R 336.1910)
- 5. The permittee shall keep, in a satisfactory manner, records of the 60 minute average combustion chamber temperature of the thermal oxidizer. The permittee shall keep all records on file and make them available to the Department upon request. (R 336.1224, R 336.1225, R 336.1702(a), R 336.1910)
- The permittee shall keep, in a satisfactory manner, records of the pH of the liquid in the caustic scrubber. The permittee shall keep all records on file and make them available to the Department upon request. (R 336.1224, R 336.1225, R 336.1702(a), R 336.1910)
- 7. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period calculations of VOC emission rates for EUREMEDIATION. The permittee shall keep all records on file and make them available to the Department upon request. (R 336.1225, R 336.1702(a))

VII. <u>REPORTING</u>

- 1. The permittee shall submit the following to the AQD District Supervisor using Appendix A or an approved equivalent method:
 - a) The flow rate and the total VOC concentration of the effluent stream of the first stage activated carbon canister, measured as required by SC VI.2.
 - b) Calculations of VOC emission rate.

The information shall be submitted within 30 days following collection of the initial data, and thereafter within 30 days following the end of the month in which the data were collected. The data may be submitted either in hard-copy format or electronically. The permittee must submit any request for a change in the reporting frequency to the AQD District Supervisor for review and approval. (R 336.1225, R 336.1702(a), R 336.1910)

VIII. STACK/VENT RESTRICTIONS

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter/ Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVREMED	28	45	R 336.1225, 40 CFR 52.21 (c) & (d)

IX. OTHER REQUIREMENTS

N/A

Footnotes:

¹This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

APPENDIX A Soil Remediation Emission Calculation and Recordkeeping

Source Name		Contact Person		
Location		County		
Recordkeeping P	eriod	Pollutant(s)		
Start Date	End Date			

	V	С	Es	Ps
Date	Air Volume Flow Rate (ft ³ /min)	Inlet Concentration (mg/m ³) ¹	Control Efficiency (Percent)	VOC Emissions (lbs/hr) ²
EXAMPLE	1,000	10,000	95	1.9

¹ Parts per million (ppm) in air is by volume and does not equal milligrams per liter (mg/ ℓ). ² Identify which pollutant the emissions are being calculated for.

EQUATION TO CALCULATE EMISSIONS:

$$P_{s} \frac{lbs}{hr} = V \frac{ft^{3}}{min} \times 0.02832 \frac{m^{3}}{ft^{3}} \times 60 \frac{min}{hr} \times C \frac{mg}{m^{3}} \times 0.001 \frac{g}{mg} \times 0.002205 \frac{lbs}{g} \times \frac{(100 - E_{s})}{100}$$

Signature:

Date:

Telephone No.:

MIU990036 STATE OF MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Reunspick

SUBSTANTIVE REQUIREMENTS DOCUMENT FOR THE VELSICOL CHEMICAL CORPORATION SUPERFUND SITE

Authorization to (hereinafter referred to as the "discharger"):

U.S. Environmental Protection Agency Region V Superfund Division

77 West Jackson Boulevard Chicago, Illinois 60604

is authorized to discharge from the Velsicol Chemical Corporation Superfund Site, NAPL/DBCP Area 1, In Situ Thermal Treatment, Operable Unit 1 located at

324 North Avenue St. Louis, Michigan 48880

designated as Velsicol Chemical Corp SF Site

In accordance with Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 *et seq.*; "CERCLA") and the Superfund Amendments and Reauthorization Act (Public Law No. 99-499, "SARA"), the Water Resources Division of the Michigan Department of Environmental Quality, in compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. 1251 *et seq.*, as amended; the "Federal Act"); Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Part 41, Sewerage Systems, of the NREPA; and Michigan Executive Order 2011-1, which are legally applicable or relevant and appropriate requirements (ARARs), herein establishes substantive requirements for a discharge of treated groundwater to the Pine River at Latitude 43.41202, Longitude -84.61851 in St. Louis, Gratiot County, Michigan.

These substantive requirements are based on information (hereinafter referred to as the "application") received on **April 26, 2016, as amended through June 13, 2016**, which provided a description of the wastewater characteristics and proposed treatment. If new information is received subsequent to the date of this document, these substantive requirements may be revised if necessary to protect the receiving waters consistent with the Act and the NREPA.

Unless specified otherwise, all contact with the Michigan Department of Environmental Quality (the "Department") required by this document shall be made to the Lansing District Supervisor of the Water Resources Division. The Lansing District Office is located at 525 West Allegan Street, 1st Floor, South Tower, Lansing, Michigan 48933, Telephone: 517-284-6651, Fax: 517-241-3571.

This document is not a National Pollutant Discharge Elimination System (NPDES) permit. An NPDES permit is not currently required for this on-site remedial action associated with a CERCLA cleanup, however, an NPDES permit shall be required to authorize any discharges from this site under any circumstances not exempted by CERCLA Section 121(e)(1).

Date: February 23, 2018

Christine Alexander, Manager Permits Section Water Resources Division

Section A. Limitations and Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A

This document is based on the discharge of a maximum 0.0648 million gallons per day of treated groundwater, condensate, and scrubber water blowdown, and water conditioner blowdown and cooling water blowdown from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to the Pine River. Such discharge shall be limited and monitored by the discharge as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring	Sample
<u>Parameter</u>	Monthly	Daily	<u>Units</u>	Monthly	<u>Daily</u>	<u>Units</u>	Frequency	Туре
Flow	(report)	(report)	MGD				Daily	Report Total Daily Flow
Total Residual Chlorine					38	ug/l	Weekly	Grab
Temperature					(report)	°F	Weekly	Grab
Copper		0.05	lbs/day		98	ug/l	Weekly	Grab
Zinc		0.59	lbs/day		1,100	ug/l	Weekly	Grab
Total Phosphorus (as P)	0.54	(report)	lbs/day	1.0	(report)	mg/l	Monthly	Grab
Total Mercury Corrected Uncorrected Field Duplicate Field Blank Laboratory Method Blank	0.0000007 <	(report) 	lbs/day 	1.3 	(report) (report) (report) (report) (report)	ng/l ng/l ng/l ng/l ng/l	Monthly Monthly Monthly Monthly Monthly	Calculation Grab Grab Preparation Preparation
Acute Toxicity – Ceriodaphni	<i>ia dubia</i> & fat 	thead minr	IOW		1.0	TUa	see Part I.A.1.d.	Grab
Outfall Observation	(report)						3 x Weekly	Visual
				Minimum <u>Daily</u>				
рН				6.5	9.0	S.U.	Weekly	Grab

a. Narrative Standard

The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Outfall Observation

Outfall observation shall be reported as "yes" or "no." The discharge shall report "yes" if this requirement was completed and "no" if this requirement was not completed. Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

c. Total Mercury Testing Requirements

The analytical protocol for total mercury shall be in accordance with US EPA Method 1631, Revision E, "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry," EPA-821-R-02-019, August 2002. The quantification level for total mercury shall be 0.5 ng/l, unless a higher level is

Section A. Limitations and Monitoring Requirements

appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The use of clean technique sampling procedures is required unless the discharger can demonstrate to the Department that an alternative sampling procedure is representative of the discharge. Guidance for clean technique sampling is contained in US EPA Method 1669, "Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels," EPA-821-R96-001, July 1996. Information and data documenting the dischargers's sampling and analytical protocols and data acceptability shall be submitted to the Department upon request.

In order to demonstrate compliance with US EPA Method 1631E and US EPA Method 1669, the discharger shall report, on the daily sheet, the analytical results of all field blanks and field duplicates collected in conjunction with each sampling event, as well as laboratory method blanks when used for blank correction. The discharger shall collect at least one (1) field blank and at least one (1) field duplicate per sampling event. If more than ten (10) samples are collected during a sampling event, the discharger shall collect at least one (1) additional field blank AND field duplicate for every ten (10) samples collected. Only field blanks or laboratory method blanks may be used to calculate a concentration lower than the actual sample analytical results (i.e., a blank correction). Only one (1) blank (field OR laboratory method) may be used for blank correction of a given sample result, and only if the blank meets the quality control acceptance criteria. If blank correction is not performed on a given sample analytical result, the discharger shall report under 'Total Mercury – Corrected' the same value reported under 'Total Mercury – Uncorrected.' The field duplicate is for quality control purposes only; its analytical result shall not be averaged with the sample result.

After one (1) year of total mercury monitoring, the discharger may request a reduction in monitoring frequency. This request shall contain an explanation as to why the reduced monitoring is appropriate and shall be submitted to the Department. Upon receipt of written approval and consistent with such approval, the discharger may reduce the monitoring frequency for total mercury indicated in Part I.A.1. of this document. The monitoring frequency shall not be reduced to less than quarterly. The Department may revoke the approval for reduced monitoring at any time upon notification to the discharger.

d. Acute Toxicity Requirements

Test species shall include fathead minnow **and** *Ceriodaphnia dubia*. Testing and reporting procedures shall follow procedures contained in EPA/600/4-90/027F, "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fifth Edition)." Toxicity tests shall be conducted three times during the project duration according to the following schedule:

1) A baseline sample shall be collected to coincide with initiation of system operations.

2) A sample shall be collected <u>within 5 days</u> of the occurrence of peak contaminant removal. The discharger shall provide documentation with the analytical test results demonstrating that peak contaminant mass removal has occurred.

3) A sample shall be collected after subsurface cooling has commenced.

The acute toxic unit value (TUa) for **each species tested** shall be reported on the Discharge Monitoring Report (DMR). For **each species not tested**, the discharger shall enter **"*W"** on the DMR. Completed toxicity test reports for each test conducted shall be retained by the discharger in accordance with the requirements of Part II.B.5. of this document permit and shall be available for review by the Department upon request.

Toxicity test data acceptability is contingent upon the validation of the test method by the testing laboratory. Such validation shall be submitted to the Department upon request.

2. Final Effluent Limitations, Monitoring Point 001B

During the period beginning on the effective date of this document, the discharger is authorized to discharge an unspecified amount of treated groundwater and condensate from Monitoring Point 001B through Monitoring Point 001A and Outfall 001. Outfall 001 discharges to the Pine River. Such discharge shall be limited and monitored by the discharge as specified below.

Section A. Limitations and Monitoring Requirements

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring Sample	
<u>Parameter</u>	Monthly	Daily	Units	Monthly	Daily	Units	Frequency	Туре
		INFLUE	NI MONI	IORING AND	REPORT	ING		
2 3 7 8-Tetrachlorodibenzo-p	-dioxin (2.3.7	(.8-TCDD)						
2,0,1,0 10000000000000000				(report)	(report)	ppq	Weekly	Grab
2,3,7,8-TCDD Toxicity Equiva	alence Conce	entration (T	EC)	(roport)	(report)	ppg	Mookly	Grah
				(report)	(report)	ррд	VVEEKIY	Grab
Total Polychlorinated Biphen	vls (PCBs)							
Total PCBs	J.= (. = = -) 			(report)	(report)	ug/l	Weekly	Calculation
Aroclor 1016					(report)	ug/l	Weekly	Grab
Aroclor 1221					(report)	ug/l	Weekly	Grab
Aroclor 1232					(report)	ug/l	Weekly	Grab
Aroclor 1242					(report)	ug/l	Weekly	Grab
Aroclor 1242					(report)	ua/l	Weekly	Grab
Aroclor 1240					(report)	ua/l	Weekly	Grab
Alocior 1204					(report)	ug/l	Weekly	Grab
					(100011)	ag.		
Total Dichlorodiphenvltrichlor	roethane (DD)T)						
Total DDT				(report)	(report)	ua/l	Weekly	Calculation
				(report)	(report)	ua/l	Weekly	Grab
4 4'-DDF				(report)	(report)	ua/l	Weekly	Grab
	20 m m			(report)	(report)	ua/l	Weekly	Grab
4,4 -000				(report)	(roport)	u.g/1		
Hexachlorobenzene				(report)	(report)	ug/l	Weekly	Grab
Chlordono				(report)	(report)	ua/l	Weekly	Grab
Chlordane				(report)	(icpoir)	ugn	Vicenty	Ciub
Aldrin				(report)	(report)	ua/l	Weekly	Grab
, udini				((.	
Beta-Hexachlorocyclohexan	ə			(report)	(report)	ug/l	Weekly	Grab
						-	-	
Total BETX (benzene, ethylk	enzene, tolu	ene, xylene	es)					
Total BETX				(report)	(report)	ug/l	Weekly	Calculation
Benzene				(report)	(report)	ug/l	Weekly	Grab
Ethylbenzene				(report)	(report)	ug/l	Weekly	Grab
Toluene				(report)	(report)	ug/l	Weekly	Grab
Xvlene				(report)	(report)	uq/l	Weekly	Grab
Xylene				(()	- 3-	, and the second s	
1,2,4-Trichlorobenzene					(report)	ug/l	Weekly	Grab
1,2-Dichloroethane					(report)	ug/l	Weekly	Grab
					<i>i</i> 0			Orah
Chlorobenzene					(report)	ug/i	VVeekiy	Grab
					(Mookhy	Croh
Vinyl Chloride					(report)	ug/I	vveekiy	Grad
					(Month	Croh
Acetone					(report)	ug/I	vveekiy	GIAD
M II I. Old II					(ronant)	u~/!	Mookly	Grah
Methylene Chloride					(report)	ug/i	vveekiy	Glab

Section A. Limitations and Monitoring Requirements

	Maximum Limits for Maximum Limits for Quantity or Loading Quality or Concentration Monitoring Sample									
Parameter	Monthly	Daily	Units	Monthly	Daily	<u>Units</u>	Frequency	Туре		
			UNITORIN	G AND REPL	RTING CO	JNTINU	ED			
Bromobenzene					(report)	ug/l	Weekly	Grab		
4-Chlorobenzene Sulfonic Aci	d				(report)	ug/l	Weekly	Grab		
						<u>ATINO</u>				
2,3,7,8-TCDD (see I.A.2.n.)										
		-			(report)	ppq	Weekly	Grab		
	n)									
2,3,7,0-1000 120 (See I.A.2.	<i>)</i>				(report)	ppg	Weekly	Grab		
					(FFA		0.00		
Total PCBs										
I otal PCBs					(report)	ug/l	Weekly	Calculation		
Arocior 1016					(report)	ug/l	VVeekly	Grab		
Aroclor 1221					(report)	ug/i	VVeekiy	Grab		
Alociol 1232					(report)	ug/i	Veekiy	Grab		
AIUCIUI 1242					(report)	ug/i	Veekiy	Grab		
Alocior 1240					(report)	ug/i	Weekiy	Grab		
Aroclor 1260					(report)	ug/i	Wookly	Grab		
Albeiol 1200					(report)	ugn	VVEEKIY	Grab		
Total DDT										
Total DDT					(report)	ua/l	Weeklv	Calculation		
4,4'-DDT					(report)	uq/l	Weekly	Grab		
4,4'-DDE			land land series		(report)	ug/l	Weekly	Grab		
4,4'-DDD					(report)	ug/l	Weekly	Grab		
					,	•	•			
Hexachlorobenzene					(report)	ug/l	Weekly	Grab		
Chlordane	ters max terr				(report)	ug/l	Weekly	Grab		
Aldrin					(report)	ua/l	Mookly	Grah		
Aidin					(report)	uyn	VVEERIY	Glab		
Beta-Hexachlorocyclohexane					(report)	ug/l	Weekly	Grab		
,						0	, ,			
Total BETX										
Total BETX					(report)	ug/l	Weekly	Calculation		
Benzene			100 000 001		(report)	ug/l	Weekly	Grab		
Ethylbenzene					(report)	ug/l	Weekly	Grab		
Toluene					(report)	ug/l	Weekly	Grab		
Xylene		Jan and say			(report)	ug/l	Weekly	Grab		
1.2.4 Trichlershenzone					(report)		Maakhy	Crah		
					(report)	ug/i	vveekiy	Gian		
1.2-Dichloroethane				2 11 111 121	(report)	ua/l	Weeklv	Grab		
.,					(- 9, '				
Chlorobenzene					(report)	ug/l	Weekly	Grab		

Section A. Limitations and Monitoring Requirements

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring	Sample		
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency	Туре		
INTERMEDIATE STAGE MONITORING AND REPORTING CONTINUED										
Vinyl Chloride					(report)	ug/l	Weekly	Grab		
Acetone					(report)	ug/l	Weekly	Grab		
Methylene Chloride					(report)	ug/l	Weekly	Grab		
Bromobenzene					(report)	ug/l	Weekly	Grab		
4-Chlorobenzene Sulfonic Ac	id				(report)	ug/l	Weekly	Grab		
DISCHARGE LIMITATIONS, MONITORING AND REPORTING										
Flow	(report)	(report)	MGD				Daily	Report Total Daily Flow		
2,3,7,8-TCDD (see I.A.2.n.)	(report)	(report)	lbs/day	(report)	<10	ppq	Weekly	Grab		
2,3,7,8-TCDD TEC (see I.A.2	.n.) 4.6x10 ⁻¹²	(report)	lbs/day	0.0086	(report)	ppq	Weekly	Grab		
Total PCBs Total PCBs Aroclor 1016 Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260	(report) 	(report) 	Ibs/day 	(report) 	(report) <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1	ug/l ug/l ug/l ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab Grab Grab Grab Grab		
Total DDT Total DDT 4,4'-DDT 4,4'-DDE 4,4'-DDD	(report) 	(report) 	lbs/day 	(report) 	(report) <0.01 <0.01 <0.01	ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab		
Hexachlorobenzene	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab		
Chlordane	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab		
Aldrin	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab		
Beta-Hexachlorocyclohexane	e 0.000014	(report)	lbs/day	0.03	(report)	ug/l	Weekly	Grab		
Total Endosulfan Endolsulfan I Endosulfan II Endosulfan Sulfate	 	0.00015 	lbs/day 	 	0.27 (report) (report) (report)	ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab		

Section A. Limitations and Monitoring Requirements

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring Sample	
<u>Parameter</u>	Monthly	Daily	Units	Monthly	Daily	Units	Frequency	Туре
Ī	DISCHARG	<u>E LIMITATI</u>	IONS, MOR	NITORING AI	ND REPOI	RTING C	ONTINUED	
Total Endrin		0 000093	lbs/dav		0 17	ua/l	Weekly	Calculation
Endrin Endrin Aldehyde					(report) (report)	ug/l ug/l	Weekly Weekly	Grab Grab
Polybrominated Biphenyls (P	BBs)							
, , , , , , , , , , , , , , , , , , ,	0.000025	(report)	lbs/day	0.05	(report)	ug/l	Weekly	Grab
Total BETX					00	· · ~ //) A / I du	Oslavistis
Benzene					20 (report)	ug/i ua/l	Weekly	Grab
Ethylbenzene		10 M 10	ters and way		(report)	ug/l	Weekly	Grab
Toluene					(report)	ug/l	Weekly	Grab
Xylene					(report)	ug/l	Weekly	Grab
1,2,4-Trichlorobenzene					5	ug/l	Weekly	Grab
1,2-Dichloroethane					5	ug/l	Weekly	Grab
Chlorobenzene					5	ug/l	Weekly	Grab
Vinyl chloride				201 PP 40	3	ug/l	Weekly	Grab
Acetone		16	lbs/day		30,000	ug/l	Weekly	Grab
Acrolein					2	ug/l	Weekly	Grab
Methylene Chloride				1 0 10 10	5	ug/l	Weekly	Grab
Bromobenzene	 '			(report)	(report)	ug/l	Weekly	Grab
4-Chlorobenzene Sulfonic Ac	id			(report)	(report)	ug/l	Weekly	Grab
Equipment Inspection	(report)						3 x Weekly	Visual

a. Analytical Testing

All samples shall be analyzed using EPA approved methods and reported at quantification levels below limits, unless otherwise specifically stated in this document. Total endosulfan, total endrin, and PBBs shall be analyzed using EPA Method 608 with a quantification limit of 0.01 ug/L. The quantification level for bromobenzene shall be 1 ug/L, and the quantification level for 4-chlorobenzene sulfonic acid shall be 0.01 ug/L. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

b. Best Available Technology Treatment

This document is based on the discharger providing in situ thermal treatment, bag filters, and multi-stage activated carbon. If a different treatment system is proposed, the discharger shall amend the application received on April 26, 2016, and amended through June 13, 2016. This document may then be modified to include additional effluent limitations to protect water quality in accordance with applicable rules and regulations.

c. Monitoring Locations

Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to treatment for all influent monitoring, prior to the final carbon stage for intermediate stage

Section A. Limitations and Monitoring Requirements

monitoring, and after treatment but prior to mixing with any other waste stream for all effluent monitoring.

d. Proper Operation and Maintenance

The discharger shall operate the multi-stage activated carbon treatment system such that the rotation of carbon stages and the replacement of spent carbon shall be initiated upon break-through of pollutants into the final treatment stage.

e. Equipment Inspection

Equipment inspection shall be reported as "yes" or "no." The discharger shall report "yes" if this requirement was completed and "no" if this requirement was not completed. The discharger shall inspect the treatment systems used to achieve compliance with the terms of this document. The discharger shall immediately implement any corrective action for the treatment system that is noted during the inspection.

f. Limits below the Quantification Level – Dioxins and Furans

1) Polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congener sampling, preservation, and handling procedures shall be in accordance with EPA Method 1613, Revision B. The analyses of these samples shall include the seventeen dioxin and furan congeners listed in Part I.A.2.f.5).

Analyses for the dioxin and furan congeners listed in Part I.A.2.f.5), to determine compliance with the toxicity equivalence concentration (TEC) limit, shall be conducted according to EPA Method 1613, Revision B. At a minimum, Method 1613, Revision B, congener specific quantification levels (i.e., minimum levels) for the dioxins and furan congeners listed in Part I.A.2.f.5) shall be achieved unless higher levels are appropriate because of sample matrix interference. If a higher quantification level(s) is(are) appropriate for any of the specified 17 congeners because of sample matrix interference, justification shall be submitted to the Department within 30 days of such determination.

2) The water quality-based effluent limitations (WQBELs) for the 2,3,7,8-TCDD congener are 0.0031 parts per quadrillion (ppq) and 1.7x10⁻¹² pounds per day (lbs/day) as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. Any discharge of the 2,3,7,8-TCDD congener at or above the quantification level of 10 ppq is a specific violation of this document. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.2.b.

For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<10 ppq." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This document does not authorize the discharge of the 2,3,7,8-TCDD congener at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to public health or welfare.

3) For purposes of reporting 2,3,7,8-TCDD TEC concentrations and loadings on the monthly DMR, a concentration value of zero shall be used in the TEC concentration and TEC loading calculations for any individual congener which is not present at or above its respective quantification level set forth in Part I.A.2.f.5). The equation for calculating the TEC value for each PCDD/PCDF sample is as follows:

 $(TEC)_{TCDD} = \Sigma(C)_x(TEF)_x(BEF)_x$

Where:

 $\begin{array}{l} (\text{TEC})_{\text{TCDD}} = 2,3,7,8\text{-TCDD} \text{ toxicity equivalence concentration in the discharge.} \\ (C)_x = \text{the concentration of congener } x \text{ in the discharge.} \\ (\text{TEF})_x = \text{toxicity equivalency factor for congener } x \text{ (see Table 1).} \\ (\text{BEF})_x = \text{bioaccumulation equivalency factor for congener } x \text{ (see Table 1).} \end{array}$

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Congener	TEF	BEF
2,3,7,8-TCDD	1.0	1.0
1,2,3,7,8-PeCDD	0.5	0.9
1,2,3,4,7,8-HxCDD	0.1	0.3
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.05
OCDD	0.001	0.01
2,3,7,8-TCDF	0.1	0.8
1,2,3,7,8-PeCDF	0.05	0.2
2,3,4,7,8-PeCDF	0.5	1.6
1,2,3,4,7,8-HxCDF	0.1	0.08
1,2,3,6,7,8-HxCDF	0.1	0.2
2,3,4,6,7,8-HxCDF	0.1	0.7
1,2,3,7,8,9-HxCDF	0.1	0.6
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.4
OCDF	0.001	0.02

Table 1. TEFs and BEFs for PCDDs and PCDFs

For each sample, measurements for any of the congeners specified in Part I.A.2.f.5) that are quantified and any specified congener measurements that are less than the quantification level but greater than the detection level shall be reported as a comment on the DMR Daily form for that day. Part I A.2.f.3) of this document does not authorize the discharge of PCDDs or PCDFs at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

4) The 2,3,7,8-TCDD congener concentrations and respective loading values shall not be averaged for reporting purposes and shall be reported on an individual sample basis on the monthly DMR. Reporting the calculated 2,3,7,8-TCDD TEC concentrations and the respective TEC loadings on the monthly DMR shall include the individual sample results in addition to the monthly average values.

5) The PCDD and PCDF congeners to be monitored and also included in the calculation to assess compliance with the above TEC requirements are listed below. EPA Method 1613, Revision B, minimum levels (quantification levels) are listed in parts per quadrillion (ppq) in parentheses after each congener.

PCDD Congeners		PCDF Congeners	
2,3,7,8-TCDD	(10 ppq)	2,3,7,8-TCDF	(10 ppq)
1,2,3,7,8-PeCDD	(50 ppq)	1,2,3,7,8-PeCDF	(50 ppq))
1,2,3,4,7,8-HxCDD	(50 ppq)	2,3,4,7,8-PeCDF	(50 ppq)
1,2,3,6,7,8-HxCDD	(50 ppq)	1,2,3,4,7,8-HxCDF	(50 ppq)
1,2,3,7,8,9-HxCDD	(50 ppq)	1,2,3,6,7,8-HxCDF	(50 ppq)
1,2,3,4,6,7,8-HpCDD	(50 ppq)	2,3,4,6,7,8-HxCDF	(50 ppq)
OCDD	(100 ppq)	1,2,3,7,8,9-HxCDF	(50 ppq)
		1,2,3,4,6,7,8-HpCDF	(50 ppq)
		1,2,3,4,7,8,9-HpCDF	(50 ppq)
		OCDF	(100 ppq)

g. Limits Below the Quantification Level – Total PCBs

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total PCBs shall be in accordance with EPA Method 608. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be

Section A. Limitations and Monitoring Requirements

submitted to the Department within 30 days of such determination.

The WQBELs for Total PCBs are 0.000026 ug/l and 1.4x10⁻⁸ lbs/day as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. Compliance with these WQBELs shall be determined based on the results of the individual aroclor analyses. **The discharge of any individual aroclor at or above the quantification level of 0.1 ug/l is a specific violation of this document**. If concentrations of all aroclors representing a monitoring period are less than their quantification levels, the discharger will be considered to be in compliance with this document for the monitoring period that the analyses represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.2.b.

For the purpose of reporting on the Daily tab of the DMR, individual aroclor results less than the quantification level shall be reported as "<0.1." Calculations shall be made using the value 0.1 in place of any aroclor result of <0.1 ug/l, and the calculated value ("X") resulting from any calculation made using one or more aroclor results of <0.1 ug/l shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of PCBs at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

h. Limits Below the Quantification Level - Total DDT

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total DDT shall be in accordance with EPA Method 608. Upon approval from the Department the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for Total DDT are 0.000011 ug/l and 5.9x10⁻⁹ lbs/day as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. The discharge of any individual isomer of DDT (4,4'-DDT, 4,4'-DDE, 4,4'-DDD) at or above the quantification level of 0.01 ug/l is a specific violation of this document. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.2.b.

For the purpose of reporting on the Daily tab of the DMR, individual isomer results less than the quantification level shall be reported as "<0.01." Calculations shall be made using the value 0.01 in place of any isomer result of <0.01 ug/l, and the calculated value ("X") resulting from any calculation made using one or more isomers results of <0.01 ug/l shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of Total DDT at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

i. Limits Below the Quantification Level – Hexachlorobenzene

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for hexachlorobenzene shall be in accordance with EPA Method 612. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.01 ug/L unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for hexachlorobenzene are 0.00045 ug/L and 2.4×10^{-7} lbs/day as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **Any discharge of hexachlorobenzene at or above the quantification level is a specific**

Section A. Limitations and Monitoring Requirements

violation of this document. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.2.b.

For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of hexachlorobenzene at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

j. Limits Below the Quantification Level – Chlordane and Aldrin

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for chlordane and aldrin shall be in accordance with EPA Method 608. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.01 ug/L unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for chlordane are 0.00025 ug/L and 1.4x10⁻⁷ lbs/day as maximum monthly averages, and the WQBELs for aldrin are 0.003 ug/L and 1.6x10⁻⁶ lbs/day as maximum monthly averages. These are less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **Any discharge of chlordane or aldrin at or above the quantification level is a specific violation of this document**. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.2.b.

For the purpose of reporting on the Daily tab of the Discharge Monitoring Report (DMR), individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of chlordane or aldrin at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

k. Total Endosulfan

Total Endosulfan is the arithmetic sum of Endolsulfan I, Endosulfan II, and Endolsulfan Sulfate. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

I. Total Endrin

Total Endrin is the arithmetic sum of endrin and endrin aldehyde. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value

Section A. Limitations and Monitoring Requirements

X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

m. Total BETX

Total BTEX is the arithmetic sum of benzene, ethylbenzene, toluene, and xylene. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<1.0 ug/L." For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

n. Monitoring Frequency for Dioxins and Furans

Upon initiation of discharge, the influent shall be monitored and sampled for the 2,3,7,8-TCDD congener at the frequency indicated in Part I.A.2. of this document. Upon detecting the 2,3,7,8-TCDD congener at or above the quantification level of 10 ppq in the influent, the discharger shall immediately begin monitoring and sampling the intermediate stage and the effluent at the frequency indicated in Part I.A.2. of this document. For the purpose of reporting on the Daily and Summary tabs of the DMR, when the influent concentration is below the quantification level of 10 ppq, the discharger shall enter *H for the intermediate and effluent modes.

o. Monitoring Frequency Reduction

Upon initiation of discharge, the influent, the intermediate stage, and the effluent shall be monitored and sampled for the parameters indicated in Part I.A.2. and at the frequency indicated in Part I.A.2. of this document. After peak contaminant mass removal has occurred, the discharger may request a reduction in monitoring frequency. This request shall be submitted to the Department, shall contain an explanation as to why the reduced monitoring is appropriate, and shall include documentation demonstrating that peak contaminant mass removal has occurred. Upon receipt of written approval and consistent with such approval, the discharger may reduce the monitoring frequency for approved parameters indicated in Part I.A.2. of this document. The monitoring frequency for parameters shall not be reduced to less than once per month. The Department may revoke the approval for reduced monitoring at any time upon notification to the discharger.

p. Water Treatment Additives

This document does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event the discharger proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the discharger shall submit a request to the Department for approval. See Part I.A.5. for information on requesting water treatment additive use.

3. Final Effluent Limitations, Monitoring Point 001C

During the period beginning on the effective date of this document, the discharger is authorized to discharge an unspecified amount of treated scrubber water blowdown and condensate from Monitoring Point 001C through Monitoring Point 001A and Outfall 001. Outfall 001 discharges to the Pine River. Such discharge shall be limited and monitored by the discharge as specified below.

Parameter	Maxim Quanti <u>Monthly</u>	um Limits <u>ty or Load</u> <u>Daily</u>	for ling <u>Units</u>	Maxim Quality or Monthly	um Limits <u>· Concent</u> Daily	for ration <u>Units</u>	Monitoring <u>Frequency</u>	Sample Type		
INFLUENT MONITORING AND REPORTING										
2,3,7,8-Tetrachlorodibenzo	o-p-dioxin (2,3,7 	7,8-TCDD) 		(report)	(report)	ppq	Weekly	Grab		
2,3,7,8-TCDD Toxicity Equ	uivalence Conce	entration (T 	EC) 	(report)	(report)	ppq	Weekly	Grab		
Section A. Limitations and Monitoring Requirements

	Maximum Limits for Quantity or Loading			Maximum Limits for _Quality or Concentration_			Monitoring Sample	
<u>Parameter</u>	Monthly	Daily	Units	Monthly	Daily	<u>Units</u>	Frequency	Туре
	INT	ERMEDIA	TE STAGE		IG AND R	EPORTI	NG	
2 3 7 8-TCDD (see A 3 n)								
					(report)	ppq	Weekly	Grab
2,3,7,8-TCDD TEC (see I.A.3	.n.)							
		For 641 Aug			(report)	ppq	Weekly	Grab
Total Polychlorinated Bipheny	yls (PCBs)				<i>(</i>)	"		
Total PCBs		tent tent end			(report)	ug/I	VVeekiy	Calculation
Aroclor 1016					(report)	ug/I	VVeekiy	Grab
Aroclor 1221					(report)	ug/l	Weekly	Grab
Aroclor 1232					(report)	ug/l	Weekly	Grab
Aroclor 1242					(report)	ug/l	Weekly	Grab
Aroclor 1248					(report)	ug/l	Weekly	Grab
Aroclor 1254					(report)	ug/l	Weekly	Grab
Aroclor 1260					(report)	ug/l	Weekly	Grab
Total Dichlorodiphenyltrichlor	oethane (DF)T)						
Total DDT			ber 700 mil		(report)	ua/l	Weekly	Calculation
					(report)	ug/l	Weekly	Grah
					(report)	ug/l	Wookly	Grab
					(report)	ug/i	Weekly	Crab
4,4 -DDD					(report)	ug/i	VVEEKIY	Grab
Hexachlorobenzene					(report)	ug/l	Weekly	Grab
Chlordane					(report)	ug/l	Weekly	Grab
Aldrin					(report)	ug/l	Weekly	Grab
Beta-Hexachlorocyclohexane					(report)	ug/l	Weekly	Grab
Total BETX (benzene, ethylbe	enzene, tolu	ene, xyler	ies)					
Total BETX					(report)	ug/l	Weekly	Calculation
Benzene					(report)	ug/l	Weekly	Grab
Ethylbenzene					(report)	ug/l	Weekly	Grab
Toluene					(report)	ug/l	Weekly	Grab
Xylene					(report)	ug/l	Weekly	Grab
1,2,4-Trichlorobenzene					(report)	ug/l	Weekly	Grab
1,2-Dichloroethane					(report)	ug/l	Weekly	Grab
Chlorobenzene					(report)	ug/l	Weekly	Grab
Vinyl Chloride					(report)	ug/l	Weekly	Grab
Acetone		Boll Soci and			(report)	ug/l	Weekly	Grab
Methylene Chloride					(report)	ug/l	Weekly	Grab
Bromobenzene					(report)	ug/l	Weekly	Grab
4-Chlorobenzene Sulfonic Ac	id				(report)	ug/l	Weekly	Grab

Section A. Limitations and Monitoring Requirements

	Maximum Limits for Quantity or Loading			Maximu Quality or	Maximum Limits for Quality or Concentration_			Sample
<u>Parameter</u>	Monthly	Daily	<u>Units</u>	Monthly	Daily	Units	Frequency	Туре
DISCHARGE LIMITATIONS, MONITORING, AND REPORTING								
Flow	(report)	(report)	MGD				Daily	Report Total
2,3,7,8-TCDD (see I.A.3.n.)	(report)	(report)	lbs/day	(report)	<10	ppq	Weekly	Grab
2,3,7,8-TCDD TEC (see I.A.3	3.n.) 4 6x10 ⁻¹²	(report)	lbs/dav	0.0086	(report)	מממ	Weekly	Grab
Total PCBs Total PCBs Aroclor 1016 Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260	(report) 	(report) 	lbs/day 	(report) 	(report) <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1	ug/l ug/l ug/l ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab Grab Grab Grab Grab
Total DDT Total DDT 4,4'-DDT 4,4'-DDE 4,4'-DDD	(report) 	(report) 	lbs/day 	(report) 	(report) <0.01 <0.01 <0.01	ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab
Hexachlorobenzene	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab
Chlordane	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab
Aldrin	(report)	(report)	lbs/day	(report)	<0.01	ug/l	Weekly	Grab
Beta-Hexachlorocyclohexane	e 0.000014	(report)	lbs/day	0.03	(report)	ug/l	Weekly	Grab
Total Endosulfan Endolsulfan I Endosulfan II Endosulfan Sulfate	 	0.00015 	lbs/day 	 	0.27 (report) (report) (report)	ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab
Total Endrin Endrin Endrin Aldehyde	 	0.000093	lbs/day 		0.17 (report) (report)	ug/l ug/l ug/l	Weekly Weekly Weekly	Calculation Grab Grab
Polybrominated Biphenyls (F	PBBs) 0.000025	(report)	lbs/day	0.05	(report)	ug/l	Weekly	Grab
Total BETX Total BETX Benzene Ethylbenzene Toluene Xylene	 		 	 	20 (report) (report) (report) (report)	ug/l ug/l ug/l ug/l ug/l	Weekly Weekly Weekly Weekly Weekly	Calculation Grab Grab Grab Grab

Section A. Limitations and Monitoring Requirements

-	Maximum Limits for Quantity or Loading		Maximum Limits for Quality or Concentration			Monitoring	Sample	
<u>Parameter</u>	<u>Monthly</u>	<u>Daily</u>	<u>Units</u>	<u>Monthly</u>	<u>Daily</u>	<u>Units</u>	<u>Frequency</u>	Түре
	DISCH/	ARGE LIM	ITATIONS,	MONITORIN	G, AND R	EPORTI	NG CONTINU	ED
1,2,4-Trichlorobenzene					5	ug/l	Weekly	Grab
1,2-Dichloroethane					5	ug/l	Weekly	Grab
Chlorobenzene					5	ug/l	Weekly	Grab
Vinyl Chloride					3	ug/l	Weekly	Grab
Acetone		16	lbs/day		30,000	ug/l	Weekly	Grab
Acrolein					2	ug/l	Weekly	Grab
Methylene Chloride	, 				5	ug/l	Weekly	Grab
Bromobenzene				(report)	(report)	ug/l	Weekly	Grab
4-Chlorobenzene Sulfonic Acie	d			(report)	(report)	ug/l	Weekly	Grab
Equipment Inspection	(report)						3 x Weekly	Visual

a. Analytical Testing

All samples shall be analyzed using EPA approved methods and reported at quantification levels below limits, unless otherwise specifically stated in this document. Total endosulfan, total endrin, and PBBs shall be analyzed using EPA Method 608 with a quantification limit of 0.01 ug/L. The quantification level for bromobenzene shall be 1 ug/L, and the quantification level for 4-chlorobenzene sulfonic acid shall be 0.01 ug/L. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

b. Best Available Technology Treatment

This document is based on the discharger providing in situ thermal treatment, bag filters, and multi-stage activated carbon. If a different treatment system is proposed, the discharger shall amend the application received on April 26, 2016, and amended through June 13, 2016. This document may then be modified to include additional effluent limitations to protect water quality in accordance with applicable rules and regulations.

c. Monitoring Locations

Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to the final carbon stage for intermediate stage monitoring, and after treatment but prior to mixing with any other waste stream for all effluent monitoring.

d. Proper Operation and Maintenance

The discharger shall operate the multi-stage activated carbon treatment system such that the rotation of carbon stages and the replacement of spent carbon shall be initiated upon break-through of pollutants into the final treatment stage.

e. Equipment Inspection

Equipment inspection shall be reported as "yes" or "no." The discharger shall report "yes" if this requirement was completed and "no" if this requirement was not completed. The discharger shall inspect the treatment systems used to achieve compliance with the terms of this document. The discharger shall immediately implement any corrective action for the treatment system that is noted during the inspection.

Section A. Limitations and Monitoring Requirements

f. Limits below the Quantification Level – Dioxins and Furans

1) Polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congener sampling, preservation, and handling procedures shall be in accordance with EPA Method 1613, Revision B. The analyses of these samples shall include the seventeen dioxin and furan congeners listed in Part I.A.3.f.5).

Analyses for the dioxin and furan congeners listed in Part I.A.3.f.5), to determine compliance with the toxicity equivalence concentration (TEC) limit, shall be conducted according to EPA Method 1613, Revision B. At a minimum, Method 1613, Revision B, congener specific quantification levels (i.e., minimum levels) for the dioxins and furan congeners listed in Part I.A.3.f.5) shall be achieved unless higher levels are appropriate because of sample matrix interference. If a higher quantification level(s) is(are) appropriate for any of the specified 17 congeners because of sample matrix interference, justification shall be submitted to the Department within 30 days of such determination.

2) The water quality-based effluent limitations (WQBELs) for the 2,3,7,8-TCDD congener are 0.0031 parts per quadrillion (ppq) and 1.7x10⁻¹² pounds per day (lbs/day) as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **Any discharge of the 2,3,7,8-TCDD congener at or above the quantification level of 10 ppq is a specific violation of this document.** If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.3.b.

For the purpose of reporting on the Daily tab of the Discharge Monitoring Report (DMR), individual sample results less than the quantification level shall be reported as "<10 ppq." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This document does not authorize the discharge of the 2,3,7,8-TCDD congener at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to public health or welfare.

3) For purposes of reporting 2,3,7,8-TCDD TEC concentrations and loadings on the monthly DMR, a concentration value of zero shall be used in the TEC concentration and TEC loading calculations for any individual congener which is not present at or above its respective quantification level set forth in Part I.A.3.f.5). The equation for calculating the TEC value for each PCDD/PCDF sample is as follows:

 $(TEC)_{TCDD} = \Sigma(C)_x(TEF)_x(BEF)_x$

Where:

 $(TEC)_{TCDD} = 2,3,7,8$ -TCDD toxicity equivalence concentration in the discharge.

 $(C)_x$ = the concentration of congener x in the discharge.

(TEF)_x = toxicity equivalency factor for congener x (see Table 1).

 $(BEF)_x$ = bioaccumulation equivalency factor for congener x (see Table 1).

Section A. Limitations and Monitoring Requirements

Congener	TEF	BEF
2,3,7,8-TCDD	1.0	1.0
1,2,3,7,8-PeCDD	0.5	0.9
1,2,3,4,7,8-HxCDD	0.1	0.3
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.05
OCDD	0.001	0.01
2,3,7,8-TCDF	0.1	0.8
1,2,3,7,8-PeCDF	0.05	0.2
2,3,4,7,8-PeCDF	0.5	1.6
1,2,3,4,7,8-HxCDF	0.1	0.08
1,2,3,6,7,8-HxCDF	0.1	0.2
2,3,4,6,7,8-HxCDF	0.1	0.7
1,2,3,7,8,9-HxCDF	0.1	0.6
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.4
OCDF	0.001	0.02

Table 1. TEFs and BEFs for PCDDs and PCDFs

For each sample, measurements for any of the congeners specified in Part I.A.3.f.5) that are quantified and any specified congener measurements that are less than the quantification level but greater than the detection level shall be reported as a comment on the DMR Daily form for that day. Part I A.3.f.3) of this document does not authorize the discharge of PCDDs or PCDFs at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

4) The 2,3,7,8-TCDD congener concentrations and respective loading values shall not be averaged for reporting purposes and shall be reported on an individual sample basis on the monthly DMR. Reporting the calculated 2,3,7,8-TCDD TEC concentrations and the respective TEC loadings on the monthly DMR shall include the individual sample results in addition to the monthly average values.

5) The PCDD and PCDF congeners to be monitored and also included in the calculation to assess compliance with the above TEC requirements are listed below. EPA Method 1613, Revision B, minimum levels (quantification levels) are listed in parts per quadrillion (ppq) in parentheses after each congener.

PCDD Congeners		PCDF Congeners	
2,3,7,8-TCDD	(10 ppq)	2,3,7,8-TCDF	(10 ppq)
1,2,3,7,8-PeCDD	(50 ppq)	1,2,3,7,8-PeCDF	(50 ppq))
1,2,3,4,7,8-HxCDD	(50 ppq)	2,3,4,7,8-PeCDF	(50 ppq)
1,2,3,6,7,8-HxCDD	(50 ppq)	1,2,3,4,7,8-HxCDF	(50 ppq)
1,2,3,7,8,9-HxCDD	(50 ppq)	1,2,3,6,7,8-HxCDF	(50 ppq)
1,2,3,4,6,7,8-HpCDD	(50 ppq)	2,3,4,6,7,8-HxCDF	(50 ppq)
OCDD	(100 ppq)	1,2,3,7,8,9-HxCDF	(50 ppq)
		1,2,3,4,6,7,8-HpCDF	(50 ppq)
		1,2,3,4,7,8,9-HpCDF	(50 ppq)
		OCDF	(100 ppq)

g. Limits Below the Quantification Level – Total PCBs

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total PCBs shall be in accordance with EPA Method 608. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be

Section A. Limitations and Monitoring Requirements

submitted to the Department within 30 days of such determination.

The WQBELs for Total PCBs are 0.000026 ug/l and 1.4x10⁻⁸ lbs/day as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **The discharge of any individual aroclor at or above the quantification level of 0.1 ug/l is a specific violation of this document**. If concentrations of all aroclors representing a monitoring period are less than their quantification levels, the discharger will be considered to be in compliance with this document for the monitoring period that the analyses represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.3.b.

For the purpose of reporting on the Daily tab of the DMR, individual aroclor results less than the quantification level shall be reported as "<0.1." Calculations shall be made using the value 0.1 in place of any aroclor result of <0.1 ug/l, and the calculated value ("X") resulting from any calculation made using one or more aroclor results of <0.1 ug/l shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of PCBs at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

h. Limits Below the Quantification Level – Total DDT

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total DDT shall be in accordance with EPA Method 608. Upon approval from the Department the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for Total DDT are 0.000011 ug/l and 5.9x10⁻⁹ lbs/day as maximum monthly averages. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. The discharge of any individual isomer of DDT (4,4'-DDT, 4,4'-DDE, 4,4'-DDD) at or above the quantification level of 0.01 ug/l is a specific violation of this document. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.3.b.

For the purpose of reporting on the Daily tab of the DMR, individual isomer results less than the quantification level shall be reported as "<0.01." Calculations shall be made using 0.01 in place of any isomer result of <0.01 ug/l, and the calculated value ("X") resulting from any calculation made using one or more isomer results of <0.01 ug/l shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of Total DDT at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

i. Limits Below the Quantification Level – Hexachlorobenzene

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for hexachlorobenzene shall be in accordance with EPA Method 612. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.01 ug/L unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for hexachlorobenzene are 0.00045 ug/L and 2.4x10⁻⁷ lbs/day as maximum monthly average. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **Any discharge of hexachlorobenzene at or above the quantification level is a specific violation of this document**. If concentrations in all effluent samples representing a monitoring period are less

Section A. Limitations and Monitoring Requirements

than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.3.b.

For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deg/deg-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of hexachlorobenzene at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

j. Limits Below the Quantification Level – Chlordane and Aldrin

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for chlordane and aldrin shall be in accordance with EPA Method 608. Upon approval from the Department, the discharger may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136). The quantification level shall be 0.01 ug/L unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The WQBELs for chlordane are 0.00025 ug/L and 1.4x10⁻⁷ lbs/day as maximum monthly averages, and the WQBELs for aldrin are 0.003 ug/L and 1.6x10⁻⁶ lbs/day as maximum monthly averages. These are less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **Any discharge of chlordane or aldrin at or above the quantification level is a specific violation of this document**. If concentrations in all effluent samples representing a monitoring period are less than the quantification level, the discharger will be considered to be in compliance with this document for the monitoring period that the samples represent, provided that the discharger is also in full compliance with operation of the treatment system specified in Part I.A.3.b.

For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deg/deg-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

This condition does not authorize the discharge of chlordane or aldrin at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

k. Total Endosulfan

Total Endosulfan is the arithmetic sum of Endolsulfan I, Endosulfan II, and Endolsulfan Sulfate. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

I. Total Endrin

Total Endrin is the arithmetic sum of endrin and endrin aldehyde. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<0.01 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at

http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

Section A. Limitations and Monitoring Requirements

m. Total BETX

Total BTEX is the arithmetic sum of benzene, ethylbenzene, toluene, and xylene. For the purpose of reporting on the Daily tab of the DMR, individual sample results less than the quantification level shall be reported as "<1.0 ug/L." Calculations shall be made using the quantification level in place of any sample result less than the quantification level, and the calculated value ("X") resulting from any calculation made using one or more sample results below quantification shall be reported as less than the calculated value X (i.e., "<X"). For example calculations, see the DMR FAQ document available at http://www.michigan.gov/documents/deq/deq-wrd-FAQ-DMR_MiWaters_546447_7.pdf.

n. Monitoring Frequency for Dioxins and Furans

Upon initiation of discharge, the influent shall be monitored and sampled for the 2,3,7,8-TCDD congener at the frequency indicated in Part I.A.3. of this document. Upon detecting the 2,3,7,8-TCDD congener at or above the quantification level of 10 ppq in the influent, the discharger shall immediately begin monitoring and sampling the intermediate stage and the effluent at the frequency indicated in Part I.A.3. of this document. For the purpose of reporting on the Daily and Summary tabs of the DMR, when the influent concentration is below the quantification level of 10 ppq, the discharger shall enter *H for the intermediate and effluent modes.

o. Monitoring Frequency Reduction

Upon initiation of discharge, the intermediate stage and the effluent shall be monitored and sampled for the parameters indicated in Part I.A.3. and at the frequency indicated in Part I.A.3. of this document. After peak contaminant mass removal has occurred, the discharger may request a reduction in monitoring frequency. This request shall be submitted to the Department, shall contain an explanation as to why the reduced monitoring is appropriate, and shall include documentation demonstrating that peak contaminant mass removal has occurred. Upon receipt of written approval and consistent with such approval, the discharger may reduce the monitoring frequency for parameters indicated in Part I.A.3. of this document. The monitoring frequency for parameters shall not be reduced to less than once per month. The Department may revoke the approval for reduced monitoring at any time upon notification to the discharger.

p. Water Treatment Additives

This document does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event the discharger proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the discharger shall submit a request to the Department for approval. See Part I.A.5. for information on requesting water treatment additive use.

4. Short-Term Waste Characterization Study

As a condition of this document, the discharger shall collect one effluent sample from monitoring point 001A <u>within 5 days</u> of the in situ thermal treatment system achieving target temperature and analyze the sample for all constituents analyzed during the 2014 remedial design investigation and the 2015 groundwater sampling event as submitted with the application. Additionally, the discharger shall analyze for total phosphorus and any other parameter from Tables 2-6 of the Application Appendix that is expected to be present at the site. All samples shall be analyzed using EPA approved methods and reported at appropriate quantification levels for evaluation. The results of the analysis of such monitoring shall be submitted to the Department <u>within 30 days</u> after receipt of the analytical results. If, upon review of the analysis, it is determined that any of the materials or constituents require limiting to protect the receiving waters in accordance with applicable water quality standards, this document may then be modified by the Department in accordance with applicable laws and rules.

5. Request for Discharge of Water Treatment Additives

Prior to discharge of any water treatment additive, written approval shall be obtained by the discharger. Requests for such approval shall be submitted via the Department's MiWaters system. The MiWaters website is located at https://miwaters.deq.state.mi.us. Instructions for submitting such a request may be obtained at http://www.michigan.gov/deqnpdes (near the bottom of that page, click on one or both of the links located under the Water Treatment Additives banner). Additional monitoring and reporting may be required as a condition for the approval to discharge the additive.

Section A. Limitations and Monitoring Requirements

A request to discharge water treatment additives shall include all of the following usage and discharge information for each water treatment additive proposed to be discharged:

- a. Safety Data Sheet (formerly known as Material Safety Data Sheet);
- b. the proposed water treatment additive discharge concentration with supporting calculations;
- c. the discharge frequency (i.e., number of hours per day and number of days per year);
- d. the monitoring point from which the product is to be discharged;
- e. the type of removal treatment, if any, that the water treatment additive receives prior to discharge;
- f. product function (i.e. microbiocide, flocculant, etc.);
- g. a 48-hour LC₅₀ or EC₅₀ for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.*); and
- h. the results of a toxicity test for one (1) other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of R 323.1057(2) of the Water Quality Standards.

6. Facility Contact

The "Facility Contact" was specified in the application. The discharger may replace the facility contact at any time, and shall notify the Department in writing <u>within 10 days</u> after replacement (including the name, address and telephone number of the new facility contact).

- a. The facility contact shall be (or a duly authorized representative of this person):
 - for a corporation, a principal executive officer of at least the level of vice president; or a designated representative if the representative is responsible for the overall operation of the facility from which the discharge originates, as described in the SRD application or other form,
 - for a partnership, a general partner,
 - for a sole proprietorship, the proprietor, or
 - for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.
- b. A person is a duly authorized representative only if:
 - the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
 - the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the discharger from properly submitting reports and forms as required by law.

7. Reopener Clause

The Department may determine that the discharge authorization, monitoring frequency requirements, and treatment technology-based effluent limitations of this document require assessment and reopen the document. In that case, the Department may modify this document, issue an individual National Pollutant Discharge Elimination System (NPDES) permit, or incorporate the requirements of this document into another document in accordance with applicable laws and rules.

Section A. Limitations and Monitoring Requirements

8. Discharge to the Groundwaters

This site is a known source of groundwater pollution. The issuance of this document does not authorize any discharge to the groundwaters or venting of contaminated groundwaters to the surface waters, nor does it constitute a release of liability for any groundwater contamination at or around the site. The state reserves its rights to seek remedies to abate any groundwater contamination.

Section B. Storm Water Pollution Prevention

Section B. Storm Water Pollution Prevention is not required for this document.

Section A. Definitions

Part II may include terms and /or conditions not applicable to discharges covered under this document.

Acute toxic unit (TU_A) means 100/LC₅₀ where the LC₅₀ is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Annual monitoring frequency refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Authorized public agency means a state, local, or county agency that is designated pursuant to the provisions of section 9110 of Part 91 of the NREPA to implement soil erosion and sedimentation control requirements with regard to construction activities undertaken by that agency.

Best management practices (BMPs) means structural devices or nonstructural practices that are designed to prevent pollutants from entering into storm water, to direct the flow of storm water, or to treat polluted storm water.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Certificate of Coverage (COC) is a document, issued by the Department, which authorizes a discharge under a general permit.

Chronic toxic unit (TU_c) means 100/MATC or 100/IC₂₅, where the maximum acceptable toxicant concentration (MATC) and IC₂₅ are expressed as a percent effluent in the test medium.

Class B biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Combined sewer system is a sewer system in which storm water runoff is combined with sanitary wastes.

Section A. Definitions

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any *individual* sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any *individual* sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any *individual* sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Daily monitoring frequency refers to a 24-hour day. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Department means the Michigan Department of Environmental Quality.

Detection level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

Discharge means the addition of any waste, waste effluent, wastewater, pollutant, or any combination thereof to any surface water of the state.

EC⁵⁰ means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

Fecal coliform bacteria monthly

FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a discharge event. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR. If the period in which the discharge event occurred was partially in each of two months, the calculated monthly value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a reporting month. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

Section A. Definitions

Fecal coliform bacteria 7-day

FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days of discharge during a discharge event. If the number of daily concentrations determined during the discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall be used for the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean value for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. If the 7-day period was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days in a reporting month. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. The first calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

Flow-proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

General permit means a document issued authorizing a category of similar discharges.

Geometric mean is the average of the logarithmic values of a base 10 data set, converted back to a base 10 number.

Grab sample is a single sample taken at neither a set time nor flow.

IC₂₅ means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Illicit connection means a physical connection to a municipal separate storm sewer system that primarily conveys non-storm water discharges other than uncontaminated groundwater into the storm sewer; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

Illicit discharge means any discharge to, or seepage into, a municipal separate storm sewer system that is not composed entirely of storm water or uncontaminated groundwater. Illicit discharges include non-storm water discharges through pipes or other physical connections; dumping of motor vehicle fluids, household hazardous wastes, domestic animal wastes, or litter; collection and intentional dumping of grass clippings or leaf litter; or unauthorized discharges of sewage, industrial waste, restaurant wastes, or any other non-storm water waste directly into a separate storm sewer.

Individual permit means a site-specific issued document.

Inlet means a catch basin, roof drain, conduit, drain tile, retention pond riser pipe, sump pump, or other point where storm water or wastewater enters into a closed conveyance system prior to discharge off site or into waters of the state.

Section A. Definitions

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference].

Land application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC₅₀ means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

Maximum extent practicable means implementation of best management practices by a public body to comply with an approved storm water management program as required by a national permit for a municipal separate storm sewer system, in a manner that is environmentally beneficial, technically feasible, and within the public body's legal authority.

MGD means million gallons per day.

Monthly concentration is the sum of the daily concentrations determined during a reporting period divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during a reporting period. The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMR.

Monthly monitoring frequency refers to a calendar month. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Municipal separate storm sewer means a conveyance or system of conveyances designed or used for collecting or conveying storm water which is not a combined sewer and which is not part of a publicly-owned treatment works as defined in the Code of Federal Regulations at 40 CFR 122.2.

Section A. Definitions

Municipal separate storm sewer system (MS4) means all separate storm sewers that are owned or operated by the United States, a state, city, village, township, county, district, association, or other public body created by or pursuant to state law, having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law, such as a sewer district, flood control district, or drainage district, or similar entity, or a designated or approved management agency under Section 208 of the Federal Act that discharges to the waters of the state. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

No observed adverse effect level (NOAEL) means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact cooling water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to watercarried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Outfall is the location at which a point source discharge enters the surface waters of the state.

Part 91 agency means an agency that is designated by a county board of commissioners pursuant to the provisions of section 9105 of Part 91 of the NREPA; an agency that is designated by a city, village, or township in accordance with the provisions of section 9106 of Part 91 of the NREPA; or the Department for soil erosion and sedimentation activities under Part 615, Part 631, or Part 632 pursuant to the provisions of section 9115 of Part 91 of the NREPA.

Part 91 permit means a soil erosion and sedimentation control permit issued by a Part 91 agency pursuant to the provisions of Part 91 of the NREPA.

Partially treated sewage is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittee's National Pollutant Discharge Elimination System permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

Point of discharge is the location of a point source discharge where storm water is discharged directly into a separate storm sewer system.

Point source discharge means a discharge from any discernible, confined, discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Changing the surface of land or establishing grading patterns on land will result in a point source discharge where the runoff from the site is ultimately discharged to waters of the state.

Polluting material means any material, in solid or liquid form, identified as a polluting material under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

POTW is a publicly owned treatment work.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

Section A. Definitions

Public (as used in the MS4 individual permit) means all persons who potentially could affect the authorized storm water discharges, including, but not limited to, residents, visitors to the area, public employees, businesses, industries, and construction contractors and developers.

Public body means the United States; the state of Michigan; a city, village, township, county, school district, public college or university, or single-purpose governmental agency; or any other body which is created by federal or state statute or law.

Qualified Personnel means an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the storm water sample.

Qualifying storm event means a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that also caused greater than 0.1 inch of rainfall. Upon request, the Department may approve an alternate definition meeting the condition of a qualifying storm event.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly monitoring frequency refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Regulated area means the permittee's urbanized area, where urbanized area is defined as a place and its adjacent densely-populated territory that together have a minimum population of 50,000 people as defined by the United States Bureau of the Census and as determined by the latest available decennial census.

Secondary containment structure means a unit, other than the primary container, in which significant materials are packaged or held, which is required by State or Federal law to prevent the escape of significant materials by gravity into sewers, drains, or otherwise directly or indirectly into any sewer system or to the surface or ground waters of this state.

Separate storm sewer system means a system of drainage, including, but not limited to, roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels, which is not a combined sewer where storm water mixes with sanitary wastes, and is not part of a POTW.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Significant materials Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the NREPA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Section A. Definitions

Significant spills and significant leaks means any release of a polluting material reportable under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

Special-use area means secondary containment structures required by state or federal law; lands on Michigan's List of Sites of Environmental Contamination pursuant to Part 201, Environmental Remediation, of the NREPA; and/or areas with other activities that may contribute pollutants to the storm water for which the Department determines monitoring is needed.

Stoichiometric means the quantity of a reagent calculated to be necessary and sufficient for a given chemical reaction.

Storm water means storm water runoff, snow melt runoff, surface runoff and drainage, and non-storm water included under the conditions of this permit.

Storm water discharge point is the location where the point source discharge of storm water is directed to surface waters of the state or to a separate storm sewer. It includes the location of all point source discharges where storm water exits the facility, including *outfalls* which discharge directly to surface waters of the state, and *points of discharge* which discharge directly into separate storm sewer systems.

SWPPP means the Storm Water Pollution Prevention Plan prepared in accordance with this permit.

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Total maximum daily loads (TMDLs) are required by the Federal Act for waterbodies that do not meet water quality standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet water quality standards, and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

Toxicity reduction evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of the NREPA, being R 323.1041 through R 323.1117 of the Michigan Administrative Code.

Weekly monitoring frequency refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

WWSL is a wastewater stabilization lagoon.

WWSL discharge event is a discrete occurrence during which effluent is discharged to the surface water up to 10 days of a consecutive 14 day period.

3-portion composite sample is a sample consisting of three equal-volume grab samples collected at equal intervals over an 8-hour period.

Section A. Definitions

7-day concentration

FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily concentrations determined. If the number of daily concentrations determined during the WWSL discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the WWSL discharge event in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations in the reporting month. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

7-day loading

FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily loadings determined. If the number of daily loadings determined during the WWSL discharge event is less than 7 days, the number of actual daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the WWSL discharge event in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred

FOR ALL OTHER DISCHARGES – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days in a reporting month divided by the number of daily loadings determined. If the number of daily loadings determined is less than 7, the actual number of daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations in the reporting month. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

24-hour composite sample is a flow-proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period. A time-proportioned composite sample may be used upon approval of the Department if the permittee demonstrates it is representative of the discharge.

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. **Test procedures used shall be sufficiently sensitive to determine compliance with applicable effluent limitations**. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Chief of the Permits Section, Water Resources Division, Michigan Department of Environmental Quality, P.O. Box 30458, Lansing, Michigan, 48909-7958. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department <u>within 14 days</u> following the effective date of this permit, and then <u>60 days prior</u> to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Part 31 of the NREPA (specifically Section 324.3110(7)); and R 323.2155(2) of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, allow the Department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self-Monitoring," the permittee shall submit self-monitoring data via the Department's MiWaters system.

The permittee shall utilize the information provided on the MiWaters website, located at https://miwaters.deq.state.mi.us, to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the Department no later than the <u>20th day of the month</u> following each month of the authorized discharge period(s). The permittee may be allowed to submit the electronic forms after this date if the Department has granted an extension to the submittal date.

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page (or otherwise authorized by the Department in accordance with the provisions of this permit) to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Department. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before <u>January 10th (April 1st for animal feeding operation facilities) of each year</u>, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittee shall submit a summary of the previous year's monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

Retained self-monitoring may be denied to a permittee by notification in writing from the Department. In such cases, the permittee shall submit self-monitoring data in accordance with Part II.C.2., above. Such a denial may be rescinded by the Department upon written notification to the permittee. Reissuance or modification of this permit or reissuance or modification of an individual permittee's authorization to discharge shall not affect previous approval or denial for retained self-monitoring unless the Department provides notification in writing to the permittee.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the NREPA or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

Section C. Reporting Requirements

5. Compliance Dates Notification

<u>Within 14 days</u> of every compliance date specified in this permit, the permittee shall submit a *written* notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the NREPA, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-Hour Reporting

Any noncompliance which may endanger health or the environment (including maximum and/or minimum daily concentration discharge limitation exceedances) shall be reported, verbally, <u>within 24 hours</u> from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided <u>within five (5) days</u>.

b. Other Reporting

The permittee shall report, in writing, all other instances of noncompliance not described in a. above <u>at</u> <u>the time monitoring reports are submitted</u>; or, in the case of retained self-monitoring, <u>within five (5) days</u> from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times, or, if not yet corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit (or, if this is a general permit, on the COC); or, if the notice is provided after regular working hours, call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from **out-of-state** dial 1-517-373-7660).

<u>Within ten (10) days</u> of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventive measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

Section C. Reporting Requirements

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone <u>within 24 hours</u> of becoming aware of such conditions; and <u>within five (5) days</u>, provide in writing, the following information:

- a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;
- b. that the permitted wastewater treatment facility was, at the time, being properly operated and maintained (note that an upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation); and
- c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

9. Bypass Prohibition and Notification

a. Bypass Prohibition

Bypass is prohibited, and the Department may take an enforcement action, unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass

If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass

The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the second page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

Section C. Reporting Requirements

d. Written Report of Bypass

A written submission shall be provided <u>within five (5) working days</u> of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.11. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of R 323.1098 and R 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

11. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, as soon as possible but no later than 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit, for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

Section C. Reporting Requirements

12. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under R 323.1098 (Antidegradation) of the Water Quality Standards <u>or</u> b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity is not prohibited by the requirements of Part II.C.10.; and 4) the action or activity will not require notification pursuant to Part II.C.11. Following such notice, the permit or, if applicable, the facility's COC may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

14. Operations and Maintenance Manual

For wastewater treatment facilities that serve the public (and are thus subject to Part 41 of the NREPA), Section 4104 of Part 41 and associated Rule 2957 of the Michigan Administrative Code allow the Department to require an Operations and Maintenance (O&M) Manual from the facility. An up-to-date copy of the O&M Manual shall be kept at the facility and shall be provided to the Department upon request. The Department may review the O&M Manual in whole or in part at its discretion and require modifications to it if portions are determined to be inadequate.

At a minimum, the O&M Manual shall include the following information: permit standards; descriptions and operation information for all equipment; staffing information; laboratory requirements; record keeping requirements; a maintenance plan for equipment; an emergency operating plan; safety program information; and copies of all pertinent forms, as-built plans, and manufacturer's manuals.

Certification of the existence and accuracy of the O&M Manual shall be submitted to the Department at least <u>sixty days prior to start-up</u> of a new wastewater treatment facility. Recertification shall be submitted sixty days prior to start-up of any substantial improvements or modifications made to an existing wastewater treatment facility.

Section C. Reporting Requirements

15. Signatory Requirements

All applications, reports, or information submitted to the Department in accordance with the conditions of this permit and that require a signature shall be signed and certified as described in the Federal Act and the NREPA.

The Federal Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

The NREPA (Section 3115(2)) provides that a person who at the time of the violation knew or should have known that he or she discharged a substance contrary to this part, or contrary to a permit, COC, or order issued or rule promulgated under this part, or who intentionally makes a false statement, representation, or certification in an application for or form pertaining to a permit or COC or in a notice or report required by the terms and conditions of an issued permit or COC, or who intentionally renders inaccurate a monitoring device or record required to be maintained by the Department, is guilty of a felony and shall be fined not less than \$2,500.00 or more than \$25,000.00 for each violation. The court may impose an additional fine of not more than \$25,000.00 for each day during which the unlawful discharge occurred. If the conviction is for a violation committed after a first conviction of the person under this subsection, the court shall impose a fine of not less than \$25,000.00 per day and not more than \$50,000.00 per day of violation. Upon conviction, in addition to a fine, the court in its discretion may sentence the defendant to imprisonment for not more than 2 years or impose probation upon a person for a violation of this part. With the exception of the issuance of criminal complaints, issuance of warrants, and the holding of an arraignment, the circuit court for the county in which the violation occurred has exclusive jurisdiction. However, the person shall not be subject to the penalties of this subsection if the discharge of the effluent is in conformance with and obedient to a rule, order, permit, or COC of the Department. In addition to a fine, the attorney general may file a civil suit in a court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state and the costs of surveillance and enforcement by the state resulting from the violation.

16. Electronic Reporting

Upon notice by the Department that electronic reporting tools are available for specific reports or notifications, the permittee shall submit electronically all such reports or notifications as required by this permit.

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit, more frequently than, or at a level in excess of, that authorized, shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the NREPA and/or the Federal Act and constitutes grounds for enforcement action; for permit or Certificate of Coverage (COC) termination, revocation and reissuance, or modification; or denial of an application for permit or COC renewal.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the NREPA. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the NREPA.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

- a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or
- b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

Section D. Management Responsibilities

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the NREPA.

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the NREPA, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department, or the Regional Administrator, upon the presentation of credentials and, for animal feeding operation facilities, following appropriate biosecurity protocols:

- a. to enter upon the permittee's premises where an effluent source is located or any place in which records are required to be kept under the terms and conditions of this permit; and
- b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (R 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit, shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the NREPA.

10. Duty to Provide Information

The permittee shall furnish to the Department, <u>within a reasonable time</u>, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or the facility's COC, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the NREPA.

2. **POTW Construction**

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW shall be by permit issued under Part 41 of the NREPA.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environmental Quality permits, or approvals from other units of government as may be required by law.

Appendix F Project Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY

ST. LOUIS, MICHIGAN

BIDDING REQUIREMENTS AND CONTRACT DOCUMENTS

for the construction of the

VELSICOL BURN PIT SUPERFUND SITE IN-SITU THERMAL TREATMENT

CH2M HILL

Milwaukee, WI

March 2018

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Project No. 668402

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SECTION 01 11 00 SUMMARY OF WORK

PART 1 GENERAL

1.01 DEFINITIONS

- A. Owner: U.S. Environmental Protection Agency, Region 5 (USEPA).
- B. Contractor: The construction management firm the USEPA has contracted to complete the remedial action.
- C. CERCLA: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as "Superfund". CERCLA is the regulatory driver for this scope of remediation work.
- D. Successful Bidder: The Bidder selected for Subcontract award prior to award of Subcontract.
- E. Ancillary Services Subcontractor: The successful bidder of the solicitation. The Ancillary Services Subcontractor will be contracted to the Contractor and is responsible for completing the Work described in these Specifications and as shown on the Drawings.
- F. Lower-tier Subcontractor: A subcontractor retained by the Ancillary Services Subcontractor or the ISTT Subcontractor.
- G. Laboratory Subcontractor: Responsible for analysis of samples from the borrow sources, waste characterization samples, geotechnical samples, in situ thermal treatment (ISTT) system samples, or other samples as necessary during the Work. Samples will be collected and sent to the Laboratory Subcontractor by the Contractor. The Laboratory Subcontractor will be subcontracted to the Contractor. If needed, the Laboratory Subcontractor may retain a Lower-Tier Laboratory Subcontractor for some of the analyses.
- H. Site Security Subcontractor: Responsible for providing overnight security at the Velsicol Burn Pit Superfund Site (VBPSS), Monday through Friday and full-time security on the weekends.
- I. Fencing Subcontractor: Responsible for providing safety netting around construction activities and provide a physical barrier between the construction area and surrounding golf course.

- J. ISTT Subcontractor: Responsible for in-situ thermal treatment at VBPSS, including construction and operation of the in-situ thermal treatment system. The ISTT Subcontractor is responsible for completing the Work described in the Performance Work Statement and in the Division 1 Specifications of this Specification package.
- K. Where "Subcontractor" is stated throughout these specifications, both Ancillary Services Subcontractor and ISTT Subcontractor is implied.
- L. Project Site: Velsicol Burn Pit Superfund Site (VBPSS).
- M. The words "perform" or "provide". When used in connection with services, materials or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
- N. When "furnish", "install", "perform", or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of the Ancillary Services Subcontractor or ISTT Subcontractor, provide is implied.
- O. Work: Installation of ancillary services for in-situ thermal treatment at the VBPSS described herein which the Ancillary Services Subcontractor and/or lower-tier Subcontractor(s) will perform. In-situ thermal treatment at the VBPSS will be performed by the ISTT Subcontractor.

1.02 PERFORMANCE REQUIREMENTS

- A. The activities for satisfying the performance requirements for this Project are summarized as follows:
 - 1. Management of all Lower-tier Subcontractors and vendor activities onsite during the execution of this Work.
 - 2. Coordination with other Lower-tier Subcontractors.
 - 3. Mobilization, including transportation of equipment, materials, and personnel to the site and assembly of equipment.
 - 4. Site preparation, including installation of temporary facilities and controls as identified in Section 01 50 00, Temporary Facilities and Controls, utility clearances, installation of erosion and sediment controls as identified in Section 01 57 13, Temporary Erosion and Sediment Control, preparation of storage and staging area(s), and documentation of existing property conditions. This Work will be performed by both the Ancillary Services Subcontractor and ISTT Subcontractor, as required.

VELSICOL BURN PIT SUPERFUND SITE IN-SITU THERMAL TREATMENT

- 5. Installation of temporary utilities, including potable water supply, natural gas supply and electric. This Work will be performed by the Ancillary Services Subcontractor.
- 6. Installation and operation of an in-situ thermal treatment system, including vapor and wastewater treatment systems. This Work will be performed by the ISTT Subcontractor.
- 7. Restoration of work areas. This Work will be performed by both the Ancillary Services Subcontractor, and ISTT Subcontractor.
- 8. Specific Tasks Not Mentioned: Specific tasks not mentioned or completely detailed in this Summary of Work that are necessary or normally required as part of the Work described will be performed by the Ancillary Services Subcontractor or ISTT Subcontractor as incidental Work without extra costs to the Contractor, as if fully detailed. The expense for such Work will be included in the applicable lump sum and unit prices for the Work described.

1.03 ENVIRONMENTAL CONTAMINANTS

- A. Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).
- B. Specifically, the contaminants of concern (COC) in the NAPL include:
 - 1. Benzene
 - 2. Bromochlorobenzenes
 - 3. Alkyl halides/halogenated compounds
 - 4. Polybrominated biphenyls (PBB).
 - 5. Tris (2,3-dibromopropyl) phosphate (TRIS).
 - 6. Dichlorodiphenyl trichloroethane (DDT).
 - 7. 1, 2-dibromo-3-chloropropane (DBCP).
 - 8. Chlorobenzenes.
 - 9. Xylenes.

1.04 QUALIFICATIONS

A. The Subcontractor will be licensed, insured, and bonded to operate in the state of Michigan and will comply with all applicable federal, state, county, and local laws and regulations. In the event of conflict, the most stringent of these regulations will apply.

1.05 PROJECT PERMITS

- A. CERCLA projects are generally exempt from requirements to obtain environmental permits for onsite work under CERCLA 121(e); however, compliance with all substantive requirements is required.
- B. Coverage under the Michigan National Pollutant Discharge Elimination System Construction Stormwater Permit-by-Rule (Mich. Admin. Code R 323-2190) is not required. However, Project will be conducted as indicated in the Basis of Design document (Ancillary Services Subcontractor) and Performance Work Statement (ISTT Subcontractor).
- C. Non-environmental permits and permits related to offsite activities must be obtained, and both administrative and substantive requirements apply to offsite activities.

1.06 SUBMITTALS PRIOR TO AWARD

- A. Prior to Contract award, the Subcontractor will be required to submit a certificate of insurance naming USEPA, City of St. Louis, and Contractor as additional insured and waivers of subrogation against USEPA and Contractor, in accordance with the Subcontract. All certificates of insurance, as well as bonds, will be either executed by or countersigned by a licensed resident agent of the surety or insurance company having its place of business in the State of Michigan. Further, the said surety or insurance company must be duly licensed and qualified to do business in the State of Michigan.
- B. Prior to Contract award, the Subcontractor will be required to submit the following:
 - 1. Completed certification of compliant drug policy.
 - 2. Site-specific health and safety plan and Activity Hazard Analysis (AHA) worksheets.
 - 3. Proof of training and medical monitoring programs.
 - 4. Safety data sheets (SDSs).
 - 5. Copies of Subcontractors' and business licenses as required by state and local statutes.
- C. Prior to Contract award, the Ancillary Services Subcontractor will be required to also submit the following:
 - 1. Completed Waste Subcontractor Qualification Form.
 - 2. Transporter's valid U.S. DOT Number.
 - 3. Transporter's valid EPA ID# (for hazardous waste transport).
 - 4. Transporter's Certificate of Insurance.

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- 5. For waste disposal facilities, written evidence of USEPA approval under Offsite Rule of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (40 CFR 300.440); and a summary of violations (formal and informal) and how they were resolved in the last 5 years.
- 6. Table describing potential borrow sources and a site drawing identifying the location(s) of borrow areas, and of any samples with respect to the specific borrow area at the borrow source.
- D. A schedule for completing the Work should be submitted as part of the Bid proposal.

1.07 SUBMITTALS AFTER AWARD

- A. The selected Subcontractor will provide the following before the commencement of any Work onsite:
 - 1. Current hazardous waste site training and medical surveillance documentation for all field personnel, as necessary.
 - 2. Progress Schedule updates in accordance with Subcontract Agreement.
 - 3. Completed AHA Forms.
 - 4. Project schedule and schedule narrative of Subcontractor's approach in performing the Work. The narrative will identify equipment, labor resources, crews and subcontracts. The narrative will also discuss Project coordination.
 - 5. Subcontractor Quality Control Plan.
 - 6. Work Plan. The Work Plan narrative will identify equipment, labor resources, crews and lower-tier subcontracts, including scope of services supplied by each. The narrative will also discuss Project schedule, Project coordination and lines of communication, mobilization, site preparation, storage and staging area plans, haul routes, site restoration, and demobilization. The Work Plan will detail the means and methods to complete the Work. The Ancillary Services Subcontractor's Work Plan will also include a traffic control plan. The ISTT Subcontractor's Work Plan will also include the abandonment approach for subsurface infrastructure installed with the ISTT system upon completion.
 - 7. The Ancillary Services Subcontractor will provide a Soil Erosion and Sedimentation Control Plan (SESC Plan).
 - a. The Ancillary Services Subcontractor will provide a for each waste stream, including waste profile forms, supporting analytical results, applicable pre-printed manifests, labels, State and EPA Land Disposal Restriction (LDR) notification/certification forms (for hazardous waste), and any other document required for

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transportation or disposal. This information will be submitted to the Contractor for review and subsequent provision to USEPA. The Generator of this waste is USEPA Region 5. Upon satisfactory completion of all documentation by the Subcontractor, the waste profile will be signed by USEPA. All waste manifests will be signed onsite by Contractor on behalf of USEPA. Once the waste profile is signed, the Contractor will provide the signed profile back to the Subcontractor for submittal to the disposal facility.

- Β. Provide the following submittals during execution of the Work:
 - 1. Daily reports (Subcontractor production report, Subcontractor quality control report, AHAs, and soil excavation/transportation log, waste disposal log for soil and liquid waste, weight tickets) during the field operations period. Daily reports shall be submitted no later than 12:00 noon on the day following the work reported.
 - Summary of remedial actions completed each day, including any 2. deviations from the specified SOW.
 - 3. Weekly updated schedule of values showing cumulative amounts for the billing period and cumulative Project to date are to be submitted no later than 9:00 a.m. on Tuesday for each week in which Work is completed for the Project.
 - Progress schedule and narrative report. 4.
 - As-built redline drawings of all utilities, roads, pads, etc. Beginning and 5. ending elevation of excavation areas will be confirmed and documented using a survey. Changes will reflect modifications to locations of the utilities, roads, pads, etc. As-built redlines must be submitted to Contractor after completion of the Work.
 - 6. A table documenting information on wastes managed, including quantities generated and disposition of wastes (to be provided by Ancillary Services Subcontractor, only).
 - 7. Disposal: The Ancillary Services Subcontractor will provide a copy of the approved profile or letter of approval for each waste stream. The Contractor will coordinate with the Ancillary Services Subcontractor for the transport and disposal of wastes, if necessary.

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- 8. Fully completed manifests or delivery tickets for all waste streams documenting ultimate disposal, as necessary (to be provided by Ancillary Services Subcontractor, only).
 - a. Manifesting: A manifest for each load of waste will be created before leaving the Site (to be provided by Ancillary Services Subcontractor, only). At a minimum, the manifest form will include the following information:
 - 1) Generator information, including name, address, contact, and phone number, and EPA ID number.
 - 2) Transporter information, including name and EPA ID number.
 - 3) Designated facility information, including name, address, phone number, and EPA ID number.
 - 4) Site name, including street and mailing address.
 - 5) DOT proper shipping name.
 - 6) Type and number of container.
 - 7) Quantity of waste (volumetric estimate).
 - 8) Task order or job number.
 - 9) Profile number.
 - 10) 24-hour emergency phone number.
 - b. Post-disposal: The Ancillary Services Subcontractor will provide fully executed manifests (with transporter and facility signatures), weight tickets, and Certificates of Disposal/Destruction (CD) as applicable. Originals shall be sent directly to the Contractor via a means of traceable mail such as Federal Express or UPS or handdelivered with a signature receipt. <u>Original facility-signed</u> <u>manifests will not be attached to invoices.</u> All original hazardous waste manifests must be returned to the Contractor within 25 calendar days.
- C. Action and informational submittals required by the technical specification.

1.08 APPLICABLE REGULATIONS

- A. General: Work shall comply with all Federal, State and local regulations, and with the latest edition of applicable sections of the following regulations, standards, and codes:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. Building Code of America.
 - 4. National Electric Code (NEC).
 - 5. National Electrical Manufacturer's Association (NEMA) Code.
 - 6. National Fire Protection Association (NFPA) Standards.

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- 7. Occupational Safety and Health Act.
- 8. Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120.
- 9. Underwriter's Laboratory (UL).
- 10. St. Louis Code of Ordinances.
- 11. Michigan Department of Transportation (MDOT).
- 12. Michigan Department of Environmental Quality (MDEQ).
- 13. United States Environmental Protection Agency (USEPA).
- 14. Other applicable state and local codes and regulations.
- B. Regulatory Framework:
 - 1. This Work is part of the USEPA's Superfund Program and is governed by CERCLA. CERCLA projects are generally exempt from requirements to obtain environmental permits for onsite work under CERCLA 121(e); however, compliance with all substantive requirements is required. Non-environmental permits and permits related to offsite activities must be obtained, and both administrative and substantive requirements apply to offsite activities.
 - 2. A SESC Plan will be required for this Work. The Subcontractor will be required to prepare the SESC Plan for approval and implement erosion control measures as best management practices for controlling erosion, regardless of other requirements.
 - 3. The actions described in this SOW are not likely to result in any atmospheric discharges that would require either notification or permitting under the Clean Air Act (CAA). Under the CAA, temporary sources are not considered stationary sources and therefore are not regulated by the provision set forth in the act; however, any emission or escape into the open air can be declared a public nuisance. To avoid the nuisance rule, best management practices (i.e., periodic wetting of the area) shall be implemented by the Subcontractor during the completion of any soil excavation activities. An Air Substantive Requirement Document will be obtained by the Contractor for ISTT system operations. The ISTT Subcontractor is responsible for compliance with this document, as outlined in the Performance Work Statement.
 - 4. A Wastewater Substantive Requirement Document will also be obtained by the Contractor for ISTT system operations. The ISTT Subcontractor is responsible for complying with the requirements of this document, as outlined in the Performance Work Statement.

1.09 HEALTH AND SAFETY

- A. A copy of Contractor's health and safety plan (HASP) can be supplied for reference. The Subcontractor will provide its own health and safety procedures for the performance of its activities. The primary chemicals of concern for this Project are summarized in Article Environmental Contaminants, and are contained within the soil and/or groundwater that will be excavated for ancillary services construction, and treated during the ISTT portion of this Project. The Subcontractor is responsible for the health and safety of its own personnel and any of its Lower-Tier Subcontractors' personnel at the Project Site, and shall provide, for all its own personnel and any of its Lower-Tier Subcontractor's safety procedures and that are necessary to complete the Work.
- B. Failure to comply with the appropriate health and safety procedures outlined in the Contractor HASP and the Subcontractor's safety procedures, as determined by Contractor's representative, will be considered grounds for a Stop Work Order. The Subcontractor will remedy failure of compliance, as directed and approved by Contractor, before resuming Work. The Subcontractor will not be paid for the time occurring after notice of Stop Work Order and before resuming Work and may be responsible for Contractor costs during the downtime.
- C. Responsibilities:
 - 1. The Subcontractors are responsible for the health and safety of their employees. Each company shall designate one site employee as the "Designated Safety Coordinator" (DSC) who shall interface with the Contractor Site Safety and Health Specialist (SSHS) in matters of site safety.
 - 2. The Health and Safety Program has three objectives: 1) to protect personnel onsite, 2) to comply with applicable (federal, state, and local) health and safety regulations and 3) minimize health and safety liabilities.
 - 3. All employees shall follow, as a minimum, the requirements of OSHA 29 CFR 1910 and 29 CFR 1926.

- D. Minimum Requirements:
 - 1. Personal Protective Equipment:
 - a. General Requirements:
 - 1) Responsibilities (29 CFR 1910.132):
 - a) Employees must use all personal protective equipment (PPE) that maintains their exposure within acceptable limits as defined in the HASP.
 - b) Employers must ensure that employees receive training in and have knowledge of the use and maintenance of all PPE that is required to maintain their exposure within acceptable limits.
 - 2) Employees must be physically able and medically determined qualified to use the PPE and safety equipment that may be required in their job duties.
 - 3) PPE and safety equipment must be tested, inspected, and maintained in serviceable and sanitary condition.
 - a) Defective equipment will not be used.
 - b) Records of any tests or inspection will be available for inspection by Contractor.
 - 4) For hazardous waste operations, Subcontractors must abide by 29 CFR 1910.120, Appendix B.
 - b. Minimum Requirements for Appropriate Personal Protective Equipment: As described in the Contractor's Health and Safety Plan.
 - c. Minimum Requirements for Site Safety:
 - Safety color code for marking physical hazards (29 CFR 1910.144) shall include the following:
 - a) Caution tape shall be at a minimum of 3 inches wide, yellow, and the words "CAUTION" spelled out legibly in black.
 - b) Safety cans or other portable containers of flammable liquids must be in compliance.
 - 2) All signs and tags must be in compliance with 29 CFR 1910.145.
 - 3) Fencing will be required around excavations (29 CFR 1926.501).
 - 2. Outline for the Site-specific Health and Safety Plan:
 - Activity Hazard Analysis:
 - All definable features of Work will be addressed with an activity hazard analysis (AHA) prior to beginning each activity. This chart looks at principal steps of the operation, potential safety/health hazards for each step, and recommended controls for each hazard. In addition, a listing

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a.

of equipment to be used onsite, inspection requirements, and training requirements for operation of equipment will be included.

- 2) Analyses will define the activities being performed, identify the sequences of Work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level.
- 3) Work will not begin until the hazard analysis for each Work activity has been reviewed and accepted by Contractor.
- b. Training requirements are as follows (29 CFR 1910.120.(e)):
 - 1) 40-hour hazardous waste training.
 - 8-hour hazardous waste refresher training within the last 12 months.
 - 3) Site-specific training including names of personnel and alternates responsible for site safety and health; safety, health, and other hazards identified in the AHA; use of PPE; Work practices to minimize risks from hazards; medical surveillance requirements and recognition of symptoms and signs which might indicate overexposure to hazards; and decontamination procedures.
 - 4) Surveyors: 24-hour hazardous waste training plus 8-hour hazardous waste refresher training within the last 12 months.
- c. Personal Protective Equipment: A specific list of PPE to be used by Subcontractor employees for each site task and operation plus the assigned level of protection and criteria for upgrading or downgrading a task shall be included.
- d. Medical Surveillance:
 - 1) As a minimum, list the requirements for annual and any site-specific physical requirements for contaminants of concern on the site.
 - 2) Provide name, route map, and contact number for emergency medical services available in case of a suspected exposure or emergency.
 - 5-panel drug testing shall be completed for all subcontractor and lower-tier subcontractor onsite employees within 30 days prior to arrival onsite.
- e. Site Control: Implement appropriate site controls to isolate areas with hazardous substances or physical hazards before Work begins. Establish Work zones, use of the "buddy" system, site communications including emergency signals, and identification of standard operating procedures.

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- f. Decontamination:
 - Written procedures will be developed and implemented before and during site activities based upon actual site conditions. Decontamination for hand tools, light equipment and personnel will be described in the Subcontractor's AHAs. Decontamination for heavy equipment and trucks will be described in the Subcontractor's Work Plan.
 - 2) All trucks or other equipment entering the exclusion zones must be decontaminated prior to exiting the exclusion zones. This includes, but is not limited to, trucks transporting contaminated soil from excavation areas to the waste stabilization area (if needed), trucks transporting equipment to and from the exclusion zone(s), trucks transporting contaminated soil from the excavation areas to the landfill(s), and trucks transporting liquids for offsite treatment/disposal. The Subcontractor is responsible for conducting all truck decontamination and management of decontamination wastes.
 - 3) All equipment leaving the site must be decontaminated and decontamination wastes must be managed, contained and disposed of by the Subcontractor in a manner approved by the Contractor in the appropriate plans.
- g. Spill Control:
 - Onsite Spills: Requirements for spill containment procedures are described in the Contractor's Health and Safety Plan; these shall be followed when developing the Subcontractor's procedures.
 - Offsite Spills: Describe procedures for containment of offsite spills in detail in the Transportation and Disposal Plan; a general description of these procedures shall be described in the Subcontractor's Health and Safety Plan.
 - 3) All personnel leaving the exclusion area will perform the required decontamination. The Subcontractor DSC will observe these operations and ensure proper decontamination procedures are being followed. These procedures shall be followed every time personnel leave the Site.
 - 4) PPE will be cleaned or disposed of in a method specified in the Subcontractor's HASP.
- h. Emergency response plan will include the following:
 - Pre-emergency planning including designation of personnel roles, responsibilities, emergency recognition, safe places of refuge or gathering, evacuation routes, emergency decontamination procedures, alerting procedure, and availability of first aid and medical treatment.

- Site emergency equipment including first aid kits, 15-minute eyewash, 20-pound fire extinguishers, bloodborne pathogen kit, emergency map, designated emergency vehicle, and listing of trained first aid and CPR personnel.
- 3) Procedures for reporting incidents, emergency communications, and testing of the site emergency notification system.
- 4) Post-emergency evaluation, an evaluation looking at how resources came into play, response of outside sources, and steps to improve the process.
- i. Confined Space Entry, if Required by Site Activities: This includes the specific procedure following 29 CFR 1910.146, including training, site isolation, permit procedures, air monitoring, and emergency rescue.
- j. Spill Containment Program:
 - 1) Written spill containment program that is targeted at the quantities and types of material brought to the Site by the Subcontractor or as a result of stockpiling or tankage of site materials.
 - 2) Spill control materials in adequate quantities to control solid or liquid spills.
 - 3) Drums or containers for recovery of spilled material or rapidly available local resources to provide these materials.
- k. Activity Hazard Analyses:
 - 1) The Subcontractor will prepare AHAs to review the hazards posed and required hazard control procedures for each day's planned activities.
 - 2) During the daily safety meeting, the Subcontractor's supervisor will brief their Work crew on the AHA, which shall include the day's planned tasks, tools, equipment, and materials that will be used, along with hazards posed and required hazard control procedures for each day's planned activities.
- 3. References:
 - a. CH2M Health and Safety Program Plan.
 - b. OSHA 29 CFR 1910, General Industry Standards.
 - c. OSHA 29 CFR 1926, Construction Industry Standards.

1.10 SUBCONTRACT TIME

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Subcontract.

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- B. Substantial Completion:
 - 1. Substantial Completion will occur when preliminary punch list Work has been completed and the Post-Construction Meeting is conducted with the Contractor and USEPA.
 - 2. The Work is to be performed in 1 mobilization. Project Substantial Completion for ancillary services will occur when installation, construction and restoration is complete, as shown in the Drawings, and punch list work is complete. Project Substantial completion for ISTT will occur when installation, operations, and restoration is complete, as outlined in the Performance Work Statement, and punch list work is complete.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Informational Submittals:
 - 1. Schedule of Values: Submit on Subcontractor's Standard Form.
 - 2. Schedule of Estimated Progress Payments:
 - a. Submit with initially acceptable Schedule of Values.
 - b. Submit adjustments thereto with Application for Payment.
 - 3. Application for Payment.
 - 4. Final Application for Payment.

1.02 SCHEDULE OF VALUES

- A. On a weekly basis, the Subcontractor shall provide and updated Schedule of Values (SOV) as described in Section 01 11 00, Summary of Work.
- B. The Schedule of Values shall be reviewed weekly during each weekly progress meeting with the Contractor. Based on the weekly review, the SOV shall be revised, if needed.
- C. Upon request of Contractor, provide documentation to support the accuracy of the Schedule of Values.
- D. The Schedule of Values shall correspond to each definable feature of work (DFOW), as outlined in Section 01 45 16.13, Subcontractor Quality Control.
- E. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.
- F. Lump Sum Work:
 - 1. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, equipment testing, facility startup, and contract closeout separately.
 - 2. Break down by Division 02 through 49 with appropriate subdivision of each specification for ancillary services.
- G. An unbalanced or front-end loaded schedule will not be acceptable.

PW/DEN001/668402 MARCH 2018 ©COPYRIGHT 2018 CH2M HILL H. Summation of the complete Schedule of Values representing all the Work shall equal the Subcontract Price.

1.03 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

- A. Show estimated payment requests throughout Subcontract Times aggregating initial Subcontract Price.
- B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Subcontract Price as reflected by modifications to the Subcontract Documents.

1.04 APPLICATION FOR PAYMENT

- A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Subcontractor.
- B. Use detailed Application for Payment Form provided by Contractor.
- C. Provide separate form for each schedule as applicable.
- D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.
- E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Contractor.
- F. Preparation:
 - 1. Round values to nearest dollar.
 - 2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Contractor.

1.05 MEASUREMENT—GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.

PAYMENT PROCEDURES 01 29 00 - 2

- B. Whenever pay quantities of material are determined by weight, material shall be weighed on scales furnished by Subcontractor and certified accurate by state agency responsible. Weight or load slip shall be obtained from weigher and delivered to Contractor at point of delivery of material.
- C. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by Contractor. Each vehicle shall bear a plainly legible identification mark.
- D. Haul materials that are specified for measurement by the cubic yard measured in the vehicle shall be hauled in vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.
- E. Where measurement of quantities depends on elevation of existing ground, elevations obtained during construction by the Subcontractor will be compared with those shown on Drawings. Variations of 1 foot or less will be ignored, and profiles shown on Drawings will be used for determining quantities.
- F. Quantities for soil disposal will be based on weight tickets of material transported from the Site for offsite disposal.
- G. Quantities for liquid disposal will be based on volumes listed on a bill of lading or manifest.
- H. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

Item	Method of Measurement	
AC	Acre—Field Measure by Subcontractor	
CY	Cubic Yard—Field Measure by Subcontractor within limits specified or shown	
CY-VM	Cubic Yard—Measured in Vehicle by Volume	
EA	Each—Field Count by Subcontractor	
GAL	Gallon—Field Measure by Subcontractor	
HR	Hour	

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Item	Method of Measurement	
LB	Pound(s)—Weight Measure by Scale	
LF	Linear Foot—Field Measure by Subcontractor	
SF	Square Foot—Field Measure by Subcontractor	
SY	Square Yard	
TON	Ton—Weight Measure by Scale (2,000 pounds)	

1.06 PAYMENT

A. General:

- 1. Progress payments will be made in accordance with the subcontract documents.
- 2. The date for Subcontractor's submission of monthly Application for Payment shall be established at the Preconstruction Conference.
- B. Payment for all Lump Sum Work covers all Work specified or shown within the limits or specification sections as shown in Table 1, Lump Sum Price Items, attached as a supplement to this section.
- C. Payment for Unit Price Items covers all the labor, materials and services necessary to furnish and install the items shown in Table 2, Unit Price Items, attached as a supplement to this section.

1.07 PAYMENT FOR WORK COMPLETED

A. Payment for work completed will be made only after the Contractor has reviewed the payment application and confirms that the work has been completed satisfactorily according to the specifications and in accordance with the 3-phase quality control process, as discussed in the Subcontractor's Quality Control Plan.

1.08 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

- A. Payment will not be made for following:
 - 1. Loading, hauling, and disposing of rejected material.
 - 2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
 - 3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Subcontractor to conform to provisions of Contract Documents.

- 4. Material not unloaded from transporting vehicle.
- 5. Defective Work not accepted by Contractor.
- 6. Material remaining on hand after completion of Work.

1.09 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored. Payment will be made only for materials incorporated in Work.

1.10 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this Specification.
 - 1. Subcontractor Application for Payment and Partial Release of Lien.
 - 2. Table 1, Lump Sum Price Items.
 - 3. Table 2, Unit Price Items.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

VELSICOL CHEMICAL CORPORATION SUPERFUND SITE FORMER PLANT NAPL/DBCP

SUBCONTRACTOR APPLICATION FOR PAYMENT & PARTIAL RELEASE OF LIEN

CH	I2M HILL Constructors, Inc	CCI Subcontract	
		No.:	
At	tn: CCI AP	CCI Project No.:	
PC) Box 241329	Site Location:	
De	nver, CO 80224		
Su	bcontractor:	Invoice No.:	
		Invoice Date:	
		Period:	То:
			From:
Pres	ent Contract Status as Follows:		
1	Original Subcontract Amount		\$
2			¢
2	Net Change by Change Orders through CO No		Þ
3	Total Subcontract Amount to Date (Line 1 + Line 2)		\$
4	Total Complete & Stored to Date		\$
5	Less Previous PERIOD Applications for Payment (Line 5 + Line 6 from previous Pay Applications)		\$
6	This PERIOD Application (Line 4 – Line 5)		\$
7	Less Retainage this PERIOD at 10%		NA
8	Net Payment Due this PERIOD (Line 6 – Line 7)		\$
9	Total Retainage including this Application (10% of Line 4)		NA

CERTIFICATION AND LIEN WAIVER:

I certify that all items and amounts shown above are correct, that all work has been performed and materials supplied in full accordance with the terms and conditions of this subcontract, and that, to the extent not previously furnished, a signed (Conditional) Waiver of Lien is attached for each Subcontractor or Supplier who performed work or furnished items for the Project.

I also certify that payment has been made to all labor through the last pay period and to all Suppliers, and lower tier subcontractors (except retainage) used in connection with performance of the subcontract through the last pay period,

The foregoing instrument was acknowledged before me this _____ by _____

Ву____

BY:____

Notary Public

My commission expires: _____

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(authorized signature) Printed Name______ Title______

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TABLE 1

Lump Sum Items

Item	Description	
Performance/Payment Bonds and Taxes	Includes the cost for required performance and payment bonds and taxes as required in General Terms & Conditions. Sections 7.1.13 and 7.1.14 of Performance Work Statement and Bid Items 6.0 and 6.1.	
Insurance	Includes the cost for insurance as required in the General Terms & Conditions.	
System Design	Includes, but is not limited to: Two iterations of the Design Report (60% and Final), system narrative, drawings, and construction details of subsurface components. The design package will also include a projected energy balance to identify the type and required capacity of utilities needed to support ISTT implementation. Section 7.1.1 of Performance Work Statement and Bid Item 1.0.	
Work Plans, Schedules, and Permits or Permit Equivalents	Includes, but it not limited to: work plan, site-specific plans, schedules, and assistance to CH2M for permit equivalencies. Section 7.1.2 of Performance Work Statement and Bid Item 2.0.	
Mobilization	Includes all necessary labor, expenses, and material to mobilize staff, materials, and equipment to the site, and all personal labor and expenses associated with travel for inter-shift travel to/from the site. Section 7.1.3 of Performance Work Statement and Bid Item 2.1.	
Site Controls	Includes all necessary labor, equipment, and material necessary to perform utility clearances, and to assemble and set up equipment, office trailer, sanitary facilities, and temporary controls (site trailer with power and communication and sanitary systems). Section 7.1.4 of Performance Work Statement and Bid Item 2.2.	
Furnish and Install Underground ISTT System Components	Includes supply and installation of all subsurface components of the ISTT system. Includes labor, equipment, and materials for locating and installation of treatment borings, extraction wells, injection wells, heaters, electrodes, grounding loops and any subsurface infrastructure required to remediate the TTZ using the provided ISTT system. Soil cuttings and other solid waste generated during installation of the ISTT system components will be containerized in Department of Transportation-approved open-top 55 gallon drums or water-tight and covered roll-off boxes provided by the Subcontractor for offsite disposal by CH2M. Section 7.1.5 of Performance Work Statement and Bid Item 3.0.	

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TABLE 1

Lump Sum Items

Item	Description	
Furnish and Install Aboveground ISTT System Components	Includes the supply and installation of all aboveground components of the ISTT system. Includes labor, equipment, and materials to install all aboveground treatment equipment, tanks, hoses, conveyance piping, pumps, blowers, valves, controls, meters, gauges, heat exchangers, cooling towers, electrical power distribution, controls, mechanical connections, aboveground thermal insulation, freeze-protection systems, vapor barriers, and all necessary process equipment to treat fluids extracted during ISTT system operation. Includes labor, equipment, and materials to construct equipment pad if existing equipment pad is not suitable for Subcontractor's equipment. Section 7.1.6 of Performance Work Statement and Bid Item 3.1.	
Commissioning and Startup of ISTT System	Includes of labor and all supporting materials and expenses to commission the constructed ISTT system. Commissioning will be a period during which all mechanical and electrical system installations are inspected, tested, and documented, and any deficiencies repaired. Section 7.1.7 of Performance Work Statement and Bid Item 3.2.	
Operate ISTT System	Includes labor, equipment, and materials costs to maintain and operate all components of the ISTT system until the time when diminishing returns are achieved. To fulfill treatment objectives, includes labor and equipment for system monitoring, assisting CH2M with system sampling, and maintenance of operational data and maintenance activities. Includes the provisions for kriged, color-contoured graphics for system data for EPA's web viewer. Includes collection, containerization, and storage of all process waste. Section 7.1.8 of Performance Work Statement and Bid Item 3.3.	
Performance Verification	Includes costs to support CH2M in accessing efficacy of the ISTT system operation in the VBPSS after diminishing returns are demonstrated. Anticipated Subcontractor support includes: temporary removal or protection of remediation system components for sampling equipment access, deactivation of extraction systems, and physical or electrical isolation of subsurface heating systems. Section 7.1.9 of Performance Work Statement and Bid Item 3.4.	
Restoration: Surface	Includes equipment, labor, and materials required to restore the surface of the site to pre-existing conditions. Once diminishing returns has been demonstrated in all treatment areas, the Subcontractor will decommission and remove all treatment equipment furnished and installed for ISTT system operation from the site. Includes decontamination of all non-disposable equipment with a portable pressure washer or steam cleaner prior to removal from the site, and containerization of decontamination water for offsite disposal. Section 7.1.10 of Performance Work Statement and Bid Item 4.0.	

TABLE 1

Lump Sum Items Description Item Includes equipment, labor, and materials required to restore the subsurface to pre-existing conditions. Once diminishing returns have been demonstrated and cool-down operations have been completed, the Subcontractor will decommission and remove from the site all treatment equipment furnished and installed for ISTT system operation. Restoration: Subsurface The Subcontractor will remove all subsurface infrastructure furnished or installed for ISTT system operation. Section 7.1.11 of Performance Work Statement and Bid Item 4.1. Includes all necessary labor, equipment, and materials necessary to demobilize personnel and equipment from the site, including assembly and breakdown of equipment, temporary facilities and controls, equipment/material storage areas, and water storage facilities. Includes removal of all debris and rubbish related to construction activities. Demobilization and Reporting Includes preparation of a final report detailing performance of the ISTT system installed and operated at the site intended to chronicle corrective action at the site by the ISTT system from start to finish, including construction, operation, site restoration, and demobilization activities. Section 7.1.12 of Performance Work Statement and Bid Item 5.0.

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TABLE 2

Unit Price Items

ltem	Description	Unit of Measure
Solid Waste Generation – System Installation	Includes soil cuttings and other solid waste generated during installation of the ISTT. Section 7.1.5 of Performance Work Statement and Bid Item 3.0.	TON
Liquid Waste Generation – System Installation	te Generation – System Includes all liquid waste generated during ISTT System Installation. Section 7.1.5 of Performance Work Statement and Bid Item 3.0.	
Operate ISTT System – Weekly Unit Rate	If, after 90 days of treatment at the target temperature, removal of contaminant mass has ceased to the point where the criteria that define diminishing returns can be demonstrated, then operation of the ISTT will be transitioned to the final stage, described as Phase 2. Phase 2 operations would be completed under a weekly unit rate structure to allow sufficient treatment time to demonstrate that diminishing returns for the system is achieved. Includes all costs for consumable materials required to operate the ISTT system components, including temporary operation of the emergency generator package (as required), electricity required (in kWh), and estimated days necessary to operate the proposed ISTT system to achieve specified treatment objectives. Section 7.1.8 of Performance Work Statement and Bid Item 3.3.	WEEK

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SECTION 01 31 13 PROJECT COORDINATION

PART 1 GENERAL

1.01 SUBMITTALS

- A. Informational:
 - 1. Statement of Qualification (SOQ) for land surveyor.
 - 2. Utility locate tickets:
 - a. Documentation of completed utility locates for both MISS DIG and 3rd party (if Applicable).
 - b. Submit one copy, within 2 days prior to beginning excavation activities.
 - 3. Photographs:
 - Digital Images: Each image is to have a minimum file size of 1.4 Mb (1,400 Kb) so viewed resolution is high quality. The production of larger file sizes with higher resolution is encouraged.
 - b. Copies of videos and photographs taken by Subcontractor.

B. Action:

- 1. Survey Documentation:
 - a. Pre-Construction Survey: Submit drawings documenting coordinates and elevations for delineation for VBPSS ISTT Area, roads, laydown areas, equipment pads, and utilities shown on the Drawings.
 - b. Post-Construction Survey: Submit Drawings documenting coordinates and post-construction grade for road installations and improvements, laydown areas, equipment pads, Pine River outfall, and utilities.
 - c. Submit electronic files in MicroStation V8i SELECT Series 2 or other compatible format.

1.02 RELATED WORK AT SITE

- A. General:
 - 1. Other work that is either directly or indirectly related to scheduled performance of the Work under these Contract Documents, listed henceforth, is anticipated to be performed at Site by others.

PROJECT COORDINATION 01 31 13 - 1

- 2. Coordinate the Work of these Subcontract Documents with work of others as specified in General Conditions.
- 3. Subcontractor shall make the southern and central portions of the existing process pad available to others every Thursday between 7:00 a.m. and 1:00 p.m.
- 4. Include sequencing constraints specified herein as a part of Progress Schedule.

1.03 UTILITY NOTIFICATION AND COORDINATION

- A. The Subcontractor will coordinate utility clearance through the local one-call system (MISS DIG). The Subcontractor shall verify that utilities have been identified and marked prior to beginning the Work and protect the utilities from damage during construction.
- B. The Subcontractor shall notify applicable utilities prior to commencing Work and if damage occurs, or if conflicts or emergencies arise during the Work.
 - 1. Electricity: City of St. Louis
 - a. Contact Person: Mike Parsons.
 - b. Telephone: 989-681-3351.
 - 2. Telephone/Internet Company: Charter Spectrum.
 - a. Telephone: 877-906-9121.
 - 3. Water Department: City of St. Louis
 - a. Contact Person: Steve Mepham.
 - b. Telephone: 989-681-3567.
 - 4. Gas Department: Consumers Energy.
 - a. Contact Person: Dan Jones.
 - b. Telephone: 989-791-5903.
- C. Electric:
 - 1. Agency and Contact Person: City of St. Louis Electric Department, Mike Parsons: 989-681-3351.
 - 2. There is an existing 12.47 kV electric service which includes real time digital metering and 200 amp fused disconnect switch at the corner of North Watson Street and North Street, as shown on the Drawings. The ISTT Subcontractor will notify Contractor if alternate service is required.
 - 3. Work to be performed by City of St. Louis Electric Department (if requested by ISTT Subcontractor):
 - a. New electrical service (details to be determined) at corner of North Watson Street and North Street.

- 4. Work to be performed by Ancillary Services Subcontractor (if requested by ISTT Subcontractor):
 - a. Coordinate Subcontractor's work with City of St. Louis Electric Department.
 - b. Installation of electric service line from corner of North Watson Street and North Street to ISTT equipment pad, as shown on Drawings.
 - c. Installation of electric service near existing access gate for heat tracing, as shown on Drawings.
 - d. Trench excavation and backfill for electric service line installation.
 - e. Repair of disturbed road and greenspace to existing conditions or better.
 - f. Repair of any damage to City of St. Louis Electric Department property caused by Subcontractor's error during construction.
- D. Natural Gas:
 - 1. Agency and Contact Person: Consumer's Energy, Dan Jones: 989-791-5903.
 - 2. There is an existing gas line connection rated for 5 psi gas service at the corner of North Watson Street and North Street, and a 2-inch HDPE gas line that runs from this connection to the ISTT equipment pad, as shown on the Drawings. The ISTT Subcontractor will notify Contractor if alternate service is required.
 - 3. Work to be performed by Consumer's Energy (if requested by ISTT Subcontractor):
 - a. Natural gas line location identification.
 - b. Operation of gas valves to isolate natural gas line where Work will be completed.
 - c. Installation of gas service meter.
 - d. Installation of natural gas line from existing distribution system to gas service meter.
 - 4. Work to be performed by Ancillary Services Subcontractor (if requested by ISTT Subcontractor):
 - a. Coordinate Subcontractor's work with Consumer's Energy.
 - b. Trench excavation and backfill for natural gas line installation.
 - c. Installation of natural gas line connection for ISTT to new gas service meter near the corner of North Street and Watson Street.
 - d. Installation of gas service meter mounting brackets (details TBD).
 - e. Repair of disturbed road and greenspace to existing conditions or better.
 - f. Repair of any damage to Consumer's Energy property caused by Ancillary Services Subcontractor's error during construction.

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- E. Water:
 - 1. Agency and Contact Person: St. Louis Water Utility, Steve Mepham: 989-681-3567.
 - 2. There is an existing potable water connection at the existing site entrance on North Street. There is an existing 2-inch SDR-11 HDPE water line with insulation foam boards that runs from this connection to the ISTT equipment pad, as shown on the Drawings. The ISTT Subcontractor will notify Contractor if alternate service is required.
 - 3. Work to be performed by St. Louis Water Utility (if requested by ISTT Subcontractor):
 - a. Water main location identification.
 - b. Operation of water valves to isolate water main where Work will be completed.
 - 4. Work to be performed by Ancillary Services Subcontractor (if requested by ISTT Subcontractor):
 - a. Coordinate Subcontractor's work with St. Louis Water Utility.
 - b. Trench excavation and backfill for temporary water service line installation from existing 1.5-inch potable water service tap near the existing site entrance on North Street.
 - c. Repair of disturbed road, sidewalk and greenspace to existing conditions or better.
 - d. Repair of any damage to St. Louis Water Utility property caused by Subcontractor's error during construction.
- F. Third Party Utility Locator:
 - 1. The Subcontractor will provide a third-party utility locate subcontractor to perform an independent utility locate search that will help define the location of existing utilities in the work area. The Subcontractor will investigate areas where subsurface work will be performed. The utility locating task will include the following:
 - a. Verify the presence or absence of underground utilities in the proposed work areas shown on the design drawings. Previous utility locate may be used but must be confirmed by completing a new utility locate.
 - b. Methods used to locate underground utilities and anomalies will include ground penetrating radar and electromagnetic/magnetometer.
 - c. Underground utilities will be marked as appropriate for each utility (e.g., electrical, gas or water). Utilities must be clearly marked with spray paint and flags capable of withstanding inclement weather and normal abuse in accordance with American Public Works Association (APWA) uniform color codes.
 - d. All utilities in the area will be delineated and clearly marked.

PROJECT COORDINATION 01 31 13 - 4

2. The results of the locate effort will be submitted to Contractor.

1.04 ADJACENT FACILITIES AND PROPERTIES

- A. Examination:
 - 1. After Effective Date of the Agreement and before Work at Site is started, Subcontractor, Contractor and affected nearby property owners (if applicable) and utility owners (if applicable) will make a thorough examination of pre-existing conditions including existing buildings, structures, and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations.
 - 2. Periodic reexamination will be jointly performed to include, but not limited to, cracks in nearby structures, settlement, leakage, and similar conditions.
- B. Documentation:
 - 1. Record and submit documentation of observations made on examination inspections in accordance with Article Construction Photographs.
 - 2. Upon receipt, Contractor will review, sign, and return one record copy of documentation to Subcontractor to be kept on file in field office.
 - 3. Such documentation shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Subcontractor's operations, and is for the protection of adjacent property owners, Contractor, and Owner.

1.05 CONSTRUCTION PHOTOGRAPHS

- A. General:
 - 1. Photographically document all phases of the Project including pre-construction, construction progress, and post-construction.
 - 2. Contractor has the right to select subject matter and vantage point from which photographs are to be taken.
 - 3. Digital Images: No post-session electronic editing of images is allowed. Stored image must be actual image as captured without cropping or other edits.
- B. Pre-Construction and Post-Construction:
 - 1. After Effective Date of the Agreement and before Work at Site is started, and again upon issuance of Substantial Completion, take photographs of Site and property adjacent to perimeter of Site.

- 2. Particular emphasis will be directed to structures both inside and outside the Site.
- 3. Format: Digital, minimum resolution of 1,832 pixels by 3,264 pixels and 24 bit, millions of color.
- C. Construction Progress Photos:
 - 1. Photographically demonstrate progress of construction, showing every aspect of Site and adjacent properties as well as interior and exterior of new or impacted structures.
 - 2. Weekly: Take photographs using digital, minimum resolution of 1,832 pixels by 3,264 pixels and 24 bit, millions of color.
- D. Documentation:
 - 1. Digital Images:
 - a. Electronic image will have date taken embedded into image.
 - b. Archive using a commercially available photo management system that provides listing of photographs including date and keyword description.
 - c. Label file folders or database records with Project and Owner's name, and month and year images were produced.

1.06 REFERENCE POINTS AND SURVEYS

- A. All survey work must be completed under the direct supervision of a Professional Land Surveyor licensed and in good standing with the State of Michigan.
- B. Location and elevation of known bench marks are shown on Drawings.
- C. Subcontractor's Responsibilities:
 - 1. Complete survey work in accordance with Exhibit 1 of this specification.
 - 2. Establish bench marks convenient to Work and at least every 500 feet on pipelines and roads.
 - 3. Establish horizontal reference points or coordinate system with bench marks and reference points for Subcontractor's use as necessary to lay out Work.
 - 4. Provide additional survey and layout required to layout the Work.
 - 5. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.
 - 6. In event of discrepancy in data provided by Contractor, request clarification before proceeding with Work.

PROJECT COORDINATION 01 31 13 - 6

- 7. Retain professional land surveyor or civil engineer registered in state of Project who shall perform or supervise engineering surveying necessary for additional construction staking and layout.
- 8. Maintain complete accurate log of survey Work as it progresses as a Record Document.
- 9. On request of Contractor, submit documentation.
- 10. Provide competent employee(s), tools, stakes, and other equipment and materials as Contractor may require to:
 - a. Establish control points, lines, and easement boundaries.
 - b. Check layout, survey, and measurement Work performed by others.
 - c. Measure quantities for payment purposes.
- 11. Establish clearing limits and set bench marks convenient for use as necessary to establish basic layout of the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.01 CUTTING, FITTING, AND PATCHING
 - A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.
 - B. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including piping, conduit, and other utilities as specified and as shown on Drawings.
 - C. Remove specimens of installed Work for testing when requested by Contractor.

3.02 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this specification.
 - 1. Exhibit 1 Standard Survey Specification.

END OF SECTION

¹Standard Survey Specification

1.1.1 General

- All work must be performed by or under the direction of a currently registered Michigan Licensed Land Surveyor who is licensed and in good standing with the State of Michigan licensing agency (surveyor).
- All documents submitted must bear the surveyor's stamped, dated, and signed seal and a certification that all work was completed under the Surveyor's supervision and that all information contained in the delivered documents are true and accurately shown.
- The surveyor is responsible for obtaining all permits and access permissions required for this work, will take all reasonable precautions to prevent damage to public and private property, and will restore the properties to the condition existing prior to the surveyor's entry.
- The surveyor will take all reasonable precautions to prevent damage to public and private property, and will restore the site to the condition existing prior to the surveyor's entry.
- All work will be completed under the direction of the surveyor. All work will be conducted using equipment, personnel, and procedures that will ensure compliance with the accuracy standards as defined herein. It is the responsibility of the supervising land surveyor to ensure that all work under this agreement complies with all federal, state, and local regulations. All documents submitted will bear the surveyor's seal, signature, and a certificate that all work was done under the surveyor's supervision and that all information contained in the document is true and is accurately shown.
- The surveyor is responsible for quality assurance for the survey work performed on this project, which will include but is not limited to fieldwork checks, equipment calibration, office calculations, drawings, and a final peer review. Obtain and report survey check shots to document quality assurance/quality control (QA/QC) measures and to document horizontal and vertical survey accuracies. Post-processing reports will be provided where the global positioning system (GPS) is used. The surveyor will provide documentation of QA and QC completed upon request and at the time of the surveyor's report final deliverable.
- All data and deliverables prepared for this survey are the property of the owner and CH2M HILL, Inc. (CH2M). The surveyor also understands and agrees that the owner and CH2M may reproduce the drawings and use all or part of the information provided on the drawings. This includes any reports prepared in connection with the investigative work for this site without incurring obligation for additional compensation to the surveyor. The original drawings, copies of field notes, and any required survey reports will be and will remain the property of the owner and CH2M. All required documents and copies of field notes will be submitted to CH2M upon completion of the work or upon request.

- Daily information will be recorded in hard copy field notebook format, and any data collector information will also be provided to CH2M. Electronic field notes alone are not acceptable. In addition, QA/QC checks and other measurement information will be included in the field notes. The field notes will include the following: the date, names of the crew, weather conditions, barometric pressure, and all collected survey data information. The field notes will contain enough sketches and other information to clearly show the work performed, including control monuments used and set. The field notes will be complete enough for retracement of the surveys by others.
- Where practical, traverses and level loops will include and verify two different permanent control monuments. Where not practical, they will be closed to the starting point control monument, and the closure error recorded. If the error is above the standards outlined above, then the surveyor will re-run the horizontal and/or vertical traverses until the errors are reduced to within the acceptable range.
- All surveyed features will be incorporated into the base mapping. A CH2M field representative will be onsite to confirm the exact survey area.

1.1.2 Specifications of Work

- The surveyor will perform and provide data for the following surveys, at a minimum:
 - Pre-construction survey, including horizontal extents of treatment areas, and horizontal and vertical extents of roads, laydown areas, equipment pads, and utilities
 - Post-construction survey, including horizontal and vertical extents of final locations of roads, laydown areas, equipment pads, Pine River outfall, and utilities.
- The objective of this task is the delivery of a 1"=20-feet scale, one-half foot contour interval accuracy planimetric and topographic mapping to the accuracies specified in this document.
- Accuracy of Control: The surveyor will recover or establish horizontal and vertical control monuments for the site. The horizontal accuracy of the control will be Third Order Class I, (1:10,000) or better, and the vertical accuracy will be Third Order, (0.05Vm) as outlined in the Federal Geographic Data Committee (FGDC) Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, Constructions (A/E/C) and Facility Management.

Prior to using GPS survey methods to establish onsite control, the surveyor will describe their planned method and provide the CH2M project manager with their determination of the horizontal and vertical accuracy they can achieve based on their planned GPS methodology and baseline lengths and how they plan to document achievement of the attained accuracy. **GPS cannot be used until the accuracy determination is provided by the surveyor and is approved by the project manager.**

- If GPS is allowed for establishing onsite horizontal control, then the surveyor will also perform and document direct field measurement checks between the monuments established using GPS.
- If GPS is allowed for establishing vertical control, then the surveyor will also perform and document direct differential level loop closure checks between the monuments established using GPS.

- Accuracy of all Other Field Surveys: Other than the control surveys, field survey mapping will comply with FGDC Geospatial Positioning Accuracy Standards, Part 4: Standards for A/E/C, and facility management with relative accuracy tolerances of ±0.25 foot for the horizontal and ±0.07 foot for the vertical on all hard surfaces (including compacted ground surfaces) and ±0.10 foot for the vertical on soft or natural ground surfaces.
- The surveyor will provide coordinates of all points X, Y, and Z to the nearest 0.01 foot, except ground control coordinates will be reported to three decimal places.
- Daily information will be recorded in hard copy field book format and copies provided to CH2M. All data collector information will also be provided to CH2M. Field notes will include sketches to show the location of control points and other information to allow for review and retracement of the survey. Electronic field notes alone are not acceptable. They will also include the following: the date, names of the crew, weather conditions, and all collected survey data information.
- Where practical, all differential level and horizontal traverses will be closed to a second benchmark or control monument and the errors recorded. If the errors are above the standards outlined above, then the survey will re-run the horizontal and vertical traverses until the errors are eliminated within the acceptable range.
- The surveyor will research, recover, and confirm the existing past project horizontal and vertical control networks found on or near the properties. The surveyor will confirm that the horizontal and vertical coordinate system and datum(s) specified herein (including adjustments) are consistent with the coordinate system and datum(s) currently in use on the properties. If the surveyor determines that the past systems are different than those specified herein, then the surveyor will explain the differences and will work with the project manager to decide which systems to use for the work identified in this document. Unless otherwise agreed to in writing, the horizontal coordinate system and horizontal and vertical datum(s) will be as follows:
 - The project horizontal coordinate system and datum will be the Michigan State Plane Coordinates System, South Zone, North American Datum of 1983 (NAD83) most current adjustment.
 - The project vertical datum will be the North American Vertical Datum of 1988, most current adjustment.
- The unit of measure will be the International Foot.

1.1.3 Standards and Delivery Formats

Survey Accuracy Standard –

FGDC Geospatial Positioning Accuracy Standards, Part 4: Standards for A/E/C, and Facility Management.

Map Accuracy Standard -

ASPRS (Map) Accuracy Standards – Class 1 for the required map scale and contour interval, except the X, Y, and Z positions for all surveyed points shown in the mapping will comply with the survey accuracy standards cited in this scope of work.

CAD Standard –

National CAD Standards (NCS), as published for the National Institute of Building Sciences.

Geographic Information System (GIS) Standard -

Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), version 2.6.

GIS Format –

GIS deliverables will be provided in either ESRI's shape file (.shp) or geodatabase (.gdb) format, along with an accompanying map document (.mxd) in ArcMap Version 10.2 or newer. All shape files and/or geodatabases must adhere to the **Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), version 2.6**. At a minimum, the naming convention of SDSFIE must be followed and relevant attribute information populated. Should the subcontractor be unable to provide the information in the SDSFIE format, the subcontractor will provide to CH2M information to define the GIS format proposed for use and obtain acceptance from the CH2M project manager prior to use.

CAD Format -

CAD deliverables will be provided in a native current version of MicroStation or AutoCAD electronic format. All electronic drawing symbology must conform to the CAD Standards identified above.

Minimum Content of the Map/Drawing Deliverables -

Construction staking Record Map: Scale to be proposed by the surveyor for approval by CH2M.

Minimum Content Requirements					
Title block	North arrow	Scale (Bar) and contour interval			
Date of survey	Legend with symbols and abbreviations	Coordinate system and datum – horizontal and vertical			
Grid Ticks – A minimum of four labeled grid ticks	Grid Values – Coordinate system values for the grid ticks	All survey control monuments found and set			
Subcontractors Certificate – Which certifies that all work complies with the accuracy requirements and with federal, state, laws, codes, ordinances, rules, and regulations.	Subcontractors (Surveyor's) stamped, dated, and signed seal				

As-Built Survey Base Mapping: For plotting at 1 inch = 20 feet horizontal scale.

Coordinate Listing of Surveyed Points –

A Microsoft Excel spreadsheet file containing ALL **survey shots/points** will be provided in the following format:

- Point number/name, northing, easting, elevation, field code, and point description.
- Control point northings and eastings and elevations will be reported to 3 decimal places.
- The northing, easting, and elevation for all points, other than control points, will be reported to 2 decimal places.
- All field-collected data will have unique point numbers/names assigned and point numbers/names will not be re-used in subsequent field surveys for the project.

1.1.4 Detailed Scope of Services by Task

Control Surveys

If existing horizontal control monuments are not recovered very near the properties, then two intervisible pair (three semi-permanent) control monuments will be set (e.g., 30-inch or longer, #5 rebar or larger, or equivalent, driven to refusal and appropriately capped and marked). These monuments will be set at ground level and will achieve the accuracies stated herein.

If existing vertical monuments are not recovered very near the properties, then two pairs of semi-permanent vertical benchmark control monuments (three benchmarks) will be set. These monuments can be the same points as the horizontal control monuments if there are no existing features or structures available that would provide more stability for vertical control monuments (e.g., bridge headwalls, building foundation, sidewalks, curbs, etc. where a chiseled square could be generated).

Construction activities will be performed within the survey/mapping area; therefore, the horizontal and vertical control monuments will be set nearby but outside of the survey area in an area that will be undisturbed by construction activities.

When control is established, regardless of the techniques used (e.g., GPS or conventional Total Station survey) the surveyor will conduct direct conventional field measurements to confirm the accuracy of the new control points and will report the results. The surveyor will base all surveys, horizontal and vertical, on the survey control monuments recovered or established as the project control monuments.

Control Surveys will include the following:

- 1. Recovered or established NAD83 State Plane Coordinate System horizontal control monuments.
- 2. Recovered or established Project North American Vertical Datum of 1988 benchmark monuments.
- 3. Data sheets, descriptions, to-reach descriptions, photographs, and coordinate listings of all found and set control monuments.
- 4. All other information described in the scope of work regarding the control will be included as part of the surveyor's report and/or base mapping deliverables.

Surveyor's Report

Surveyor's Report will include the following:

- 1. A survey report will be prepared and delivered addressing all survey fieldwork and aerial mapping performed. The survey report will include the following:
 - a. Copies of all field notes, manual, and electronic.
 - b. Documentation of the horizontal coordinate system and horizontal and vertical datum(s) and adjustments.
 - c. The control monuments recovered and set, and those used as the basis for the surveys.
 - d. The surveyor's report will describe the equipment and methodology used to perform the work and will also describe the results of the survey and accuracies attained.
 - e. Documentation of the QC procedures and checks performed and their results.

- f. The report will contain a coordinate point listing for all points field surveyed provided in both paper and Microsoft Excel electronic format.
- g. The report will be stamped, dated, and signed by the surveyor who will certify that the work was completed in compliance with the specifications and that the deliverables meet or exceed (are better than) the specified accuracy requirements.
- h. The surveyor's report will be delivered in hard copy, in pdf format, and in Microsoft Word format. It will be delivered in draft in Word format for review and comment by CH2M. A final version, addressing all comments, will also be delivered.
- 2. A record map containing all points surveyed. The map must include the minimum content requirements listed in the table in the Minimum Content of Map/Drawing Deliverables section of this document. This deliverable will be delivered in ESRI ArcMap GIS format, including an .mxd map document in ArcMap 10.2.1 or higher and associated shape files or a personal geodatabase. If the surveyor does not have ESRI GIS capabilities, then the CAD deliverables will be delivered in a manner that can be easily converted to GIS. The ease of conversion to GIS will be demonstrated as part of the delivery.

SECTION 01 31 19 PROJECT MEETINGS

PART 1 GENERAL

1.01 GENERAL

- A. Subcontractor will participate in specified project meetings as required herein. The meetings include the following:
 - 1. Pre-construction conference.
 - 2. Scheduling meetings.
 - 3. Pre-construction meetings.
 - 4. Preparatory phase meetings.
 - 5. Post-construction meetings.
 - 6. Daily tailgate meetings.
 - 7. Weekly progress meetings.
 - 8. Final post-construction meeting.
 - 9. Other meetings that may be determined necessary during the construction period.
- B. Contractor will schedule meeting time and locations throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record notes to include significant proceedings and decisions, and reproduce and distribute copies of notes within 2 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

- A. Subcontractor will attend a one-time mandatory preconstruction conference, which will be held in St. Louis, Michigan, prior to mobilization. The exact date and time will be determined at the time of Subcontract Award. Subcontractor will be prepared to discuss the following subjects, as a minimum:
 - 1. Required schedules.
 - 2. Status of Bonds and insurance.
 - 3. Sequencing of critical path work items.
 - 4. Progress payment procedures.
 - 5. Project changes and clarification procedures.
 - 6. Use of Site, access, office and storage areas, security and temporary facilities.

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- 7. Major product delivery and priorities.
- 8. Status of permits, license or required approvals.
- 9. Status of submittals.
- 10. Maintaining required records.
- 11. Activity Hazard Analyses.
- 12. Subcontractor Transportation and Disposal Plan.
- 13. Subcontractor Soil Erosion and Sedimentation Control Plan.
- 14. Subcontractor Key Personnel Information and Points of Contact for 24 hours per day, 7 days per week.
- 15. Subcontractor's safety plan and representative.
- 16. Subcontractor's Quality Control Plan.
- B. Attendees will include:
 - 1. Owner's representatives.
 - 2. Contractor's representatives.
 - 3. Subcontractor's office representative.
 - 4. Subcontractor's project manager.
 - 5. Subcontractor's resident superintendent.
 - 6. Subcontractor's quality control representative.
 - 7. Lower-tiered Subcontractors' representatives whom Subcontractor may desire or Contractor may request to attend.
 - 8. Others as appropriate.

1.03 PRELIMINARY SCHEDULES REVIEW MEETING

A. As set forth in General Conditions and Section 01 32 00, Construction Progress Documentation.

1.04 PREPARATORY PHASE MEETINGS

A. Preparatory Phase meetings will be held to review each definable feature of work (DFOW), as outlined in Section 01 45 16.13, Subcontractor Quality Control.

1.05 DAILY TAILGATE MEETINGS

A. Daily tailgate meetings will be conducted every workday morning with Contractor prior to starting Work for the day. Generally, attendees for this meeting will include all Subcontractor and lower-tier Subcontractor personnel who will be working that day. Documentation of the meeting will be provided to Contractor by 10 a.m. that same day.

- B. Daily tailgate meetings will discuss the following subjects, as a minimum:
 - 1. The work planned for the day.
 - 2. Changes in work assignment.
 - 3. Health and safety issues.
 - 4. Quality issues.
 - 5. Review problems encountered the previous day.
 - 6. Review and sign the AHA prior to beginning any Work onsite.

1.06 WEEKLY PROGRESS MEETINGS

- A. Contractor will schedule regular progress meetings at Site, conducted weekly to review the Work progress, safety performance since the previous meetings, progress schedule, sample collection and submissions schedule, contract modifications, Quality Control meetings and other matters that require discussion and resolution.
- B. Submittals required for each weekly progress meeting will include, at a minimum:
 - 1. Updated progress schedule.
 - 2. Updated schedule of values.
- C. Attendees will include:
 - 1. Owner's representative(s), as appropriate.
 - 2. Contractor's representative(s).
 - 3. Subcontractors representative(s).
 - 4. Lower-tiered Subcontractors' representative(s) and Suppliers, as appropriate.
 - 5. Others as appropriate.

1.07 QUALITY CONTROL MEETINGS

- A. In accordance with Section 01 45 16.13, Subcontractor Quality Control.
- B. Scheduled by Contractor on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of the Work and work of other Subcontractors.
- C. Attendees will include:
 - 1. Subcontractor.
 - 2. Subcontractor's designated quality control representative.
- 3. Lower-tiered Subcontractors and Suppliers, as necessary.
- 4. Owner's and Contractor's quality control representatives.

1.08 POST-CONSTRUCTION MEETINGS

- A. Preliminary Post-Construction meetings will be conducted following completion of restoration to review acceptability of completed Work and to develop punch list items as required. During the meeting, a copy of the edited survey notes and construction drawings will be reviewed. Contractor will coordinate and lead the meetings with the Owner and Subcontractor in attendance at the Site.
- B. A final Post-Construction meeting will be conducted one week after the preliminary post-construction meeting. Subcontractor will attend a mandatory final post-construction meeting for the project, which will be scheduled after completion of all field activities but prior to Subcontractor demobilization. The purpose of this final inspection/meeting is to close out any punch list items, discuss schedule for demobilization, and discuss delivery of all required deliverables.

1.09 OTHER MEETINGS

A. In accordance with Subcontract Documents and as may be required by Owner and Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUBMITTALS

- A. Preliminary Progress Schedule: Submit with Subcontractor's proposal. Submit updated progress schedule during pre-construction conference.
- B. Overall Progress Schedule: Submit adjusted schedule with each Monthly Application for Payment in accordance with the General Terms and Conditions, and at such other times as necessary to reflect:
 - 1. Progress of Work to within 2 working days prior to submission;
 - 2. Changes in Work scope and activities modified since submission;
 - 3. Delays in Submittals or resubmittals, deliveries, or Work;
 - 4. Adjusted or modified sequences of Work;
 - 5. Other identifiable changes; and
 - 6. Revised projections of progress and completion.
- C. Weekly Progress Schedule: Submit adjusted schedule weekly at weekly progress meeting to reflect:
 - 1. Progress of Work within 2 working days prior to submission;
 - 2. Include rolling 2-week look-ahead;
 - 3. Changes in Work scope and activities modified since submission;
 - 4. Delays in submittals or resubmittals, deliveries, or Work;
 - 5. Adjusted or modified sequences of Work;
 - 6. Other identifiable changes; and
 - 7. Revised projections of progress and completion.
- D. For each progress schedule submission,
 - 1. Subcontractor's certification that Progress Schedule submission is actual schedule being utilized for execution of the Work.
 - 2. One electronic copy shall be provided in specified application format.
 - 3. Disk file compatible with Microsoft Office Project 2013 unless otherwise approved by Contractor.
 - 4. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
 - 5. Prior to final payment, submit a final updated progress schedule.

1.02 SCHEDULE COORDINATION

- A. The Contractor will develop and maintain a master Progress Schedule utilizing Progress Schedules prepared by the Subcontractor as submitted to the Contractor under this section.
- B. The construction schedule will be reviewed during the weekly progress meetings.

1.03 PRELIMINARY PROGRESS SCHEDULE

- A. The schedule shall show major Work activities, beginning with Notice to Proceed. The major Work activities will include project coordination, mobilization, and all major activities outlined in the Summary of Work through Final Completion.
- B. Show activities including, but not limited to the following:
 - 1. Notice to Proceed.
 - 2. Permits.
 - 3. Preconstruction Conference.
 - 4. Project Mobilization Activities.
 - 5. Submittals, with review time. Subcontractor may use Schedule of Submittals specified in Section 01 33 00, Submittal Procedures.
 - 6. Early procurement activities for long lead equipment and materials.
 - 7. Initial Site work.
 - 8. Site preparation activities.
 - 9. Specified Work Sequences and Construction Constraints.
 - 10. Contract Milestone and Completion Dates.
 - 11. Post-construction Meetings.
 - 12. Project close-out summary.
 - 13. Demobilization summary.
- C. The Preliminary Progress Schedule will show Work approach, sequences, and constraints. This schedule data will be used by the Subcontractor in preparation of the Detailed Progress Schedule.
- D. Format: In accordance with Article Progress Schedule-Bar Chart.

1.04 DETAILED PROGRESS SCHEDULE

A. Prior to the Pre-construction Conference, submit Detailed Progress Schedule with each corresponding definable feature of work (DFOW) beginning with Notice to Proceed and continuing through Final Completion.

- B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Subcontractor.
- C. When accepted by Contractor, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- D. Format: In accordance with Article Progress Schedule—Bar Chart.
- E. Update weekly to reflect actual progress and occurrences to date, including weather delays.

1.05 PROGRESS SCHEDULE—BAR CHART

- A. General: Comprehensive bar chart schedule, generally as outlined in Associated General Contractors of America (AGC) 580, "Construction Project Planning and Scheduling Guidelines." If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.
- B. Format:
 - 1. Color print on 11-inch by 17-inch sheet size.
 - 2. Title Block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
 - 3. Identify horizontally across top of schedule the time frame by year, month, and day.
 - 4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
 - 5. Indicate the critical path.
 - 6. Show, at a minimum, the controlling relationships between activities.
 - 7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.
 - 8. Plot activities on an early start basis unless otherwise requested by Contractor.
 - 9. Provide a legend to describe standard and special symbols used.
 - 10. Schedule shall show accepted baseline start and finish dates, and actual start and finish dates.
- C. Contents:
 - 1. Schedule shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
 - 2. Identify Work calendar basis using days as a unit of measure.

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- 3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.
- 4. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path of activities.
- 5. Reflect sequences of the Work, restraints, delivery windows, review times, Subcontract Times and Project Milestones set forth in the Agreement and this section.
- 6. Include as applicable, at a minimum:
 - a. Obtaining permits, submittals for early product procurement, and long lead time items.
 - b. Mobilization and other preliminary activities.
 - c. Pre-construction and Post-construction meetings.
 - d. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
 - e. Site preparation construction activities.
 - f. Remediation.
 - g. Maintenance.
 - h. Project closeout and cleanup.
 - i. Demobilization.
- D. Network Graphical Display:
 - 1. Color print on 11 by 17 paper.
 - 2. Title Block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
 - 3. Identify horizontally across top of schedule the time frame by year, month, and day.
 - 4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
 - 5. Indicate the critical path.
 - 6. Show, at a minimum, the controlling relationships between activities.
 - 7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.
 - 8. Plot activities on an early start basis unless otherwise requested by Contractor.
 - 9. Provide a legend to describe standard and special symbols used.
- E. Schedule Report:
 - 1. Electronic copy on 11-inch by 17-inch white paper, unless otherwise approved.

- 2. List information for each activity in tabular format, including at a minimum:
 - a. Activity Identification Number.
 - b. Activity Description.
 - c. Original Duration.
 - d. Remaining Duration.
 - e. Early Start Date (Actual start on Updated Progress Schedules).
 - f. Early Finish Date (Actual finish on Updated Progress Schedules).
 - g. Late Start Date.
 - h. Late Finish Date.
 - i. Total Float.
- 3. Sort reports, in ascending order, as listed below: Activity number sequence with predecessor and successor activity.

1.06 PROGRESS OF THE WORK

- A. Updated Progress Schedule shall reflect:
 - 1. Progress of Work to within 2 working days prior to submission.
 - 2. Approved changes in Work scope and activities modified since submission.
 - 3. Delays in Submittals or resubmittals, deliveries, or Work.
 - 4. Adjusted or modified sequences of Work.
 - 5. Other identifiable changes.
 - 6. Revised projections of progress and completion.
 - 7. Report of changed logic.
- B. If Subcontractor fails to complete activity by its latest scheduled completion date and this Failure is anticipated to extend Contract Times (or Milestones), Subcontractor must, within 3 days of such failure, submit a written statement as to how Subcontractor intends to correct nonperformance and return to acceptable current Progress Schedule. Actions by Subcontractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.
- C. Contractor may order Subcontractor to increase equipment, labor force or working hours if Subcontractor fails to:
 - 1. Complete a Milestone activity by its completion date.
 - 2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, without any additional compensation to the Subcontractor.

1.07 OVERALL PROGRESS SCHEDULE

- A. Notice to Proceed will be issued only after the Overall Progress Schedule has been reviewed as acceptable by Contractor in accordance with Section 01 33 00, Submittal Procedures. Contractor will review the initial submittal and subsequent resubmittals of the Overall Progress Schedule within 7 calendar days of receipt.
- B. Schedule(s) shall reflect Work logic sequences, restraints, delivery windows, review times, Subcontract Times, and Milestones set forth in the Agreement and shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
- C. The schedule requirement herein is the minimum required.
- D. Subcontractor may prepare a more sophisticated schedule if such will aid Subcontractor in execution and timely completion of Work.
- E. Float time is a Project resource available to both parties to meet contract Milestones and Subcontract Times.
- F. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of the Contractor and Subcontractor.
- G. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.
- H. If Subcontractor provides an accepted schedule with an early completion date, Contractor reserves the right to reduce Subcontract Times to match the early completion date by issuing a deductive Change Order at no change in Subcontract Price.

1.08 NARRATIVE PROGRESS REPORT

- A. Format:
 - 1. Organize same as Progress Schedule.
 - 2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

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- B. Contents:
 - 1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
 - 2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of Subcontractor, and major milestones achieved.
 - 3. Subcontractor's plan for management of Site (e.g., lay down and staging areas, construction traffic), utilization of construction equipment, buildup of trade labor, and identification of potential Subcontract changes.
 - 4. Identification of new activities and sequences as a result of executed Subcontract changes.
 - 5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
 - 6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
 - 7. Changes to activity logic.
 - 8. Changes to the critical path.
 - 9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
 - 10. Steps taken to recover the schedule from Subcontractor-caused delays.

1.09 SCHEDULE ACCEPTANCE

- A. Contractor's acceptance will demonstrate agreement that:
 - 1. Proposed schedule is accepted with respect to:
 - a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
 - b. Specified Work sequences and constraints are shown as specified.
 - c. Specified Owner-furnished Equipment or Material arrival dates, or range of dates, are included.
 - d. Access restrictions are accurately reflected.
 - e. Startup and testing times are as specified.
 - f. Submittal review times are as specified.
 - g. Startup testing duration is as specified and timing is acceptable.
 - 2. In all other respects, Contractor's acceptance of Subcontractor's schedule indicates that, in Contractor's judgement, schedule represents reasonable plan for constructing Project in accordance with the Subcontract Documents. Contractor's review will not make any change in Subcontract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Subcontract Documents will

PW/DEN001/668402 MARCH 2018 ©COPYRIGHT 2018 CH2M HILL CONSTRUCTION PROGRESS DOCUMENTATION 01 32 00 - 7 not thereby indicate acceptance of that change, unless Subcontractor has explicitly called the nonconformance to Contractor's attention in submittal. Schedule remains Subcontractor's responsibility and Subcontractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Subcontract Documents.

- B. Unacceptable Preliminary Progress Schedule:
 - 1. Make requested corrections; resubmit within 5 days.
 - 2. Until acceptable to Contractor as Baseline Progress Schedule, continue review and revision process, during which time Subcontractor shall update schedule on a monthly basis to reflect actual progress and occurrences to date.
- C. Unacceptable Detailed Progress Schedule:
 - 1. Make requested corrections; resubmit within 5 days.
 - 2. Until acceptable to Contractor as Baseline Progress Schedule, continue review and revision process.
- D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Contractor's acceptance of Baseline Progress Schedule, will be delineated in Narrative Report current with proposed Updated Progress Schedule.

1.10 CLAIMS FOR ADJUSTMENT OF SUBCONTRACT TIMES

A. Where Contractor has not yet rendered formal decision on Subcontractor's claim for adjustment of Subcontract Times, and parties are unable to agree as to amount of adjustment to be reflected in progress schedule, Subcontractor will reflect that amount of time adjustment in progress schedule as Contractor may accept as appropriate for the interim. It is understood and agreed that such interim acceptance by Contractor will not be binding and will be made only for purpose of continuing to schedule Work, until such time as formal decision as to an adjustment, if any, of the Subcontract Times acceptable to Contractor has been rendered. Subcontractor will revise progress schedule prepared thereafter in accordance with Contractor's formal decision.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

CONSTRUCTION PROGRESS DOCUMENTATION 01 32 00 - 8

SECTION 01 33 00 SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Action Submittal: Written and graphic information submitted by Subcontractor that requires Contractor's approval.
- B. Informational Submittal: Information submitted by Subcontractor that requires Contractor's review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

A. Direct sample submittals to Contractor at the following, unless specified otherwise.

CH2M 41850 West 11 Mile Road, Suite 101 Novi, MI 48375 Attn: Scott Pratt

- B. Electronic Submittals: Submittals will, unless otherwise specified, be made in electronic format.
 - 1. Each submittal will be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
 - 2. Electronic files that contain more than 10 pages in PDF format will contain internal bookmarking from an index page to major sections of the document.
 - 3. PDF files will be set to open "Bookmarks and Page" view.
 - 4. Add general information to each PDF file, including title, subject, author, and keywords.
 - 5. PDF files will be set up to print legibly at 8.5-inch by 11-inch or 11-inch by 17-inch No other paper sizes will be accepted.
 - 6. Submit new electronic files for each resubmittal.
 - 7. Include a copy of the Transmittal of Submittal form, with each electronic file.
 - 8. Provide Contractor with authorization to reproduce and distribute each file as many times as necessary for Project documentation.

- C. Transmittal of Submittal:
 - 1. Subcontractor will:
 - a. Review each submittal and check for compliance with Subcontract Documents.
 - b. Subcontractor is responsible for thorough review of Lower-tier Subcontractor submittals, prior to submittal to Contractor for final review and approval.
 - c. Stamp each submittal with uniform approval stamp before submitting to Contractor.
 - Stamp to include Project name, submittal number, Specification number, Subcontractor's reviewer name, date of Subcontractor's approval, and statement certifying submittal has been reviewed, checked, and approved for compliance with Subcontract Documents.
 - Contractor will not review submittals that do not bear Subcontractor's approval stamp certifying the submittal has been checked and approved for compliance with Subcontract Documents and will return them without action.
 - 2. Complete, sign, and transmit with each submittal package, one Transmittal of Subcontractor's Submittal form attached at end of this section.
 - 3. Identify each submittal with the following:
 - a. Numbering and Tracking System:
 - 1) Sequentially number each submittal.
 - 2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
 - b. Specification section and paragraph to which submittal applies.
 - c. Project title and Contractor's project number.
 - d. Date of transmittal.
 - e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
 - 4. Identify and describe each deviation or variation from Subcontract Documents.
 - 5. All action and information submittals will be submitted electronically on a SharePoint site. SharePoint site address will be provided by Contractor.
- D. Format:
 - 1. Do not base Shop Drawings on reproductions of Subcontract Documents.

- 2. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
- 3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Subcontract Documents.
- 4. Index with labeled tab dividers in orderly manner.
- E. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual specification sections.
- F. Processing Time:
 - 1. Time for review will commence on Contractor's receipt of submittal.
 - 2. Contractor will act upon Subcontractor's submittal and transmit response to Subcontractor not later than 10 work days after receipt, unless otherwise specified.
 - 3. Resubmittals will be subject to same review time.
 - 4. No adjustment of Subcontract Times or Price will be allowed as a result of delays in progress of Work caused by rejection and subsequent resubmittals.
- G. Resubmittals: Clearly identify each correction or change made.
- H. Incomplete Submittals:
 - 1. Contractor will return entire submittal for Subcontractor's revision if preliminary review deems it incomplete.
 - 2. When any of the following are missing, submittal will be deemed incomplete:
 - a. Subcontractor's review stamp; completed and signed.
 - b. Transmittal of Subcontractor's Submittal; completed and signed.
 - c. Insufficient number of copies.
- I. Submittals not required by Subcontract Documents:
 - 1. Will not be reviewed and will be returned stamped "Not Subject to Review."
 - 2. Contractor will keep one copy and return submittal to Subcontractor.

1.03 ACTION SUBMITTALS

A. Prepare and submit Action Submittals required by individual specification sections.

- B. Shop Drawings:
 - 1. Copies: One hard copy unless requested otherwise by the Contractor and one reproducible electronic copy on CD, except copyrighted documents.
 - 2. Identify and Indicate:
 - a. Applicable Subcontract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
 - b. Equipment and Component Title: Identical to title shown on Drawings.
 - c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
 - d. Project-specific information drawn accurately to scale.
 - 3. Manufacturer's standard schematic drawings and diagrams as follows:
 - a. Modify to delete information that is not applicable to the Work.
 - b. Supplement standard information to provide information specifically applicable to the Work.
 - 4. Product Data: Provide as specified in individual specifications.
 - 5. Foreign Manufacturers: When proposed, include following additional information:
 - a. Names and addresses of at least two companies that maintain technical service representatives close to Project.
 - b. Complete list of spare parts and accessories for each piece of equipment.
- C. Samples:
 - 1. Copies: Two, unless otherwise specified in individual specifications.
 - 2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of quality. Attach label on unexposed side that includes the following:
 - a. Manufacturer name.
 - b. Model number.
 - c. Material.
 - d. Sample source.
 - 3. Manufacturer's Color Chart: Units or sections of units showing full range of colors, textures, and patterns available.
 - 4. Full-size Samples:
 - a. Size as indicated in individual specification section.
 - b. Prepared from same materials to be used for the Work.
 - c. Cured and finished in manner specified.
 - d. Physically identical with product proposed for use.

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- D. Action Submittal Dispositions: Contractor will review, comment, stamp, and distribute as noted:
 - 1. Approved:
 - a. Subcontractor may incorporate product(s) or implement Work covered by submittal.
 - b. Distribution:
 - 1) One copy retained in Contractor's file.
 - 2) One copy furnished to Contractor's onsite Representative.
 - 3) Remaining copies returned to Subcontractor appropriately annotated.
 - 2. Approved as Noted:
 - a. Subcontractor may incorporate product(s) or implement Work covered by submittal, in accordance with Contractor's notations.
 - 1) One copy retained in Contractor's file.
 - 2) One copy furnished to Contractor's onsite Representative.
 - 3) Remaining copies returned to Subcontractor appropriately annotated.
 - 3. Partial Approval, Resubmit as Noted:
 - a. Make corrections or obtain missing portions, and resubmit.
 - b. Except for portions indicated, Subcontractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Contractor's notations.
 - c. Distribution:
 - 1) One copy retained in Contractor's file.
 - 2) One copy furnished to Contractor's onsite Representative.
 - 3) Remaining copies returned to Subcontractor appropriately annotated.
 - 4. Revise and Resubmit:
 - a. Subcontractor may not incorporate product(s) or implement Work covered by submittal.
 - b. Distribution:
 - 1) One copy retained in Contractor's file.
 - 2) One copy furnished to Contractor's onsite Representative.
 - 3) Remaining copies returned to Subcontractor appropriately annotated.

1.04 INFORMATIONAL SUBMITTALS

- A. General:
 - 1. Copies: Submit three copies, unless otherwise indicated in individual specification section.

- 2. Refer to individual specification sections for specific submittal requirements.
- 3. Contractor will review each submittal. If submittal meets conditions of the Contract, Contractor will forward copy to appropriate parties. If Contractor determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, Contractor will retain one copy and return remaining copy with review comments to Subcontractor, and require that submittal be corrected and resubmitted.
- B. Certificates:
 - 1. General:
 - a. Provide notarized statement that includes signature of entity responsible for preparing certification.
 - b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
 - 2. Installer: Prepare written statements on manufacturer's letterhead certifying installer complies with requirements as specified in individual specification section.
 - 3. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
 - 4. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual specification sections.
- C. Construction Photographs and Video In accordance with Section 01 31 13, Project Coordination, and as may otherwise be required in Subcontract Documents.
- D. Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures.
- E. Subcontractor-design Data (related to temporary construction):
 - 1. Written and graphic information.
 - 2. List of assumptions.
 - 3. List of performance and design criteria.
 - 4. Summary of loads or load diagram, if applicable.
 - 5. Calculations.
 - 6. List of applicable codes and regulations.
 - 7. Information requested in individual specification section.

- F. Manufacturer's Instructions: Written or published information that documents manufacturer's recommendations, guidelines, and procedures in accordance with individual specification section.
- G. Payment:
 - 1. Application for Payment: In accordance with Section 01 29 00, Payment Procedures.
 - 2. Schedule of Values: In accordance with Section 01 29 00, Payment Procedures.
- H. Quality Control Documentation: As required in Section 01 45 16.13, Subcontractor Quality Control.
- I. Schedules:
 - 1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00, Construction Progress Documentation.
 - a. Show for each, at a minimum, the following:
 - 1) Specification section number.
 - 2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
 - 3) Estimated date of submission to Contractor, including reviewing and processing time.
 - b. On a weekly basis, submit updated Schedule of Submittals to Contractor if changes have occurred or resubmittals are required.
 - 2. Progress Schedules: In accordance with Section 01 32 00, Construction Progress Documentation.
- J. Special Warranty: Supplier's written warranty as required in individual specification sections.
- K. Statement of Qualification: Evidence of qualification, certification, or registration as required in Subcontract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.
- L. Submittals Required by Laws, Regulations, and Governing Agencies:
 - 1. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.

- 2. Transmit to Contractor one copy of correspondence and transmittals (to include enclosures and attachments) between Subcontractor and governing agency.
- M. Test, Evaluation, and Inspection Reports:
 - 1. General: Must contain signature of person responsible for test or report.
 - 2. Factory:
 - a. Identification of product and specification section, type of inspection or test with referenced standard or code.
 - b. Date and time of test, Project title and number, and name and signature of authorized person.
 - c. Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
 - d. Test results.
 - e. If test or inspection deems material or equipment not in compliance with Subcontract Documents, identify corrective action necessary to bring into compliance.
 - f. Provide interpretation of test results, when requested by Contractor.
 - g. Other items as identified in individual specification sections.
 - 3. Field:
 - a. As a minimum, include the following:
 - 1) Project title and number.
 - 2) Date and time.
 - 3) Record of temperature and weather conditions.
 - 4) Identification of product and specification section.
 - 5) Type and location of test, Sample, or inspection, including referenced standard or code.
 - 6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
 - 7) If test or inspection deems material or equipment not in compliance with Subcontract Documents, identify corrective action necessary to bring into compliance.
 - 8) Provide interpretation of test results, when requested by Contractor.
 - 9) Other items as identified in individual specification sections.
- N. Training Data: In accordance with Section 01 11 00, Summary of Work.

1.05 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", is part of this Specification.
 - 1. Forms: Transmittal of Subcontractor's Submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ch2m:	TRANSMITTAL OF S SUBMITTAL (ATTACH TO EACH SUBMITTAL	SUBCONTRACTOR'S	
TO:		Submittal No.:	
		New Submittal R	esubmittal
		Project:	
		Project No.:	
		Specification Section No.: (Cover only one section	with each transmittal)
FROM:		Schedule Date of Submitta	ıl:
Subcontractor			
SUBMITTAL TYPE:	Shop Drawing		Informational

The following items are hereby submitted:

Number of	Description of Item Submitted	Spec and	Drawing or Brochure Number	Contains Variation to Subcontract	
Copies	(Type, Size, Model Number, Etc.)	Para. No.		No	Yes

Subcontractor hereby certifies that (i) Subcontractor has complied with the requirements of Subcontract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Subcontract Documents and requirements of laws and regulations and governing agencies.

By:_______Subcontractor (Authorized Signature)

SECTION 01 42 13 ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

- A. Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith will be as provided in Article 3 of the General Conditions, and as may otherwise be required herein and in the individual Specification sections.
- B. Work specified by reference to published standard or specification of government agency, technical association, trade association, professional society or institute, testing agency, or other organization must meet requirements or surpass minimum standards of quality for materials and workmanship established by designated standard or specification.
- C. Where so specified, products or workmanship must also meet or exceed additional prescriptive or performance requirements included within Subcontract Documents to establish a higher or more stringent standard of quality than required by referenced standard.
- D. Where two or more standards are specified to establish quality, product and workmanship must meet or exceed requirements of most stringent.
- E. Where both a standard and a brand name are specified for a product in Subcontract Documents, proprietary product named must meet or exceed requirements of specified reference standard.
- F. Copies of standards and specifications of technical societies:
 - 1. Copies of applicable referenced standards have not been bound in these Subcontract Documents.
 - 2. Where copies of standards are needed by Subcontractor, obtain a copy or copies directly from publication source and maintain in an orderly manner at the Site as Work Site records, available to Subcontractor's personnel, lower-tiered Subcontractors, Owner, and Contractor.

1.02 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

1.	AA	Aluminum Association
2.	AABC	Associated Air Balance Council
3.	AAMA	American Architectural Manufacturers
		Association
4.	AASHTO	American Association of State Highway and
		Transportation Officials
5.	ABMA	American Bearing Manufacturers' Association
6.	ACI	American Concrete Institute
7.	AEIC	Association of Edison Illuminating Companies
8.	AGA	American Gas Association
9.	AGMA	American Gear Manufacturers' Association
10.	AI	Asphalt Institute
11.	AISC	American Institute of Steel Construction
12.	AISI	American Iron and Steel Institute
13.	AITC	American Institute of Timber Construction
14.	ALS	American Lumber Standards
15.	AMCA	Air Movement and Control Association
16.	ANSI	American National Standards Institute
17.	APA	APA – The Engineered Wood Association
18.	API	American Petroleum Institute
19.	APWA	American Public Works Association
20.	AHRI	Air-Conditioning, Heating, and Refrigeration
		Institute
21.	ASA	Acoustical Society of America
22.	ASABE	American Society of Agricultural and Biological
		Engineers
23.	ASCE	American Society of Civil Engineers
24.	ASHRAE	American Society of Heating, Refrigerating and
		Air-Conditioning Engineers, Inc.
25.	ASME	American Society of Mechanical Engineers
26.	ASNT	American Society for Nondestructive Testing
27.	ASSE	American Society of Sanitary Engineering
28.	ASTM	ASTM International
29.	AWI	Architectural Woodwork Institute
30.	AWPA	American Wood Preservers' Association
31.	AWPI	American Wood Preservers' Institute
32.	AWS	American Welding Society

ABBREVIATIONS AND ACRONYMS 01 42 13 - 2

33.	AWWA	American Water Works Association
34.	BHMA	Builders Hardware Manufacturers' Association
35.	CBM	Certified Ballast Manufacturer
36.	CDA	Copper Development Association
37.	CGA	Compressed Gas Association
38.	CISPI	Cast Iron Soil Pipe Institute
39.	CMAA	Crane Manufacturers' Association of America
40.	CRSI	Concrete Reinforcing Steel Institute
41.	CS	Commercial Standard
42.	CSA	Canadian Standards Association
43.	CSI	Construction Specifications Institute
44.	DIN	Deutsches Institut für Normung e.V.
45.	DIPRA	Ductile Iron Pipe Research Association
46.	EIA	Electronic Industries Alliance
47.	EJCDC	Engineers Joint Contract Documents'
		Committee
48.	ETL	Electrical Test Laboratories
49.	FAA	Federal Aviation Administration
50.	FCC	Federal Communications Commission
51.	FDA	Food and Drug Administration
52.	FEMA	Federal Emergency Management Agency
53.	FIPS	Federal Information Processing Standards
54.	FM	FM Global
55.	Fed. Spec.	Federal Specifications (FAA Specifications)
56.	FS	Federal Specifications and Standards
		(Technical Specifications)
57.	GA	Gypsum Association
58.	GANA	Glass Association of North America
59.	HI	Hydraulic Institute
60.	HMI	Hoist Manufacturers' Institute
61.	IBC	International Building Code
62.	ICBO	International Conference of Building Officials
63.	ICC	International Code Council
64.	ICEA	Insulated Cable Engineers' Association
65.	IFC	International Fire Code
66.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
67.	IESNA	Illuminating Engineering Society of North
68	IFI	Industrial Fasteners Institute
69	IGMA	Insulating Glass Manufacturer's Alliance
70.	IMC	International Mechanical Code

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71.	INDA	Association of the Nonwoven Fabrics Industry
72.	IPC	International Plumbing Code
73.	ISA	International Society of Automation
74.	ISO	International Organization for Standardization
75.	ITL	Independent Testing Laboratory
76.	ЛС	Joint Industry Conferences of Hydraulic
		Manufacturers
77.	MDOT	Michigan Department of Transportation
78.	MIA	Marble Institute of America
79.	MIL	Military Specifications
80.	MMA	Monorail Manufacturers' Association
81.	MSS	Manufacturer's Standardization Society
82.	NAAMM	National Association of Architectural Metal
		Manufacturers
83.	NACE	NACE International
84.	NBGQA	National Building Granite Quarries Association
85.	NEBB	National Environmental Balancing Bureau
86.	NEC	National Electrical Code
87.	NECA	National Electrical Contractor's Association
88.	NEMA	National Electrical Manufacturers' Association
89.	NESC	National Electrical Safety Code
90.	NETA	InterNational Electrical Testing Association
91.	NFPA	National Fire Protection Association
92.	NHLA	National Hardwood Lumber Association
93.	NICET	National Institute for Certification in
		Engineering Technologies
94.	NIST	National Institute of Standards and Technology
95.	NRCA	National Roofing Contractors Association
96.	NRTL	Nationally Recognized Testing Laboratories
97.	NSF	NSF International
98.	NSPE	National Society of Professional Engineers
99.	NTMA	National Terrazzo and Mosaic Association
100.	NWWDA	National Wood Window and Door Association
101.	OSHA	Occupational Safety and Health Act (both
		Federal and State)
102.	PCI	Precast/Prestressed Concrete Institute
103.	PEI	Porcelain Enamel Institute
104.	PPI	Plastic Pipe Institute
105.	PS	Product Standards Section-U.S. Department of
		Commerce
106.	RMA	Rubber Manufacturers' Association
107.	RUS	Rural Utilities Service

ABBREVIATIONS AND ACRONYMS 01 42 13 - 4

108.	SAE	SAE International
109.	SDI	Steel Deck Institute
110.	SDI	Steel Door Institute
111.	SJI	Steel Joist Institute
112.	SMACNA	Sheet Metal and Air Conditioning Contractors
		National Association
113.	SPI	Society of the Plastics Industry
114.	SSPC	The Society for Protective Coatings
115.	STI/SPFA	Steel Tank Institute/Steel Plate Fabricators
		Association
116.	SWI	Steel Window Institute
117.	TEMA	Tubular Exchanger Manufacturers' Association
118.	TCA	Tile Council of North America
119.	TIA	Telecommunications Industry Association
120.	UBC	Uniform Building Code
121.	UFC	Uniform Fire Code
122.	UL	Underwriters Laboratories Inc.
123.	UMC	Uniform Mechanical Code
124.	USBR	U.S. Bureau of Reclamation
125.	WCLIB	West Coast Lumber Inspection Bureau
126.	WI	Wood Institute
127.	WWPA	Western Wood Products Association

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 16.13 SUBCONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
 - 1. ASTM International (ASTM):
 - a. D3740-12A, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - b. E329-11C, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.02 DEFINITIONS

- A. Subcontractor Quality Control (SQC): The means by which Subcontractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Subcontract.
- B. Preliminary Work: The work carried out on the job site before the start of the main construction activities but not actually part of the construction work. The preliminary work sets up the base for the construction activities.
- C. Definable Feature of Work (DFOW): A task that is separate and distinct from other tasks and has separate control requirements.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. SQC Plan: Submit, not later than 10 days after receipt of Notice to Proceed.
 - 2. SQC Report: Submit, weekly, an electronic version and one hard copy.

1.04 CONTRACTOR'S QUALITY ASSURANCE

A. All Work is subject to Contractor's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Subcontract Documents.

- B. Contractor's quality assurance inspections and tests are for the sole benefit of Contractor and do not:
 - 1. Relieve Subcontractor of responsibility for providing adequate quality control measures;
 - 2. Relieve Subcontractor of responsibility for damage to or loss of the material before acceptance;
 - 3. Constitute or imply acceptance; or
 - 4. Affect the continuing rights of Contractor after acceptance of the completed Work.
- C. The presence or absence of a quality assurance inspector does not relieve Subcontractor from any Subcontract requirement.
- D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Contractor.
- E. Contractor may charge Subcontractor for any additional cost of inspection or test when Work is not ready at the time specified by Subcontractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.01 GENERAL
 - A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Subcontract Documents.
 - B. Maintain complete inspection records and make them available at all times to Owner and Contractor.
 - C. The quality control system will consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system will cover all construction and demolition operations, both onsite and offsite, including Work by lower-tiered-subcontractors, fabricators, suppliers and purchasing agents, and will be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

- A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the SQC Plan, schedule a meeting with Contractor and Owner to discuss the quality control system.
- B. Develop a mutual understanding of the system details, including the forms for recording the SQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance.
- C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the SQC system or procedures that may require corrective action by Subcontractor.

3.03 QUALITY CONTROL ORGANIZATION

- A. SQC System Manager:
 - 1. Designate an individual within Subcontractor's organization who will be responsible for overall management of SQC and have the authority to act in SQC matters for the Subcontractor.
 - 2. SQC System Manager may not perform other duties on the Project.
 - 3. SQC System Manager will be an experienced construction person, with a minimum of 3 years construction experience on similar type Work.
 - 4. SQC System Manager will report to the Subcontractor's project manager or someone higher in the organization. Project manager in this context will mean the individual with responsibility for the overall quality and production management of the Project.
 - 5. SQC System Manager will be onsite during construction.
 - 6. Identify an alternate for SQC System Manager to serve with full authority during the System Manager's absence. The requirements for the alternate will be the same as for designated SQC System Manager.
- B. SQC Staff:
 - 1. Designate a SQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Subcontract. SQC staff members will be subject to acceptance by Contractor.
 - 2. SQC staff will take direction from SQC System Manager in matters pertaining to QC.

- 3. SQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
- 4. The actual strength of the SQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper SQC organization.
- C. Organizational Changes: Obtain Contractor's acceptance before replacing any member of the SQC personnel. Requests for changes will include name, qualifications, duties, and responsibilities of the proposed replacement.

3.04 DEFINABLE FEATURES OF WORK (DFOW)

- A. The DFOW are as follows:
 - 1. Mobilization and setup.
 - 2. Utility locates.
 - 3. Monitoring well and groundwater elevation control tile abandonment.
 - 4. Sampling, testing and monitoring.
 - 5. Surveying.
 - 6. Construct new ISTT roads and ISTT equipment laydown area.
 - 7. Construct new ISTT equipment pads.
 - 8. Install ISTT utilities.
 - 9. Improve Pine River outfall.
 - 10. Waste management.
 - 11. Site restoration.
 - 12. Demobilization.

3.05 QUALITY CONTROL PHASING

- A. SQC will include at least three phases of control to be conducted by SQC System Manager for all definable features of Work, as follows:
 - 1. Preparatory Phase:
 - a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
 - b. This phase will include a meeting conducted by the SQC System Manager and attended by the superintendent, other SQC personnel (as applicable), and the foreman responsible for the definable feature. The SQC System Manager will instruct applicable SQC staff as to the acceptable level of workmanship required in order to meet Subcontract requirements.

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- c. Document the results of the preparatory phase meeting by separate minutes prepared by the SQC System Manager and attached to the QC report.
- d. Perform prior to beginning Work on each definable feature of Work:
 - 1) Review applicable Subcontract Specifications.
 - 2) Review applicable Subcontract Drawings.
 - 3) Verify that all materials and/or equipment have been tested, submitted, and approved.
 - 4) Verify that provisions have been made to provide required control inspection and testing.
 - 5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Subcontract.
 - 6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawing or submitted data, and are properly stored.
 - 7) Review the appropriate activity hazard analysis to verify safety requirements are met.
 - 8) Review procedures for constructing the Work, including repetitive deficiencies.
 - 9) Document construction tolerances and workmanship standards for that phase of the Work.
 - 10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by Contractor.
- 2. Initial Phase:
 - a. Accomplish at the beginning of a definable feature of Work:
 - 1) Notify Contractor at least 48 hours in advance of beginning the initial phase.
 - 2) Perform prior to beginning Work on each definable feature of Work:
 - a) Review minutes of the preparatory meeting.
 - b) Check preliminary Work to verify compliance with Subcontract requirements.
 - c) Verify required control inspection and testing.
 - d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.
 - e) Resolve all differences.
 - f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

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- 3) Separate minutes of this phase will be prepared by the SQC System Manager and attached to the QC report. Exact location of initial phase will be indicated for future reference and comparison with follow-up phases.
- 4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- 3. Follow-up Phase:
 - a. Perform daily checks to verify continuing compliance with Subcontract requirements, including control testing, until completion of the particular feature of Work.
 - b. Daily checks will be made a matter of record in the SQC documentation and will document specific results of inspections for all features of Work for the day or shift.
 - c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.
- 4. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by Contractor if the quality of ongoing Work is unacceptable; or if there are changes in the applicable QC staff or in the onsite production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.06 SUBCONTRACTOR QUALITY CONTROL PLAN

- A. General:
 - 1. Plan will identify personnel, procedures, control, instructions, test, records, and forms to be used.
 - 2. An interim plan for the first 30 days of operation will be considered.
 - 3. Construction will be permitted to begin only after acceptance of the SQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
 - 4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a SQC Plan or another interim plan containing the additional features of Work to be started.

- B. Content:
 - 1. Plan will cover the intended SQC organization for the entire Subcontract and will include the following, as a minimum:
 - a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the SQC staff will implement the three-phase control system (see Paragraph QC Phasing) for all aspects of the Work specified.
 - b. SQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
 - c. Letters of Authority: A copy of a letter to the SQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the SQC System Manager, including authority to stop Work which is not in compliance with the Subcontract. The SQC System Manager will issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Contractor.
 - d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of lower-tiered subcontractors, offsite fabricators, suppliers and purchasing agents.
 - e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.
 - f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
 - g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
 - h. Reporting procedures, including proposed reporting formats; include a copy of the SQC report form.
- C. Acceptance of Plans: Acceptance of the Subcontractor's basic and addendum SQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. Contractor reserves the right to require Subcontractor to make changes in the SQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

PW/DEN001/668402 MARCH 2018 ©COPYRIGHT 2018 CH2M HILL SUBCONTRACTOR QUALITY CONTROL 01 45 16.13 - 7 D. Notification of Changes: After acceptance of the SQC plan, Subcontractor will notify Contractor, in writing, a minimum of 3 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Contractor.

3.07 SUBCONTRACTOR QUALITY CONTROL REPORT

- A. Prepare a SQC report for each day onsite. Account for all days throughout the life of the Subcontract. Reports will be signed and dated by SQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.
- B. Maintain current records of quality control operations, activities, and tests performed, including the Work of lower-tiered subcontractors and suppliers.
- C. Records will be on an acceptable form and will be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:
 - 1. Subcontractor/lower-tiered subcontractor and their areas of responsibility.
 - 2. Operating plant/equipment with hours worked, idle, or down for repair.
 - 3. Work performed today, giving location, description, and by whom.
 - 4. When a network schedule is used, identify each phase of Work performed each day by activity number.
 - 5. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
 - 6. Material received with statement as to its acceptability and storage.
 - 7. Identify submittals reviewed, with Subcontract reference, by whom, and action taken.
 - 8. Offsite surveillance activities, including actions taken.
 - 9. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
 - 10. List instructions given/received and conflicts in Drawings and/or Specifications.
 - 11. Subcontractor's verification statement.
 - 12. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
 - 13. These records will cover both conforming and deficient features and will include a statement that equipment and materials incorporated in file work and workmanship comply with the Subcontract.

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3.08 SUBMITTAL QUALITY CONTROL

A. Submittals will be as specified in Section 01 33 00, Submittal Procedures. The SQC organization will be responsible for certifying that all submittals are in compliance with the Subcontract requirements.

3.09 TESTING QUALITY CONTROL

- A. Testing Procedure:
 - 1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Subcontract requirements. Perform the following activities and record the following data:
 - a. Verify testing procedures comply with contract requirements.
 - b. Verify facilities and testing equipment are available and comply with testing standards.
 - c. Check test instrument calibration data against certified standards.
 - d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 - e. Documentation:
 - 1) Record results of all tests taken, both passing and failing, on the SQC report for the date taken.
 - 2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
 - 3) Actual test reports may be submitted later, if approved by Contractor, with a reference to the test number and date taken.
 - 4) Provide directly to Contractor an information copy of tests performed by an offsite or commercial test facility. Test results will be signed by an engineer registered in the state where the tests are performed.
 - 5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Subcontract.
- B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel will meet criteria detailed in ASTM D3740-12A and ASTM E329-11C, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of

PW/DEN001/668402 MARCH 2018 ©COPYRIGHT 2018 CH2M HILL SUBCONTRACTOR QUALITY CONTROL 01 45 16.13 - 9 State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing will be certified by the American Concrete Institute (ACI).

3.10 COMPLETION INSPECTION

- A. SQC System Manager will conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Subcontract.
- B. Completion inspections need to be performed before equipment or subcontractors required for any element of the Work are demobilized.
- C. Punchlist:
 - 1. SQC System Manager will develop a punchlist of items which do not conform to the Subcontract requirements.
 - 2. Include punchlist in the SQC report, indicating the estimated date by which the deficiencies will be corrected.
 - 3. SQC System Manager or staff will make a second inspection to ascertain that all deficiencies have been corrected and so notify the Contractor.
 - 4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Nursery and Landscape Association (ANLA): American Standards for Nursery Stock.
 - 2. Federal Emergency Management Agency (FEMA).
 - 3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - 4. Telecommunications Industry Association (TIA): 568-C, Commercial Building Telecommunications Cabling Standard.
 - 5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
 - U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.
 - 7. OSHA 29 CFR 1910 and 1926.
 - 8. U.S. Environmental Protection Agency:
 - a. Resource Conservation and Recovery Act (RCRA).
 - 1) Title 40 of the Code of Federal Regulations, Part 261 (40 CFR 261), Subpart C Characteristics of Hazardous Waste.
 - 2) 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste.
 - 3) 40 CFR 268, Land Disposal Restrictions.
 - b. Toxic Substances Control Act (TSCA), 40 CFR 761.
 - c. Oil Pollution Prevention, 40 CFR, Part 112.
 - 9. U.S. Department of Transportation:
 - a. 49 CFR 171, General Information, Regulations, and Definitions.
 - b. 49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
 - c. 49 CFR 173, Shippers General Requirements for Shipments and Packaging.
 - d. 49 CFR 178, Specifications for Packaging.
 - 10. State of Michigan:
 - a. Transportation Standards and Recordkeeping (Mich. Admin. Code R 299.9608-9609).

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- b. Solid Waste Management (Mich. Admin. Code R 299.4101 299.4922).
- c. Part 121 of the Natural Resource and Environmental Protection Act (Liquid Industrial By-Products).

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
 - 2. Temporary Utility Submittals: Electrical connections.
 - 3. Site Specific Health and Safety Plan:
 - a. The Subcontractor will submit a Site Specific Health and Safety Plan (HASP) to the Contractor. Full Notice to Proceed will be given by the Contractor only after the HASP has been accepted as satisfactory by the Contractor.
 - b. Onsite personnel will present certifications of training (as applicable) prior to beginning onsite Work.
 - c. The HASP must meet the requirements given in the General Terms and Conditions.
 - 4. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
 - 5. Temporary Construction Submittals:
 - a. Storage and staging area plans.
 - b. Fencing and protective barrier locations and details.
 - c. Plan for maintenance of access roads and intended haul routes.
 - 6. The Ancillary Services Subcontractor will provide the following Temporary Control Submittals:
 - a. Noise Control Plan: Submit information to mitigate construction noise, including method of construction, operating procedures, equipment to be used, and acoustical treatments to minimize disturbance to the community and comply with applicable local noise regulations and ordinances.
 - b. Dust Control Plan: Submit information for the management of stockpiles and transport of bulk materials to minimize dust emissions.
 - c. Transportation and Disposal Plan: Plan for disposal of waste materials and intended haul routes. Describe sampling, transportation, and disposal of waste materials and construction debris. The Subcontractor will revise the draft Transportation and Disposal Plan developed by the Contractor. The revised plan will include the following:
 - 1) Proposed offsite disposal location.
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- 2) Proposed transporters.
- 3) Sequences of construction affecting use of roadways, time required and phasing of operations to limit traffic on the residential roads.
- 4) The sequence of moving, handling and loading of trucks.
- 5) Describe signage and protective measures for vehicular traffic on streets.
- 6) Information for intended haul routes to and from the FPS and approved disposal facility. Routes to and from the site will generally be shortest route available.
- 7) Provisions for sampling and disposing of decontamination liquids and also disposal of used personal protective equipment or other work-derived wastes generated.
- 8) Plans for transporting and disposing of contaminated soil and existing on-site materials scheduled for demolition and removal and importing materials from approved borrow sources.
- 9) Preparation of waste characterization profiles, proof of disposal facility approval under the CERCLA Offsite Rule, set forth in the National Contingency Plan, at 40 *Code of Federal Regulations* 300.440, and proof of disposal facility acceptance.
- 10) Drum, container and tank handling and moving procedures.
- 11) Provisions for street cleaning and equipment decontamination.
- 12) Manifesting and other shipping documentation requirements for transportation of contaminated materials.
- 13) Identification of all waste streams.
- 14) Waste and container management, storage, labeling, and marking.
- 15) Spill response and reporting (for potential spills related to transportation of materials).
- 16) Records and reporting.
- 7. Water supply source.

1.03 PROTECTION OF WORK AND PROPERTY

- A. Comply with Contractor's safety rules while onsite.
- B. Keep Contractor informed of all near misses, incidents, onsite accidents, and related claims.
- C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

D. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.

1.04 VEHICULAR TRAFFIC

- A. Traffic Routing Plan: Provide necessary access, and plans for signing, barricading and striping to provide passages for pedestrians and vehicles.
- B. Traffic Control: Subcontractor personnel must adhere to traffic control in approved Transportation and Disposal Plan. Changes to this plan will be made only by written approval of appropriate public authority and Contractor. Secure approvals for necessary changes so as not to delay progress of the Work.

1.05 PERMITS

- A. Permits, Licenses, or Approvals: Obtain in accordance with the General Terms and Conditions and as otherwise may be provided in the Supplementary Conditions and retain onsite.
- B. During the performance of the Work, Subcontractor is responsible for adapting its means, methods, techniques, sequences, and procedures of construction consistent with applicable permit requirements, and Laws and Regulations.

1.06 TEMPORARY CONTROLS

- A. Subcontractor will provide safety and environmental controls during construction activities to protect the public, workers, and environment and ensure that all work is performed in a manner that meets the intent of federal, state, and local environmental regulations.
- B. Soil Erosion and Sedimentation Control Plan as indicated in Section 01 57 13, Temporary Erosion and Sediment Control.

1.07 SAFETY

- A. Subcontractor is responsible for all safety activities associated with the execution of the Work.
- B. Keep Contractor informed of all near misses, incidents, onsite accidents, and related claims.

- C. Subcontractor will provide a fulltime onsite Health and Safety Manager with a minimum of 5 years of construction and safety experience for the entire time the Subcontractor is onsite.
- D. All workers associated with any activity that may expose them to contaminated materials or the treatment of such must have proper OSHA-approved 40-hour health and safety training. If the Subcontractor guarantees that separate individuals will perform routine custodial services and will NOT be exposed to any potentially contaminated materials or disposable items associated with its treatment, such employees need not have this training after concurrence by Contractor.

PART 2 PRODUCTS

2.01 SUBCONTRACTOR'S FIELD OFFICES

- A. If needed, furnish field office and equipment for exclusive use of Subcontractor and its representatives.
- B. Potable water is not available for use for field offices.
- C. The Subcontractor will provide portable toilets and hand wash units for use.

2.02 TEMPORARY STOCKPILE COVERING

- A. Material will be reinforced black plastic, 6-mil minimum, with an ultra-violet ray inhibitor or polyvinyl chloride (PVC) a minimum of 10-mils thick. When freezing conditions are expected, use PVC material.
- 2.03 BARRICADES AND LIGHTS
 - A. As required to perform Work.
- 2.04 SIGNS AND EQUIPMENT
 - A. As recommended by Subcontractor and approved by the Contractor.
 - B. Delivered equipment will be inspected at the Project Site. Equipment that is not in good condition or which arrives with content and/or contamination will be turned away with the costs borne by the Subcontractor at the sole discretion of the Contractor.

2.05 SPILL RESPONSE AND CONTROL EQUIPMENT

A. Supply spill response equipment in areas where fuel and chemicals are stored or used, and where liquid wastes are stored.

B. Provide containment around fuels, chemical, and liquid wastes or their storage areas such that a release of these materials do not reach waters of the state, drainage way(s), streams, storm sewers, or sanitary sewers.

PART 3 EXECUTION

3.01 MOBILIZATION

- A. This task will consist of mobilizing Subcontractor personnel, equipment, any lower-tier Subcontractors, and materials to the project site. The Subcontractor will be responsible for coordinating and making arrangements for storage and laydown areas for construction equipment.
- B. The Subcontractor will install erosion control measures according to best management practices and the Soil Erosion and Sedimentation Control Plan, and also prepare a vehicle decontamination area and a soil storage area that are designed to contain runoff from these activities.
 - 1. Coordination and scheduling of mobilization activities will be discussed with Subcontractor in detail during the pre-construction conference.
- C. Mobilization will include, but not be limited to, these principal items:
 - 1. Obtaining required approvals and permits.
 - 2. Mobilizing Subcontractor's field office, if desired, and equipment required for operations onto Site.
 - 3. Installing temporary construction power, wiring, and lighting facilities.
 - 4. Providing onsite communication facilities if desired by Subcontractor.
 - 5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
 - 6. Arranging for Subcontractor's storage yard.
 - 7. Posting OSHA required notices and establishing safety programs and procedures.
 - 8. Having Subcontractor's superintendent at the Site full time.

3.02 TEMPORARY UTILITIES

- A. Power:
 - 1. Electric power will be available at Site. Subcontractor will arrange for electrical hook-ups at the field office and staging areas, if desired.
 - 2. Cost of electric power will be borne by Subcontractor.

- B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work 24 hours per day.
- C. Heating, Cooling, and Ventilating:
 - 1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage because of temperature or humidity. Costs for temporary heat will be borne by Subcontractor.
 - 2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
 - 3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.
 - 4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
- D. Water:
 - 1. Potable water is available for ISTT system operations at the existing ISTT equipment pad. Potable water for general Subcontractor is available at the existing site entrance off of North Street. The Subcontractor is responsible for making arrangements for and will bear costs of providing water required for construction purposes. Potable water is not available onsite for drinking by construction personnel during construction.
 - 2. Hydrant Water:
 - a. Is available from nearby hydrants. Secure written permission for connection and use from water department and meet requirements for use. Notify fire department before obtaining water from fire hydrants.
 - b. Use only special hydrant-operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify appropriate agency as quickly as possible. Hydrants must be completely accessible to fire department at all times.
 - c. Include costs to connect and transport water to construction areas in Subcontract Price.
 - d. Cost of water obtained from hydrant(s) to be borne by Subcontractor.

- E. Sanitary and Personnel Facilities will be provided and maintained by Subcontractor. Sanitary facilities will be anchored according to manufacturer instructions and located such that in the event of a release or spill, they will not drain to surface waters (e.g., storm drain inlets, ditches, streams, wetlands, floodplains, etc.).
- F. Telephone Service: Subcontractor will arrange and provide onsite telephone service for use during construction, and pay costs of installation, and monthly bills during construction.
- G. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

3.03 PROTECTION OF WORK AND PROPERTY

- A. General:
 - 1. Maintain in continuous service existing gas pipelines, underground power, telephone or communication cable, water mains, sewers, poles and overhead power, and other utilities encountered a long line of the Work and not designated for demolition or removal.
 - 2. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with said utility and perform work to their satisfaction.
 - 3. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
 - 4. In areas where Subcontractor's operations are adjacent to or near a utility, such as gas, telephone, electric power, water or sewer, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Subcontractor.
 - 5. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance by calling the Michigan utility one-call number (MISS DIG) or utility owner directly as appropriate and provide private utility locate to identify any utilities that may be present in the work area. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Subcontractor's operation, notify proper authority and Contractor immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.

- 6. Remove existing utilities encountered within the footprint of the consolidation facility and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Contractor.
- 7. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
- 8. Maintain original Site drainage wherever possible.
- 9. Maintain integrity of existing site-wide soil cap. Repair at Subcontractor's cost if damaged. Notify Contractor at least 2 days prior to all intrusive activities. Obtain written permission prior to starting work.
- B. Site Security:
 - 1. Provide and maintain additional temporary security fences as necessary to protect the Work and Subcontractor-furnished products not yet installed.
 - 2. The Owner and Contractor are not responsible for theft, damages or losses incurred during the performance of this Work.
- C. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.
- D. Barricades and Lights: Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of Subcontractor's employees, other employer's employees, and others who may be affected by the Work.
- E. Archaeological Finds: Should finds of an archaeological or paleontological nature be made within Site limits, immediately notify Owner and Contractor. Continue the Work in other areas without interruption.
- F. Endangered and Threatened Species and Their Habitat:
 - 1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna, fauna habitat, and migratory birds (including active nests).
 - 2. Notify Contractor of construction activities that might threaten endangered and threatened species or their habitats.
 - 3. Contractor will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.

4. Additional areas will be marked by Contractor as other habitats of endangered and threatened species become known during construction.

3.04 TEMPORARY CONTROLS

- A. Air Pollution Control:
 - 1. Minimize air pollution from construction operations.
 - 2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
- B. Noise Control:
 - 1. Provide controls if noise emanating from tools or equipment will exceed legal noise levels.
 - 2. Noise Control Plan: Propose plan to mitigate construction noise and to comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.
 - 3. Standard hours of construction are Monday through Friday from 7 a.m. to 5 p.m. Weekend hours can be added from 9 a.m. to 6 p.m. if necessary work permits and approval from the Contractor have been obtained.
- C. Water Pollution Control:
 - 1. Comply with Section 01 57 13, Temporary Erosion and Sediment Control.
 - 2. Do not dispose of wastewater, stormwater, decontamination fluids, or volatile wastes in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.
 - 3. Notify Contractor immediately of any spill, sheen, or release onto the ground or water.
- D. Erosion, Sediment, and Flood Control: Design, install/implement and maintain erosion and sediment controls and other best management practices as specified in Section 01 57 13, Temporary Erosion and Sediment Control.
- E. Dust Control:
 - 1. The Subcontractor will be responsible for controlling the dust and airborne dirt generated by construction activities. Water or other suppression means will be used as needed to control dust.
 - 2. All excavation activities will be performed in a manner that limits blowing dust and tracking of mud onto site access roads. Dust control

measures may include vacuuming, water spraying, and sweeping or other methods allowed under local regulations. The Subcontractor will prepare a fugitive dust control plan that will address the management of stockpiles and transport of bulk materials.

- 3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust.
- 4. Limit drop height during soil loading and unloading.
- 5. Strictly adhere to applicable environmental regulations for dust prevention.

3.05 ACCESS ROADS AND LAYDOWN AREAS

- A. Construct access roads within Project limits as shown on the Drawings. Utilize existing roads where shown.
- B. Maintain drainage ways. Install and maintain culverts to allow water to flow beneath access roads. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.
- C. Access roads and laydown areas will be constructed by the Ancillary Services Subcontractor as specified in Section 32 11 23, Aggregate Base Courses.
- D. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.
- E. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.
- F. Provide good housekeeping practices at equipment laydown yards. Protect equipment and cover receptacles as necessary to prevent blowing trash.
- G. Coordinate with Contractor detours and other operations affecting traffic and access. Provide at least 72 hours' notice to Contractor of operations that will alter access to Site.
- H. Upon completion of construction, leave access roads in condition suitable for future use by Owner and Contractor. Replace damaged or broken culverts with new culvert pipe of same diameter and material.

3.06 PARKING AREAS

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Contractor's operations, or construction operations.
- B. Parking lot for personnel working on Project provided by Subcontractor.

3.07 VEHICULAR TRAFFIC

- A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road will be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.
- B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
- D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to the Owner and Contractor a minimum of 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.
- E. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations will follow immediately behind backfilling.
- F. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices. Flaggers must have appropriate training as required by the Michigan Department of Transportation (MDOT).

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G. Notify fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Subcontractor's night emergency telephone numbers to police department.

3.08 SURFACE WATER CONTROL

- A. Ponding surface water that may interfere with the work area will be pumped to another area on the existing clay cap. Install highly efficient pumps as controls to quickly discharge water from the work area.
- B. Remove surface runoff controls when no longer needed.
- C. Provide supplemental ditches and sumps only as necessary to collect water from rain events. Do not use ditches and sumps as primary means of water control.

3.09 SPILL PREVENTION, RESPONSE, AND REPORTING

- Areas used to store fuel, chemicals and waste will be properly protected from vehicle traffic. If fuel is stored onsite, fuel tanks or containers (including fuel storage and waste storage) will be equipped with secondary containment. These tanks or containers will be inspected routinely for signs of leaks. Accumulated water must be inspected for signs of contamination (e.g., product sheen, discoloration and odor) before being discarded. Applicable fire protection codes and guidance will be adhered to.
- B. The Subcontractor will prepare a Spill Prevention Control and Countermeasures Plan that conforms to the requirements of 40 CFR Part 112, Oil Pollution Prevention, if the total onsite oil or oil product storage capacity is expected to meet or exceed 1,320 gallons at any time during the Project. All containers with a capacity of 55 gallons or greater will be included in determining onsite capacity. This threshold does not include mobile refueling tanks if they do not remain onsite overnight.
- C. Onsite vehicles and equipment will be refueled onsite at designated fueling areas, located on level ground and away from any surface water features including storm water inlets or ditches. Spill kits, drip pans, and absorbent spill cleanup materials will be available in the fueling area. These materials will be properly disposed of after use. No vehicle or equipment maintenance will be performed on the construction site.

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- D. Chemical products will be properly stored, transferred, and used. Original labels on chemical containers with the identity of the chemical and any hazard warnings, will be maintained.
- E. Spill response equipment will be adequately stocked and maintained throughout the project. Spills and leaks will be cleaned up immediately and disposed of properly.
- F. The Subcontractor is responsible for the disposal of waste and contaminated environmental media from a spill or release of Subcontractor-owned hazardous substances and petroleum products (diesel, hydraulic oil, etc.). Subcontractor must immediately report all spills to Contractor. Unless otherwise directed by Contractor or Owner, Subcontractor will make notification to external agencies for reportable spills of Contractor-owned materials.
- G. Good housekeeping procedures will be followed to reduce risks associated with construction materials and hazardous materials. These procedures include but are not limited to keeping materials in their original containers whenever possible, maintaining original labels and Safety Data Sheets, and using proper disposal methods for surplus materials.

3.10 CLEANING DURING CONSTRUCTION

- A. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris.
- B. Pick up and dispose of trash as necessary to prevent trash from blowing offsite.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least weekly, dispose of such waste materials, debris, and rubbish offsite or as necessary to prevent waste receptacles from overflowing.

3.11 DECONTAMINATION OF EQUIPMENT AND PERSONNEL

A. As specified in Section 01 72 00, Decontamination of Personnel and Equipment.

3.12 DEMOBILIZATION

- A. Upon substantial completion of Work, Subcontractor will demobilize from the Site. Demobilization includes:
 - 1. Removal of all field equipment, temporary facilities, and other miscellaneous items (for example, barricades, caution tapes, and signs) resulting from or used during field operations, unless otherwise directed by Contractor.
 - 2. Proper offsite disposal of all wastes and general construction debris generated by construction activities.
- B. Subcontractor will complete closeout punch list described in Section 01 77 00, Closeout Procedures.

END OF SECTION

SECTION 01 57 13 TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers Work to implement structural and nonstructural Best Management Practices (BMP) to control soil erosion by wind or water and keep eroded sediments and other construction-generated pollutants from moving off project sites. Requirements described in this Specification are part of the Project Soil Erosion and Sediment Control Plan (SESC Plan) and are the minimum for all project construction sites and conditions. This Specification covers all Project activities, including material sources, disposal sites, and offsite mitigation areas unless specific Project activities are excluded elsewhere in this Specification or in other Subcontract Documents controlling the Work.
- B. This section covers Work necessary for stabilization of soil to prevent erosion during construction and land disturbing activities. The minimum areas requiring soil erosion and sediment control measures are indicated in Exhibit 1. Contractor reserves right to modify use, location, and quantities of soil erosion and sediment control measures based on activities of Subcontractor.
- C. The work will include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified. This includes the installation, maintenance, and final removal of all temporary soil erosion and sediment control measures.

1.02 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced.
 - 1. ASTM International (ASTM):
 - a. D638-10, Standard Test Method for Tensile Properties of Plastics.
 - b. D3776/D3776M, Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
 - c. D4355-07, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in Xenon Arc Type Apparatus.
 - d. D4632-08, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

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- 2. Federal Emergency Management Agency (FEMA).
- U.S. Department of Agriculture: Urban Hydrology for Small Watersheds; Soil Conservation Service Engineering Technical Release No. 55, 1986.
- 4. U.S. Weather Bureau: Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Technical Paper No. 40, 1981.
- 5. Michigan Department of environmental Quality: Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (NREPA).
- 6. Part 17 Soil Erosion and Sedimentation Control (Mich. Admin. Code R 323.1702, 1703, 1709, 1710)
- 7. Part 21 National Permit for Storm Water Discharge from Construction Activity (Mich. Admin. Code R 323-2190).
- 8. *Michigan Nonpoint Source Best Management Practices Manual*, Michigan Department of Environmental Quality
- 9. Soil Erosion and Sedimentation Control Guidebook, Michigan Department of Technology, Management & Budget.
- 1.03 GENERAL
 - A. The Subcontractor will revise the draft Soil Erosion and Sedimentation Control Plan developed by the Contractor. The draft Soil Erosion and Sedimentation Control Plan for the Former Plant Site is included in Exhibit 1. The Soil Erosion and Sedimentation Control Plan will be submitted to the Contractor and City of St. Louis for review and approval. The revised Soil Erosion and Sedimentation Control Plan must be consistent with substantive requirements of Part 21 R 323.2190 (National Permit for Stormwater Discharge During Construction) of NREPA 1994 P.A. 451, as amended; Gratiot County requirements; *Michigan Nonpoint Source Best Management Practices Manual*; and the *Soil Erosion and Sedimentation Control Guidebook*. The revised plan will at a minimum:
 - 1. Describe the structural best management practices (BMPs) for earth disturbing activities and procedures to prevent the offsite discharge of pollutants. Erosion and sediment control BMPs will be installed, at a minimum, at the site perimeter, excavated areas, stockpiles of general backfill and excavated soils, staging and storage areas, inlets and drains, and construction site entrance and exit. BMPs, including by not limited to sediment retention measures (e.g., silt fence), vegetated buffer zones, stormwater diversions, will be designed, installed, and maintained in accordance with the *Michigan Nonpoint Source Best Management Practices Manual* and the *Soil Erosion and Sedimentation Control Guidebook* see References.

- 2. Describe non-structural BMPs, including but not limited to housekeeping practices, dust control, spill prevention and response measures, fuel storage and use, and equipment and vehicle maintenance practices.
- 3. Describe stabilization BMPs.
- 4. Describe how water entering excavations and contained on top of liners will be discharged as clean stormwater and other stormwater management activities.
- 5. Describe inspection and maintenance procedures.
- B. All activities must conform to the requirements of the City of St. Louis, Gratiot County, and the State of Michigan. In the event of a conflict, the more stringent requirement will apply.
- C. Subcontractor will install, inspect, and maintain and provide recordkeeping for temporary soil erosion and sediment control measures under the authorization of a Michigan DEQ-certified stormwater operator supplied by the Contractor.

1.04 SYSTEM DESCRIPTION

- A. Erosion and Sediment Control:
 - 1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.
 - 2. Design erosion and sediment controls to handle peak runoff resulting from 25-year, 24-hour storm event based on Michigan Nonpoint Source Best Management Practices Manual, Michigan Department of Environmental Quality and Soil Erosion and Sedimentation Control Guidebook, Michigan Department of Technology, Management & Budget.
 - 3. Size temporary stormwater conveyances based on procedures presented in *Michigan Nonpoint Source Best Management Practices Manual*, Michigan Department of Environmental Quality and *Soil Erosion and Sedimentation Control Guidebook*, Michigan Department of Technology, Management & Budget.
- B. Soil erosion stabilization and sedimentation control consists of the following elements:
 - 1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.
 - 2. Construction and maintenance of permanent and temporary storm drainage piping and channel systems, as necessary.

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- 3. Construction of temporary erosion and sediment controls such as silt fences and check dams.
- 4. Placement and maintenance of stabilization measures such as temporary seeding on areas disturbed by construction.

1.05 SUBMITTALS

- A. Submittals will be made in accordance with Section 01 33 00, Submittal Procedures.
- B. Informational Submittals:
 - 1. Soil Erosion and Sedimentation Control Plan and Procedures.
 - a. The Subcontractor will update or modify the Draft SESC Plan. Provide a schedule for SESC Plan implementation and incorporate it into Contractor's progress schedule. Obtain Contractor's approval of the SESC Plan and schedule before any Work begins.
 - b. Modified SESC Plans will meet all requirements of the applicable jurisdictions.
 - c. The SESC Plan will cover all areas that may be affected inside and outside the limits of the Project (including all Owner-provided sources, disposal sites, and haul roads, and all nearby land, streams, and other bodies of water).
 - d. Allow at least 5 working days for Contractor to review any original or revised SESC Plan. Failure to approve all or part of any such Plan will not make Owner liable to Contractor for any Work delays.
 - 2. Initial Schedule for installation of drainage, erosion, and sedimentation control measures.
 - 3. Method for placement of soil stabilization seed and additives.

1.06 QUALITY ASSURANCE

- A. Soil Erosion and Sediment Control Plan:
 - 1. A draft SESC Plan for the Former Plant Site is furnished in Exhibit 1 and will be updated or revised by the Subcontractor.
 - 2. For each phase of the scheduled work, indicate in the SESC Plan the proposed BMPs. Include all temporary slopes, constructed for staging or other reasons, which may not have been identified in the original Subcontract plans.

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- 3. SESC Plan required elements:
 - a. Narrative Site Description:
 - 1) Nature of construction activity planned for the Site.
 - 2) Estimates of total site area and the areas of the Site expected to be disturbed.
 - 3) Soil types found onsite and their erosion potential.
 - 4) The types of fill materials to be used.
 - 5) Timetable for sequence of major construction events.
 - b. Site Map:
 - 1) All areas of development.
 - 2) Drainage patterns.
 - 3) Areas of soil disturbance, including pre-development and post-development elevation contours.
 - 4) Areas used for storage of soils or wastes.
 - 5) Areas where vegetative practices are to be implemented.
 - 6) Location of structural erosion and sediment control BMPs.
 - 7) Location of stabilization measures.
 - 8) Location of all impervious structures and surfaces after project is completed.
 - 9) Springs, wetlands, and other surface waters located onsite and location of nearest receiving water(s).
 - 10) Boundaries of the 100-year floodplain, if determined.
 - 11) Ordinary High Water line, if determined.
 - 12) Location of detention ponds, storm drain inlets and ditches.
 - c. Required BMPs and Procedures for Erosion Prevention, Runoff Control, and Sediment Control:
 - 1) Construction entrances and parking areas.
 - 2) Unpaved site roads such as haul roads.
 - 3) Hauling saturated soils from the Site.
 - 4) Water washed from concrete trucks.
 - 5) Erosion and sediment control BMPs, including detail on design, installation, and maintenance.
 - 6) Clearing and grading practices to minimize area of exposed soil throughout life of the Project.
 - 7) Schedule of phased clearing operations to limit soils to what can be stabilized.
 - 8) Stabilization and vegetative buffers, including preservation of existing vegetation, seeding, mulching, and buffer strips.
 - 9) Perimeter controls.
 - 10) Additional controls for wet season work and temporary work suspensions.
 - 11) Sensitive areas such as wetlands.
 - 12) Equipment and waste storage areas.
 - 13) Dust control.

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- 14) Emergency materials stockpiled onsite.
- 15) Soil stockpile management.
- 4. SESC Plan update/revision and implementation schedules must be prepared by a competent individual. Furnish a signed copy of the SESC Plan with individual's name, title, state certifications, and employing firm if different than Subcontractor's firm.
- 5. Do not begin any Site activities that have potential to cause erosion or sediment movement until the SESC Plan and implementation schedules are approved by Contractor.
- 6. Keep a copy of the approved SESC Plan with updated changes onsite during all construction activities. During inactive periods longer than 7 calendar days, keep the SESC Plan onsite or provide a copy to Contractor to retain.
- 7. Continually update the SESC Plan and schedules as needed for unexpected storm or other events to ensure that sediment-laden water does not leave the construction site. Add approved changes to the SESC Plan no later than 24 hours after implementation.
- B. Preventing erosion, and controlling runoff, sedimentation, and non-stormwater pollution, requires Subcontractor to perform temporary Work items including, but not limited to:
 - 1. Providing ditches, berms, culverts, and other measures to control surface water.
 - 2. Building dams, settling basins, energy dissipaters, and other measures, to control downstream flows.
 - 3. Controlling underground water found during construction.
 - 4. Covering or otherwise protecting slopes until permanent erosion control measures are working.
- C. To the degree possible, coordinate this temporary Work with permanent drainage and erosion control work the Subcontract requires.
- D. Contractor may require additional temporary control measures if it appears pollution or erosion may result from weather, nature of materials, or progress on the Work.
- E. When natural elements rut or erode the slope, restore and repair damage with eroded material where possible, and remove and dispose of any remaining material found in ditches and culverts. When Contractor orders replacement with additional or other materials, unit Subcontract prices will cover quantities needed.

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- F. Install all sediment control devices including, but not limited to, sediment ponds, perimeter silt fencing, or other sediment trapping BMPs prior to any ground disturbing activity. Do not expose more erodible earth than necessary during clearing, grubbing, excavation, borrow, or fill activities without written approval by Contractor. Contractor may increase or decrease the limits based on project conditions. Erodible earth is defined as any surface where soils, grindings, or other materials may be capable of being displaced and transported by rain, wind, or surface water runoff. Cover inactive areas of erodible earth, whether at final grade or not, within specified time period (see [NPDES] Erosion and Sediment Control Permit), using an approved soil covering practice. Phase clearing and grading to maximum extent practical to prevent exposed inactive areas from becoming a source of erosion.
- G. Water Management:
 - 1. Manage site water in accordance with the conditions of the waste discharge permit from a local permitting authority. If site water management is not subject to permit, manage as follows:
 - a. Excavation water. When groundwater is encountered in an excavation, treat and discharge as follows:
 - 1) When excavation water conforms to Michigan Department of Environmental quality (MDEQ) Water Quality Standards, it may bypass detention and treatment facilities and be routed directly to its normal discharge point at a rate and method that will not cause erosion.
 - 2) When turbidity of excavation water is similar to turbidity of site runoff, water may be treated using same BMP being used to treat the site runoff and then discharged at a rate that will not cause erosion.
 - 3) When excavation water turbidity is greater than turbidity of site runoff, treat water separately until turbidity is similar to or better than site runoff, and then it may be combined with site runoff and treated as described above.
 - 4) In no case, can the discharge of excavation water cause an exceedance of MDEQ water quality standards in the receiving water.
 - b. Process Water:
 - Do not discharge high pH process water or wastewater (non-stormwater) that is generated onsite, including water generated during concrete grinding, rubblizing, washout, and hydro-demolition activities, to waters of Gratiot County, including wetlands. Water may be infiltrated upon approval of Contractor. Offsite disposal of concrete process water is subject to approval of Contractor.

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- 2) Treat all water generated onsite from construction or washing activities that is more turbid than site runoff separately until turbidity is the same or less than site runoff, and then it may be combined with site runoff and treated as described above. Water may be infiltrated upon approval of Contractor.
- c. Offsite Water: Prior to disruption of normal watercourse, intercept offsite stormwater and pipe it either through or around the Project Site. This water will not be combined with onsite stormwater. Discharge offsite water at its preconstruction outfall point preventing an increase in erosion below the site. Submit proposed method for performing this Work for Contractor's approval.
- H. Dispersion/Infiltration: Convey water only to dispersion or infiltration areas designated in the SESC Plan or to sites approved by Contractor. Water will be conveyed to designated dispersion areas at a rate such that, when runoff leaves the area and enters waters of Gratiot County, turbidity standards are achieved. Convey water to designated infiltration areas at a rate that does not produce surface runoff.
- I. Detention/Retention Pond Construction: Whether permanent or temporary, construct before beginning other grading and excavation Work in the area that drains into that pond. Install temporary conveyances concurrently with grading in accordance with the SESC Plan so that newly graded areas drain to the pond as they are exposed.
- J. Pollution Control: Use BMPs to prevent or minimize stormwater exposure to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery, as well as debris, leftover paints, solvents, and glues from construction operations. Implement the following BMPs when applicable:
 - 1. Written spill prevention and response procedures.
 - 2. Employee training on spill prevention and proper disposal procedures.
 - 3. Spill kits in all vehicles.
 - 4. Regular maintenance schedule for vehicles and machinery.
 - 5. Material delivery and storage controls.
 - 6. Training and signage.
 - 7. Covered storage areas for waste and supplies.

- K. If Contractor orders the Work suspended, continue to control erosion, pollution, and runoff during the shutdown.
- L. Nothing in this section will relieve Subcontractor from complying with other Subcontract requirements.

PART 2 PRODUCTS

- 2.01 SILT FENCE
 - A. Geotextile: In accordance with *Michigan Nonpoint Source Best Management Practices Manual*, Michigan Department of Environmental Quality.
 - B. Support Posts: In accordance with *Michigan Nonpoint Source Best Management Practices Manual*, Michigan Department of Environmental Quality and as recommended by manufacturer of geotextile.
 - C. Fasteners: Heavy-duty wire staples at least 1-inch long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

2.02 CLEARING LIMIT FENCE

- A. Fabric:
 - 1. Ultraviolet stabilized polyethylene, polypropylene, or nylon filaments woven into uniform pattern, with distinct and measurable openings.
 - 2. Minimum Physical Qualities:
 - a. Tensile Yield: Average 2,000 pounds per 4-foot width; ASTM D638-10.
 - b. Ultimate Tensile Yield: Average 2,900 pounds per 4-foot width; ASTM D638-10.
 - c. Elongation at Break: Greater than 1,000 percent; ASTM D638-10.
 - d. Chemical Resistance: Inert to most chemicals and acids.
 - 3. Color: Yellow or orange.
 - 4. Height: 3 feet.
 - 5. Material Edges: Finished in order that filaments retain their relative positions under stress.
- B. Posts: Conventional metal "T" or "U" posts.

2.03 STRAW MULCH

A. Clean salt hay or threshed straw of oats, wheat, barley, or rye; free from seed of noxious weeds.

2.04 OUTLET PROTECTION

A. Size riprap or quarry spall to resist movement under design flows. Install at least 8 inches deep. Provide riprap or quarry spall material free of extraneous material.

2.05 PLASTIC COVERING

A. Clear plastic meeting requirements of ASTM D4397 for polyethylene sheeting having a minimum thickness of 6 mils.

2.06 POLYACRYLAMIDE (PAM)

- A. Meet ANSI/NSF Standard 60 for drinking water treatment with an AMD content not to exceed 0.05 percent.
- B. Anionic, linear, and not cross-linked.
- C. Minimum average molecular weight greater than 5 mg/mole and minimum 30 percent charge density.
- D. 80 percent active ingredients minimum with moisture content not exceeding 10 percent by weight.
- E. Delivered in a dry granular or powder form.

2.07 SEEDING

A. See Section 32 92 00, Turf and Grasses.

2.08 SILT (SEDIMENT) FENCE

- A. Geotextile: As specified in Article Geotextile.
- B. Support Posts: As recommended by manufacturer of geotextile.
- C. Fasteners: Heavy-duty wire staples at least 1-inch long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

2.09 STRAW

- A. Straw:
 - 1. Air dried condition free of noxious weeds, seeds, and other materials detrimental to plant life. Hay is not acceptable. Provide weed-free documentation:
 - a. Certified Weed Free Straw using North American Weed Management Association (NAWMA) standards.

- b. Provide documentation that material is steam or heat treated to kill seeds.
- c. Provide U.S. or state's Department of Agriculture laboratory test reports, dated within 90 days prior to date of application, showing there are no viable seeds in the straw.
- B. Straw Mulch: Suitable for spreading with mulch blower equipment.
- C. Posts for Straw Bales: 2-inch by 2-inch untreated wood or commercially manufactured metal posts.

2.10 TACKIFIERS

- A. Biodegradable Hydraulically Applied Erosion Control Products (HECPs) in a dry condition, free of noxious weeds, seeds, chemical printing ink, germination inhibitors, herbicide residue, chlorine bleach, rock, metal, plastic, and other materials detrimental to plant life. Up to 5 percent by weight may be photodegradable material.
- B. Suitable for spreading with a hydroseeder.
- C. Furnish HECPs premixed by the manufacturer. Under no circumstances will field mixing of additives or components be acceptable.
- D. Provide test results, dated within 3 years prior to the date of application, from an independent, accredited laboratory, as approved by Contractor, showing that the product meets the HECP requirements in Table 1.

Table 1 HECP Requirements				
Properties	Test Method	Requirements		
Acute Toxicity	EPA-821-R-02-012 Methods for Measuring Acute Toxicity of Effluents. Test leachate from recommended application rate receiving 2 inches of rainfall per hour using static test for No-Observed-Adverse- Effect-Concentration (NOEC).	Four replicates are required with no statistically significant reduction in survival in 100 percent leachate for a Daphnid at 48 hours and Oncorhynchus mykiss (rainbow trout) at 96 hours.		

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Table 1 HECP Requirements				
Properties	Test Method	Requirements		
Solvents	EPA 8260B	Benzene:	< 0.03 mg/kg	
		Methylene chloride:	< 0.02 mg/kg	
		Naphthalene:	< 5 mg/kg	
		Tetrachloreoethylene:	< 0.05 mg/kg	
		Toluene:	<7 mg/kg	
		Trichloroethylene:	< 0.03 mg/kg	
		Xylenes:	< 9 mg/kg	
Heavy Metals	EPA 6020A Total Metals	Antimony:	<4 mg/kg	
		Arsenic:	< 6 mg/kg	
		Barium:	< 80 mg/kg	
		Boron:	< 100 mg/kg	
		Cadmium:	< 2 mg/kg	
		Chromium:	< 2 mg/kg	
		Copper:	< 5 mg/kg	
		Lead:	< 5 mg/kg	
		Mercury:	< 2 mg/kg	
		Nickel:	< 2 mg/kg	
		Selenium:	< 10 mg/kg	
		Strontium:	< 30 mg/kg	
		Zinc:	< 5 mg/kg	
Water Holding Capacity	ASTM D7367	900 percent minimum		
Organic Matter Content	ASTM D2974	90 percent minimum		
Moisture Content	ASTM D2974	15 percent		
Seed Germination	ASTM D7322	Long-Term: 420 percent minimum		
Enhancement		Moderate-Term: 400 p minimum	ercent	
		Short-Term: 200 perces	nt minimum	

PART 3 EXECUTION

3.01 PREPARATION

- A. Contractor's acceptance of Soil Erosion and Sedimentation Control Plan required prior to starting earth disturbing activities.
- B. Subcontractor is responsible for phasing Work in areas allocated for their exclusive use during Project, including proposed stockpile areas and installation of temporary erosion control devices, ditches, or other facilities.
- C. Areas set aside for Subcontractor's use during Project may be temporarily developed to provide satisfactory working, staging, and administrative areas. Preparation of these areas will be in accordance with other requirements contained within Specifications and completed in a manner to control sediment transport away from area.

3.02 INSTALLATION

A. Installation and maintenance will be in accordance with the *Michigan Nonpoint Source Best Management Practices Manual* and the *Soil Erosion and Sedimentation Control Guidebook* – see References and in accordance with manufacturer's instructions.

3.03 SOIL STOCKPILES

A. Protect from erosion with silt fence.

3.04 FIELD QUALITY CONTROL

- A. Conduct inspections jointly with Contractor every week to evaluate conformance to requirements of Specifications local and state authorities.
- B. Replace or repair failed or overloaded silt fences, or other temporary erosion control devices within 2 days after Site inspections.

3.05 MAINTENANCE

- A. Promptly repair or replace silt fence that becomes damaged.
- B. Provide and maintain soil stabilization seeding at all times.
- C. Silt Traps:
 - 1. Clean silt traps of collected sediment after every storm or as determined from biweekly inspections.

- 2. Perform cleaning in a manner that will not direct sediment into storm drain piping system.
- 3. Take removed sediment to area selected by Contractor where it can be cleaned of sticks and debris, then allowed to dry.
- 4. Dispose of final sediment onsite as designated by Contractor.
- 5. Dispose of debris offsite.
- D. Regrade unpaved earth drainage ditches as needed to maintain original grade and remove sediment buildup. If ditch becomes difficult to maintain, install additional erosion control devices such as check dams, temporary paving, or silt fences as directed by Contractor.
- E. Inspect, repair, and replace as necessary erosion control measures during the time period from start of construction to completion of construction.

3.06 CLEANING

A. Dress sediment deposits remaining after fence has been removed to conform to existing grade.

3.07 PREPARATION

- A. Contractor's acceptance of the SESC Plan is required prior to starting earth disturbing activities.
- B. Include proposed stockpile areas and installation of temporary erosion control devices, ditches, or other facilities in Work phasing plans.
- C. Areas designated for Subcontractor's use during Project may be temporarily developed as specified to provide working, staging, and administrative areas. Include control of sediment from these areas in the SESC Plan.
- D. Provide stabilization, as needed, to enhance establishment of vegetation.
- E. Outlet Protection: Provide outlet protection to prevent scour at outlets of ponds, pipes, ditches, or other conveyances.
- F. Plastic Covering: Use clear plastic covering to promote seed germination when seeding is performed outside of specified dates. Use black plastic covering for stockpiles or other areas where vegetative growth is unwanted. Place plastic with at least a 12-inch overlap of all seams. Install and maintain plastic cover to prevent water from cutting under the plastic and to prevent cover from blowing open in the wind.
- G. Polyacrylamide (PAM): See Tackifiers.

- H. Sediment Control Barriers: Install sediment control barriers in accordance with SESC Plan or manufacturer's recommendations in the areas of clearing, grubbing, earthwork, or drainage prior to starting those activities. Maintain sediment control barriers until soils are stabilized.
- I. Silt (Sediment) Fence:
 - 1. When backup support is used, use steel wire with a maximum mesh spacing of 2 inches by 4 inches, or plastic mesh as resistant to ultraviolet radiation as the geotextile it supports. Provide wire or plastic mesh with strength equivalent to or greater than as required for unsupported geotextile (for example, 180 pounds grab tensile strength in the machine direction).
 - 2. Attach geotextile to posts and support system using staples, wire, or in accordance with manufacturer's recommendations. Geotextile will be sewn together at the point of manufacture, or at a location approved by Contractor, to form geotextile lengths as required.
 - 3. Provide wood or steel support posts at sewn seams and overlaps as necessary to support fence.
 - 4. Wood Posts: Minimum dimensions of 2-inch by 2-inch.
 - 5. Steel Posts: Minimum weight of 0.90 lb/ft.
 - 6. When sediment deposits reach approximately one-third the height of the silt fence, remove and stabilize deposits.
- J. Stabilized Construction Entrance: Construct temporary stabilized construction entrance, prior to beginning any clearing, grubbing, earthwork, or excavation. When stabilized entrance no longer prevents track out of sediment or debris, either rehabilitate existing entrance to original condition or construct a new entrance.
- K. Street Cleaning: Use self-propelled pickup street sweepers whenever required by Contractor to prevent transport of sediment and other debris off Project Site. Provide street sweepers designed and operated to meet air quality standards. Street washing with water will require approval by Contractor. Intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.
- L. Tackifiers:
 - 1. Mix and apply tackifier in accordance with manufacturer's recommendations. If applied with a hydroseeder, add Short-Term Mulch as a tracer at a rate of 125 pounds to 250 pounds per acre to visibly aid uniform application.

- 2. Soil Binding Using Polyacrylamide (PAM): Apply PAM on bare soil completely dissolved and mixed in water or applied as a dry powder. Apply dissolved PAM at a rate of not more than 2/3 pound per 1,000 gallons of water per acre. Apply a minimum of 200 pounds per acre of Short-Term Mulch with the dissolved PAM. Dry powder applications may be at a rate of 5 pounds per acre using a hand-held fertilizer spreader or a tractor-mounted spreader.
 - a. Apply PAM only to areas that drain to completed sedimentation control BMPs in accordance with the SESC Plan. PAM may be reapplied on actively worked areas after a 48-hour period.
 - b. PAM will not be applied during rainfall or to saturated soils.

3.08 ADDITIONAL REQUIREMENTS

- A. Natural Buffer or Equivalent:
 - 1. Unless natural buffer between the Project Site and receiving waters has previously been eliminated by pre-existing development disturbances, comply with one of the following alternatives if stormwater from construction will discharge to surface water:
 - a. Provide a 50-foot, undisturbed natural buffer between construction disturbances and surface water.
 - b. Provide an undisturbed natural buffer that is less than 50 feet supplemented by additional erosion and sediment controls, which in combination, achieve a sediment load reduction that is equivalent to a 50-foot buffer.
 - c. If it is infeasible to provide an undisturbed natural buffer of any size, implement erosion and sediment controls that achieve a sediment load reduction that is equivalent to a 50-foot buffer.

3.09 MAINTENANCE

- A. The SESC measures described in this Specification are minimum requirements for anticipated Site conditions. During the construction period, upgrade these measures as needed to comply with all applicable local, state, and federal erosion and sediment control regulations.
- B. Maintain erosion and sediment control BMPs so they properly perform their function until Contractor determines they are no longer needed.
- C. Construction activities must avoid or minimize excavation and creation of bare ground during wet weather.

- D. The intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.
- E. Inspect BMPs in accordance with the schedule in the Construction Stormwater Discharge Permit(s) or as directed by Contractor.
- F. Complete an inspection report within 24 hours of an inspection. Each inspection report will be signed and identify corrective actions. Document that corrective actions are performed within 7 days of identification. Keep a copy of all inspection reports at the Site or at an easily accessible location.
- G. Unless otherwise specified, remove deposits before the depth of accumulated sediment and debris reaches approximately height of BMP. Dispose of debris or contaminated sediment at approved locations. Clean sediments may be stabilized onsite using BMPs as approved by Contractor.
- H. Sediment Fence: Remove trapped sediment before it reaches one-third of the above ground fence height and before fence removal.
- I. Initiate repair or replacement of damaged erosion and sediment control BMPs immediately, and work completed by end of next work day. Significant replacement or repair must be completed within 7 days, unless infeasible.
- J. Within 24 hours, remediate any significant sediment that has left construction site. Investigate cause of the sediment release and implement steps to prevent a recurrence of discharge within same 24 hours. Perform in-stream cleanup of sediment according to applicable regulations.
- K. At end of each work day, stabilize or cover soil stockpiles or implement other BMPs to prevent discharges to surface waters or conveyance systems leading to surface waters.
- L. Temporarily stabilize soils at end of shift before holidays and weekends, if needed. Ensure soils are stable during rain events at all times of year.
- M. Initiate stabilization by no later than end of next work day after construction work in an area has stopped permanently or temporarily.
- N. Within 14 days of initiating stabilization or as specified in permit, either seed or plant stabilized area; or apply non-vegetative measures and cover all areas of exposed soil. Seed dry areas as soon as Site conditions allow. Ensure that vegetation covers at least 70 percent of stabilized area. In areas where Subcontractor's activities have compromised erosion control functions of existing grasses, overseed existing grass. Non-vegetative measures may

include blown straw and a tackifier, loose straw, or an adequate covering of compost mulch. Complete initial stabilization within 7 days if storm water discharges to surface waters impaired for sediment or nutrients, or high quality waters.

O. Provide stabilization measures on all exposed areas. Do not remove temporary sediment control practices until exposed areas are stabilized. However, do remove all temporary erosion control measures as exposed areas become stabilized, unless doing so conflicts with local requirements. Properly dispose of construction materials and waste, including sediment retained by temporary BMPs.

3.10 REMOVAL

- A. When Contractor determines that a BMP is no longer required, remove BMP and all associated hardware from the Project limits. When materials are biodegradable, Contractor may approve leaving temporary BMP in place.
- B. Permanently stabilize all bare and disturbed soil after removal of erosion and sediment control BMPs. Dress sediment deposits remaining after BMPs have been removed to conform to existing grade. Prepare and seed graded area. If installation and use of erosion control BMPs have compacted or otherwise rendered soil inhospitable to plant growth, such as construction entrances, take measures to rehabilitate soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or seeding with specified seed.

3.11 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this specification.
 - 1. Exhibit 1 Draft Soil Erosion and Sedimentation Control Plan.

END OF SECTION

Velsicol Burn Pit Superfund Site In Situ Thermal Treatment, Operable Unit 1 St. Louis, Michigan Remedial Action WA No. 195-RDRD-B5US/Contract No. EP-S5-06-01

Prepared for



August 2019



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Appendixes

- A SESC Permit Application
- B Construction Schedule
- C Michigan Department of Environment, Great Lakes, and Energy Best Management Practices Specifications
- D Soil Erosion and Sediment Control Inspection Form

Drawings

C-201 Existing Conditions Plan – West

C-202 Existing Conditions Plan – East

Tables

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Acronyms and Abbreviations

ANP	Adjacent or Nearby Properties
ARAR	applicable or relevant and appropriate requirement
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	U.S. Environmental Protection Agency
FPS	former plant site
NPL	National Priorities List
NREPA	Natural Resources and Environmental Protection Act
OU1	Operable Unit 1
ROD	Record of Decision
SESC	Soil Erosion and Sedimentation Control
SM	site manager

Introduction

This Soil Erosion and Sedimentation Control (SESC) Plan was developed for in situ thermal treatment (ISTT) within the Velsicol Burn Pit (Burn Pit) of Operable Unit 1 (OU1) at the Velsicol Chemical Corporation Superfund Site, EPA ID# MIN000510389. The site is located in Gratiot County, St. Louis, Michigan. The remedial actions at the Burn Pit will be conducted in accordance with the Record of Decision (ROD) for this site as required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The U.S. Environmental Protection Agency (EPA) will contract an ISTT Subcontractor to conduct the remedial activities.

This SESC Plan applies to ISTT remedial activities performed at the Burn Pit. This plan provides an overview of construction activities and includes procedures that will be implemented to mitigate soil erosion and sedimentation from the work areas within the Burn Pit.

Under CERCLA 121(e), onsite remediation activities (that is, activities within OU1) are exempt from permitting and other administrative requirements; however, the remedial action must comply with applicable, relevant, and appropriate requirements (ARARs). The ROD for this site includes the following ARAR:

Part 91 (Soil Erosion and Sedimentation Control) of the Natural Resources and Environmental Protection Act [NREPA]. 1994 P.A. 451 as amended (MCL 324.9101 – 324.9123a [Michigan Administrative Rules 323.1701 - 1714]). Prevents uncontrolled erosion and sedimentation in lakes, streams and rivers from earth-changing activities. Requires a soil erosion control and sedimentation plan for any earth change. Substantive requirements are applicable for excavation and earth changing activities.

In accordance with the substantive requirements of Rule 323.1704, an SESC plan is required if an earth change:

- Disturbs more than 1 acre of land or
- Is within 500 feet of a lake or stream, as defined under Administrative Rule R323.1701 to 1714, Part 17, Soil Erosion and Sedimentation Control

The total disturbed area of work on the Burn Pit is an estimated 161,000 square feet, or 3.7 acres. This SESC Plan was therefore developed following the substantive requirements of Administrative Rules 323.1703 and 323.1706.

A copy of the SESC permit application is provided in Appendix A for informational purposes. To address the Gratiot County SESC Permit Application and Plan Requirements, the following items are provided in this SESC Plan.

- Scaled maps
- Site location sketch
- Proximity to lakes, streams or drains
- Limits of earth change
- Predominant land features
- Slope information
- Soils information
- Drainage facilities
- Timing and sequence
SOIL EROSION AND SEDIMENTATION CONTROL PLAN: VELSICOL BURN PIT SUPERFUND SITE IN SITU THERMAL TREATMENT, OPERABLE UNIT 1

- Temporary SESC measures and timing sequence for installation and removal
- Permanent SESC measures
- Maintenance program for SESC measures

This plan provides an overall approach to be implemented for soil erosion and sedimentation control. This plan will be updated by the ISTT Subcontractor prior to starting ISTT activities and will be modified by the ISTT Subcontractor when there is a change in design, operation, or maintenance in construction activities. The plan will also be revised by the ISTT Subcontractor if procedures or controls prove to be ineffective in eliminating or significantly minimizing soil erosion or sedimentation from the Burn Pit.

2.1 Site Background

The following sections give a general overview of the location, setting, and history of the site, as well as surface soil types that can be found in the vicinity.

2.1.1 Site Location

The site, National Superfund database identification number MIN000510389, encompasses a 5-acre land parcel located entirely within the Hidden Oaks Golf Course at 1270 West Monroe Road, in St. Louis, Michigan. The staging areas for use during the ISTT construction and operations will be located at the Burn Pit. See attached site location plan.

2.1.2 Site History

The Burn Pit was an offsite disposal area, operated by Velsicol, where industrial wastes were burned for volume reduction or other disposal purposes. During plant operations, solid and liquid waste from the Former Plant Site (FPS) was burned at the Burn Pit. In addition, solid waste from the City of St. Louis was burned at the Burn Pit. According to records, liquid waste was burned weekly in an open pit.

From 1978 through 1983 and before inclusion of the site on the National Priorities List (NPL), a preliminary assessment, site inspection, and site characterization investigation were performed. In response to investigation findings and in fulfillment of a 1982 Consent Judgment remedy for the Velsicol Chemical Superfund Site, approximately 68,000 cubic yards (yd³) of contaminated material were removed from the Burn Pit, transferred to the FPS, and placed for disposal beneath a compacted clay cap.

2.1.3 Surface Soil Types

Surface soil types that are found within the vicinity of the site include the Marlette Sandy Loam and the Spinks Loamy Sand.

2.1.3.1 Marlette Sandy Loam

The Marlette sandy loam is a gentle to moderate sloping, well-drained soil found on foot slopes, knolls, and ridges. The surface layer is typically described as a dark grayish brown or brown sandy loam underlain by a pale brown sandy loam. The subsoil is friable and described as a mixed yellowish brown loam and pale brown loam or sandy loam underlain by a brown clay loam to a depth of about 60 inches. The hydrologic properties of these soils are extremely variable. Typically, the permeability is moderate or moderately slow, and the available water capacity is high with medium to rapid runoff.

2.1.3.2 Spinks Loamy Sand

The Spinks loamy sand is a level and gently sloping, well-drained soil on foot slopes, knolls, and ridges. Typically, the surface layer is described as grayish brown loamy sand. The subsoil is loose, yellowish brown sand underlain by pale brown sand to a depth of about 60 inches.

Permeability is moderately rapid or rapid, and available water capacity is low with slow runoff.

2.2 Description of Construction and Operations Activities

The Burn Pit remedial action is intended to facilitate future activities that will be performed to achieve remedial action objectives (RAOs) for contaminants of concern (COCs) within the Burn Pit in accordance with the 2015 ROD. RAOs are goals that are specific to media or OUs for protecting human health and the environment and were established in the 2015 ROD. The schedule for Burn Pit ISTT activities is to be determined and will be updated as part of the SESC Plan updates during the RA.

2.2.1 ISTT Activities

The following definable features of work (DFOWs) are the major components of the ISTT construction and operation activities:

- 1. Mobilization and Site Controls
- 2. Wellfield Below-Ground Installation
- 3. Wellfield Thermal/Vapor Cap Installation
- 4. Wellfield Assembly
- 5. Liquid and Vapor Treatment Assembly
- 6. Commissioning and Startup
- 7. Operation and Maintenance, Performance Verification
- 8. Demobilization and Site Restoration

2.2.2 Staging Area

The Burn Pit staging area will include parking, field offices, tool trailers, storage trailers, water supply and portable sanitary facilities.

2.2.3 Potential Sources of Pollutants in Stormwater Discharges from Construction and Operations Activities

The potential sources of pollutants during construction activities include:

- Sediment from vehicle and equipment decontamination areas
- Sediment from vehicle tracking
- Sediment from ISTT construction activities
- Sediment and waste (including wastes from portable sanitary facilities and material storage areas)
- Petroleum products (gasoline, diesel, oil, hydraulic fluid, lubricants, etc.) from vehicle and equipment maintenance and fueling

2.3 Site Drawings

Drawings C-201 and C-202 show existing conditions at the Burn Pit, including general drainage patterns within this area. The drawing also provides the limits of the Burn Pit work, and its proximity to Pine River.

2.4 Topography

Topography in this area is generally undulating with some areas of gentle relief (Drawings C-201 and C-202). There is no anticipated change in topography as a result of the remedial activities. Site restoration activities will bring the construction areas as close to their original elevations as possible.

The Pine River flows along the eastern and southern boundary of the Burn Pit into Mill Pond, where a hydroelectric dam is located (about 0.25 mile east of the FPS). There are wetlands located within the Burn Pit.

2.5 Schedule

The ISTT activities construction and operations schedule summary will be presented in Appendix B as part of the SESC Plan updates during the RA.

Best Management Practices (BMPs) will be implemented as described below to control soil erosion and sedimentation, and otherwise prevent the discharge of pollutants during construction activities at the Burn Pit. The BMPs will be selected, installed, and maintained in an appropriate and functional manner that is in accordance with the relevant manufacturer specifications and accepted engineering practices. The description of controls includes:

- Control measures during construction
- Erosion and sediment controls, including structural and stabilization controls
- Spill prevention and control
- Employee training

Appendix C contains the Michigan Department of Environment, Great Lakes, and Energy (MDEGLE) BMP specifications.

3.1 Control Measures during ISTT Construction and Operations Activities

The potential sources of pollutants were described previously in Section 2.2.3. BMPs will be implemented prior to ISTT construction activities and will be maintained until ISTT activities are completed where the control measures have been implemented. Specific measures to control pollutant discharges from these sources are discussed below.

3.1.1 ISTT Areas

To prevent erosion and sedimentation from stormwater runoff at the construction areas, the control measures discussed below and BMPs described in Section 3.2, Erosion and Sediment Controls, will be implemented as applicable.

- Inlet Protection: There are no stormwater drains (for example, curb, and gutter, drop inlet) present in the Burn Pit where drilling activities will occur. If needed, the disturbed area may be stabilized with erosion control blanket and staples near drainage culverts (Appendix C).. Potential inlet protection BMPs will be removed after all Burn Pit operations are complete.
- **Silt Fence:** Silt fence (Appendix C) will be installed as a perimeter control along the down slope of potential disturbed areas during ISTT activities.
- **Seeding:** Seeding and mulching of disturbed areas within the ISTT area in the Burn Pit will be completed as part of the site restoration. The final graded areas will be seeded using a mix native to the local area in accordance with Michigan Department of Transportation Standard Specifications for Construction.
- Erosion Control Blanket: If necessary, erosion control blankets will be secured over soil in disturbed areas for the winter months. The erosion control blanket will be Type 1D, double-netted blanket secured in place with staples. If necessary, erosion control blankets will be removed during site restoration activities.

3.1.2 Vehicle and Heavy Equipment Decontamination Areas

Decontamination will be performed to remove contaminated soil and debris from vehicles and equipment prior to leaving the project site. During the progress and upon completion of the work, all tools, heavy equipment, vehicles, exteriors of trucks, and other items used at the Burn Pit to perform

intrusive activities involving contaminated soil or debris will be decontaminated. If haul trucks that are used to transport impacted soils are later used for uncontaminated backfill materials, the bed of the haul trucks will be decontaminated between hauling impacted and uncontaminated soils. Construction tools and equipment that contact impacted soils will be decontaminated prior to use for uncontaminated soils. Liquids, rinse water, solids, and sludge generated during decontamination operations will be collected and contained for offsite disposal.

3.1.3 Offsite Vehicle Tracking

Offsite tracking of soil and the generation of dust will be minimized. Vehicles will be inspected prior to leaving the Burn Pit. The object is to reduce fugitive dust emissions within the Burn Pit and neighboring areas.

3.1.4 Waste and Material Storage Areas

3.1.4.1 Material Storage

- Petroleum products will be stored with appropriate secondary containment in containers compatible with the material stored.
- Other vehicle maintenance liquids (antifreeze, motor oil, hydraulic fluid, etc.) will be stored either indoors or in bermed areas in containers compatible with the material stored.
- Safety data sheets (SDS) will be made available for all materials. SDS will be stored in the ISTT Subcontractor field office trailer.
- Sufficient separation will be allowed between storage containers to allow for cleanup and emergency response.
- Chemically incompatible materials will not be stored together or in the same storage facility.
- Original labels must not be removed. Materials must be relabeled properly to maintain current, legible labels with proper safety and disposal information.
- Equipment, trailers, and trucks will be staged in designated areas within the Burn Pit.
- All equipment will be returned to the equipment staging area at the Burn Pit each night for security purposes.
- The staging area and work area are to be locked at all times when onsite personnel are absent. At no time will unauthorized personnel be admitted onto the Burn Pit site. Signs will be posted at the entrance and around the site fence indicating "UNAUTHORIZED PERSONNEL KEEP OUT". All personnel will sign in and out each workday.

3.1.4.2 Waste Storage

These practices are to be used to minimize and prevent solid waste associated with construction and operations activities from entering stormwater. This applies to facilities or designated construction work areas where solid waste is generated. Solid waste can be classified as non-hazardous solid material including: rock, debris, soil, wood, plastic, fabrics, mortar, metal scraps, Styrofoam, and general litter such as beverage containers and plastic wrappers.

- Waste materials will be contained and will not be discharged to waters of the state.
- Litter will be minimized in all construction areas and collected on a regular basis into covered containers. Trash receptacles will be provided in various locations within the site boundaries. Trash receptacles will be located away from streets, gutters, watercourses, and storm drains. A trash-

hauling contractor will properly dispose of the collected waste in a timely manner. Dumpster washout at the site is not permissible.

- Waste storage areas will be located at least 50 feet from drainage ways and watercourses and will not be located in areas susceptible to frequent flooding.
- Solid waste will be segregated properly into various categories for recycling or disposal. Proper disposal is required for each waste category in accordance with federal, state, and local regulations.
- Useful vegetation, packaging material, and surplus construction materials will be recycled when practical.

3.1.4.3 Temporary Sanitary Facilities

These practices are to be used to minimize and prevent sanitary and septic waste associated with construction and operations activities from entering stormwater. This BMP applies to facilities or designated work areas that use temporary or portable sanitary systems.

- Waste materials must not be discharged to waters of the State.
- Sanitary wastes will be stored in sanitary facilities (for example, individual portable toilets), which will be periodically hauled off by a licensed disposer.
- Temporary sanitary facilities will be located away from drainage ways, inlets, receiving waters, areas of high traffic, and areas susceptible to flooding or damage by construction equipment.
- In project areas susceptible to strong winds, temporary sanitary facilities will be secured to prevent overturning.

Sanitary wastes will be stored, managed, and disposed of in accordance with federal, state, and local regulations.

3.1.5 Vehicle and Equipment Maintenance and Fueling

The following practices are to be used during vehicle and equipment staging, fueling, cleaning, and maintenance to prevent associated pollutants from entering stormwater. This BMP applies to facilities or designated work areas where vehicles and equipment are staged, fueled, cleaned, or maintained.

- Fueling will be performed offsite whenever possible.
- Perform cleaning, washing, and maintenance in a centralized station offsite where possible. Designated onsite stations should preferably be located on impervious surfaces.
- Use drip pans or absorbent materials under equipment and during fuel transfer and maintenance activities to catch/contain leaks.
- A spill kit will be maintained at refueling locations.
- Eliminate or reduce the amount of toxic or hazardous solvent used where possible.
- Use proper waste or recycling drums for used or spilled fluids; separate and recycle materials when possible.
- Do not pour liquid waste into storm drains or watercourses.
- Avoid hosing down work stations.
- Properly maintain vehicles and equipment and routinely check for leaking oil or fluids.
- Proper spill and illicit discharge reporting and cleanup procedures shall be followed for both hazardous and non-hazardous materials.

• Implement storm drains inlet protection near maintenance, fueling, and servicing activities.

3.2 Erosion and Sediment Controls

In accordance with Rule 1709 promulgated under the authority of Part 91, Soil Erosion and Sedimentation Control of the NREPA, remedial activities will be implemented to meet the following provisions:

- Perform ground disturbance in the shortest period of time.
- Capture sediment in stormwater before it leaves the Burn Pit.
- Use erosion control measures to prevent erosive stormwater flow through disturbed areas.
- Install erosion control measures prior to performing ground-disturbing activities and maintain them until the area is stabilized. Stabilized means the establishment of vegetation or proper placement, grading, or covering soil to ensure its resistance to soil erosion, sliding, or other earth movement.
- Complete permanent soil erosion control measures within 5 calendar days after final grading. If it is not possible to permanently stabilize the area, maintain temporary measures until permanent measures can be in place and the area stabilized.

Table 3-1 lists erosion and sediment control BMPs that may be implemented to meet these goals.

3.3 Employee Training

The ISTT Subcontractor will have an employee onsite during construction and operations activities who is a certified Construction Stormwater Operator/Soil Erosion Inspector in the state of Michigan. The Construction Stormwater Operator/Soil Erosion Inspector will be responsible for the following:

- Inspection of sites to determine compliance with the SESC Plan
- Documentation of inspection observations
- Identification of SESC measures that are failing or require maintenance
- Identification of areas where additional SESC measures may be necessary
- Reporting of findings of the inspection, including any corrective or additional action recommended

Certified Construction Stormwater Operators/Soil Erosion Inspectors may be the same person responsible for installing and maintaining the SESC measures, although this is not a required duty under the certification.

Table 3-1. Structural and Stabilization Measures at the Velsicol Burn Pit Superfund site

Velsicol Burn Pit Superfund Site, St. Louis, Michigan

CONTROL MEASURE	LOCATION	DESCRIPTION OF CONTROL MEASURE
Vegetative Buffers	Wherever practical.	Wherever possible, existing vegetation will be retained between drilling areas and the Pine River. It minimizes erosion potential and protects water quality.
		The preservation of natural vegetation will provide additional water quality improvement prior to the stormwater entering State or U.S. waters.
Erosion Control Blanket	On appropriate disturbed areas after construction is complete.	Erosion control blanket is a mat made of netting layered with straw, wood, coconut, or man-made fibers that prevents erosion by sheltering the soil from rainfall and runoff while holding moisture for establishing plants.

CONTROL MEASURE	LOCATION	DESCRIPTION OF CONTROL MEASURE
Seed	Seed is to be implemented in disturbed areas.	Growing of a vegetative cover on disturbed areas.
Fiber Logs	Around areas requiring protection, such as to form a temporary containment.	Fiber logs include straw, wood, or coconut fiber logs that slow water and filter sediment. Fiber logs may be used for perimeter control where inlet traps or silt fence are infeasible or for temporary containment.
Silt Fence	Downslope at excavation areas with positive slope greater than 1V:5H.	Silt fence reduces stormwater-flow velocity and filters sediment from runoff by allowing water to pass through a geotextile fabric or by creating a pool to allow sediment to drop out of the water column. It is primarily installed at downslope boundaries of disturbed soil. Silt fence consists of posts with filter fabric stretched across the posts. The lower end of the fence fabric is vertically trenched and covered with backfill.
Hay Bales	Placed at the entry and exit of drainage culvert to collect sediment.	A straw (or hay) bale sediment trap is a row of bales entrenched and secured to detain and filter sediment-laden runoff. Hay bales may potentially be aligned and staked to create a perimeter around storm drain inlets.

3.4 Spill Prevention and Control

These practices are implemented to prevent and control spills to ensure that spills and leaks do not result in water quality impacts. This BMP applies to all construction and operations activities. Spill prevention and control measures will be implemented any time chemicals or hazardous substances are used, stored, or handled.

- Project areas and activities potentially susceptible to spills will be identified. Areas and activities most vulnerable to spills include loading and unloading areas, fuel and chemical storage areas, process activities, dust- or particulate-generating processes and waste disposal activities.
- Spills will be contained and cleaned up as soon as possible.
- If complete cleanup is not immediately possible, spills will be fully covered and not exposed to precipitation.
- Spills will not be washed down or buried.
- Residuals left over from the cleanup activity, such as absorbent pads or containers of spill material, will be disposed of properly.
- Proper spill and illicit discharge reporting procedures will be followed.
- An area where a spill has occurred must be inspected to verify that spill residuals are not present after the initial cleaning and that the area does not need to be re-cleaned.
- Emergency phone numbers will be posted at the construction/operations area.
- Personnel will be trained in emergency response procedures.
- Proper notification of regulatory agencies will occur in the event of a reportable spill.

3.4.1 Cleanup Response Procedures

The following response guidelines have been identified below for responding to spills that may potentially result in an illicit discharge.

SOIL EROSION AND SEDIMENTATION CONTROL PLAN: VELSICOL BURN PIT SUPERFUND SITE IN SITU THERMAL TREATMENT, OPERABLE UNIT 1

- Immediately warn any nearby workers and notify supervisor.
- Assess the spill area to ensure that it is safe to respond.
- Evacuate area if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.
- Stop source of spill.
- Establish site control for spill area.
- Contain and control spilled material through use of sorbent booms, pads, or other material.
- Use proper personal protective equipment in responding to spills.
- Properly barricade material staging areas for containment and to control runoff as needed.
- If rainfall is present at the time of the spill, cover the spill with a tarp to prevent contaminating runoff.
- Use absorbent materials to contain spills and clean the area of residuals.
- As necessary, a licensed contractor or HAZMAT team shall be used to properly clean up spills.
- Dispose of the absorbent material properly.
- Do not hose down spill area with water.

3.4.2 Spill Reporting

The ISTT Subcontractor will follow the emergency response and reporting procedures in their approved health and safety plan.

Maintenance

All erosion and sediment control measures and other protection measures will be maintained in effective operating condition. All non-functional BMPs will be repaired, replaced, or supplemented with functional BMPs within 24 hours after discovery, or as soon as field conditions allow access.

Maintenance will be performed as needed, as determined by the inspections. Specific maintenance requirements may include the following:

- Removal of sediment and other debris that has collected within sediment traps or behind silt fences, fiber logs, geotextile, or hay bales
- Re-staking of silt fences or hay bales; securing of fiber logs
- Securing loose edges or damage to erosion control blankets.

Inspections

Inspections will be performed to review the areas for evidence of, or the potential for, pollutants leaving the Burn Pit. The controls identified in Section 3 will be inspected to verify they are being implemented properly. Maintenance and/or repairs will be made to erosion and sediment control measures as identified by the inspections. As necessary, this SESC Plan will be revised to incorporate any changes that come about as a result of the inspection. A record of the inspections will be maintained at the Burn Pit as part of the SESC Plan. Appendix D includes an SESC inspection form.

5.1 Requirements during Construction and Operations

The following areas will be inspected at a minimum every 7 days and within 24 hours of the end of a storm event of 0.5 inch or greater in a 24-hour period, as determined using an onsite rain gauge:

- Disturbed areas where stabilization measures have not been completed and any nearby stormwater inlets
- Storage areas that are exposed to precipitation
- Structural control and stabilization measures
- Construction entrances/exits
- Construction perimeter controls

Following an inspection that occurs within 24 hours after a rainfall event, the next inspection will be conducted within 7 days after that. Documentation of inspections will include at least the following:

- Date and time of inspections
- Initials of person conducting inspection
- Type of inspections
- Findings of inspections, including recommendations for corrective actions
- Corrective actions taken (including dates, times, and party completing maintenance activities)
- Date and amount of rainfall events greater than 0.5 inch in 24 hours
- Documentation of changes made to the SESC Plan
- Inspection of discharge points and downstream, offsite areas for signs of impact
- Inspection of perimeter controls
- Comparison of BMPs in the SESC Plan with construction site conditions
- Inspection of disturbed areas not currently being worked
- Inspection of areas with final stabilization
- Areas used for storage of materials, soil, or waste

A copy of the detailed area drawing will be used during inspections and will be manually updated, as necessary, to reflect any changes. Table 5-1 provides stormwater BMP inspection/maintenance guidelines.

5.2 Requirements Prior to Final Stabilization

Permanent or interim stabilization measures of disturbed land area will be implemented within 5 calendar days after final grading or the final earth change has been completed. Grass seed will be placed in the disturbed land area for final stabilization. A final inspection will be performed after completion of site restoration activities and removal of control measures.

Table 5-1. Stormwater Inspection/Maintenance Guidelines

Velsicol Burn Pit Superfund Site, St. Louis, Michigan

EROSION CONTROL BLANKET

- Is fabric damaged, loose, or in need of repairs?
- Are sections overlapping 4 to 6 inches? Are staples 12 inches apart on overlapping sections and 24 inches apart along the sides and in the middle?

SILT FENCE

- Is the fence damaged, collapsed, or ineffective?
- Has sediment been removed from behind fence? (Sediment should be 1/3 height of fence or less.)
- Is the silt fence properly installed and positioned? Is the silt fence trenched at least 6 inches deep and 6 inches wide with stakes on downhill side?

HAY BALES

- Are the hay bales damaged, deteriorated, or ineffective?
- Are the hay bales positioned and installed correctly?
- Has sediment been removed from behind the hay bales?

INLET SEDIMENT TRAP

- Is there accumulated sediment that needs to be removed?
- Is the trap intact and in good condition?
- Is the trap impeding the flow of stormwater?

FIBER LOGS

- Are the fiber logs damaged or deteriorated, or ineffective?
- Has sediment been removed from behind the logs?
- Are the logs installed and positioned correctly?

VEHICLE TRACKING

- Is the site graded away from the construction exit to prevent runoff from leaving the site?
- Is there evidence of sediment tracking from the site?
- Is there evidence that vehicles are leaving the site from other locations, and not using the designated construction exits?

Drawings



PLOT TIME: 10:05:07 AM

PLOT DATE: 2019\05\06



PLOT TIME: 10:17:21 AM

PLOT DATE: 2019\05\06

Appendix A SESC Permit Application

PERMIT APPLICATION For Part 91 SOIL EROISION AND SEDIMENTATION CONTROL

1. APPLICANT

Name (Land o	wner Only											Date of Birth					
Address												Drive	rs License	#			
City					State		5	Zin Co	de			Phone	- Number				
City					State		2	Sip CC	luc -								
1. LOCA	TION																
Section	Section Town Range Township												County				
Subdivision			Lot No.	T	Fax ID Nu	mber					Street Address						
2. PROPSED EARTH CHANGE Project type: Residential Multi-family Commercial Industrial Industria													onoing / Mining				
Project typ		Kesiden			II-Tamin	у		imer			laustriai	L		Earth Charge			
Describe P	roject												(acres	or square feet)			
Nama and dist										_ D-	·		Data				
Name and dista	ince to Near	rest Lake,	Stream or L	rain						Da	the project to star	1	Date p	roject to be completed			
3. SOIL	EROSI	ION AI	ND SEI	DIME	NTAT	TON (CON	TR	OL PL	AN	(Refer to]	Rule 3	323.170)3)			
								Esti	mated cost	for S	Soil Erosion and	Sedimen	tation Cor	ntrol			
Note: 2 C	omplet	ed sets	of plan	s mus	st be af	tache	d	Plar	Prenares	Name	e and Telephone	Number					
								1 Iui	r reputes i	i vann	e and receptione	rumber	Are	a Code			
A PART	TES DI	FSPON	ISIRI F	FOR	FAR	гн ст	TAN	CF					() -			
Name of Land	Owner (if n	ot provide	d in Box No)	L'AN.			Addr	ess								
City			State			Zip Co	de	Area code/Telephone Numb					er				
Name of Indivi	dual "On S	ite" Respo	nsible for E	arth Cha	nge		Com	apany Name									
								- · ·									
Address					City				State	Zip	Code	Area co	de/Teleph	one Number			
5. PROF	ORMA	NCE I	DEPOS	IT (If	requir	ed by t	the p	erm	itting a	gen	cy)						
Amount Red	quired \$_			C	ash 🗖	Certifie	d Che	ck [ocab!	le Letter of C	redit [Suret	y Bond			
Name of Su	rety Com	ipany															
Address					City			State		Zip	Code	A	Are Code/7	Felephone Number			
I (we) affirm	that the	above in	formatior	is acci	urate and	l that I (we) w	vill co	onduct th	e ab	ove described	l earth	change i	n accordance with			
Part 91, Soi	Erosion	and Sed	imentatio	n Cont	rol, of t	he Natu	ral Re	esour	ces and l	Envi	ironmental Pr	otectio	on Act, 1	994 PA 451, as			
amended, ap	plicable	local ord	inances,	and the	docume	ents acc	ompa	nying	g this app	plica	ation.						
Landowner's S	ıgnature							Prin	t Name					Date			
Designated Ag	ent's Signat	ture*						Drin	t Namo				Date				
Designated Ag	ent o orginal													Dute			
								1									

*Designated agent must have a written statement from the landowner authorizing him/her to secure a permit in the landowner's name.

			⊿ SITE PLAN CHCKLIST
Have	Need	N/A	FOR SOIL EROSION PERMITS
			Drawing must be to scale (map scale:1"=200' or less)
			Site location map showing nearest road intersection
			Legal description of property (i.e. T12N R4W Section 17 NW ¼, NE ¼.)
			Location and size of each proposed earth change (clearly defined ON DRAWING)
			Location and size of all temporary soil stockpiles
			Major geographic and vegetation features
			Location and size of all tree lines and forested areas
			Location and size of all existing buildings and structures
			Soil information (on drawing or in written form)
			Distance to nearest water body (lake, stream, river, county drain, wetland, etc.) for
			each proposed earth change.
			Location of all existing and proposed drainage and dewatering facilities
			Slope information or topography
			Location and detailed description of all TEMPORAY erosion and sedimentation
			control measures (shown on drawing)
			Location and detailed description of all PERMANENT erosion and sedimentation
			control measures (shown on drawing)
			Maintenance program for erosion and sedimentation control measures (including
			person responsible)
			Timing and sequence of construction (construction schedule)

PLEASE INCLUDE THIS PAGE WITH SESC PLANS.

TYPE OF EARTH CHANGE

single	family	residence	(new	construction
single	ranniy	restuctive	(IIC W	construction

single family residence (addition/alteration)

garage (addition or detached)

pole barn

pool (in ground)

pond

commercial/industrial (new)

commercial/industrial (add./alt.) residential development (subdivision, multi-family)

recreation development

□ pipeline utility school/church hospital ⊂ other_

road

Γ

ADDITIONAL EARTH CHANGE INFORMATION

Has earth-moving activity started? Is the earth-moving activity over 1 acre? Will the work be occurring in a wetland? Will de-watering occur? Will work be occurring in a waterway/floodplain? Will a designated county drain be affected? Will fill be brought on site? Will material be removed from site?



golf course



APPROXIMATE PROJECT TIMING (Month/Year)

MINOR PROJECTS

______ Temporary Erosion Control Measures installed
______ Gravel Drive/Entrance Installed
______ Land Cleared or Excavation Started
______ Final Grade / Seeding
______ Permanent Erosion Measures in Place
______ Temporary Erosion Measures Removed

MAJOR PROJECTS

- ____/ Temporary Erosion Control Measures installed
- ____/___ Gravel Drive/Entrance Installed
- ____/___ Land Cleared or Excavation Started
- ____/ ___ Detention/Retention /Sediment Ponds Installed
- ___/__ Road Construction
- ___/__ Utilities Installed
- ____/ Final Grade / Seeding
- ___/ Catch Basins/Ponds Cleaned
- ___/___ Permanent Erosion Measures in Place
- ___/___ Temporary Erosion Measures Removed

Appendix B Construction Schedule (to be provided during the RA)

Appendix C Michigan Department of Environment, Great Lakes, and Energy Best Management Practices Specifications

Seeding

Description

Seeding is the establishment of a temporary or permanent vegetative cover by planting seed. For the purposes of this BMP, "grass" and "turf" will be used interchangeably.

This BMP does not address planting individual sprigs of grasses or other vegetation. See the <u>Trees</u>, <u>Shrubs</u>, and <u>Ground Covers</u> BMP for information on planting sprigs.

Other Terms Used to Describe

Hydroseeding Vegetative Cover

Pollutants Controlled and Impacts

Once established, turf helps keep soil on site, absorbs nutrients, and allows groundwater recharge.

Application

Land Use This BMP is applicable to all land uses.

Soil/Topography/Climate

Vegetative establishment is important on all exposed areas, but particularly on sloping terrain and areas adjacent to waterbodies or wetlands. It is also important in areas which frequently flood or which are impacted by spring runoff or strong winds.

When to Apply

Seed should be applied immediately after grading and preparation of the seed bed is finished on each small segment of a construction project. <u>Mulch</u> and/or soil erosion control blankets should be used to keep seed in place until the vegetation is established.

Where to Apply

Apply on all construction or earth change sites which require temporary or permanent vegetative stabilization.

Relationship With Other BMPs

Seeding can be used in conjunction with almost all temporary and permanent soil erosion and sedimentation control measures. Any fertilizer or lime that is applied should be done based on the results of soil tests. See the <u>Soil Management</u> BMP. <u>Mulching</u> should be used in conjunction with seeding to ensure establishment of an effective vegetative cover.

Proper grading is needed to ensure the seed bed is adequate for seed application. See the "Site Preparation" section, below.

Specifications

Planning Considerations:

- 1. The proper **species** of seed should be selected following basic integrated pest management practices (see the <u>Pesticide Management</u> BMP). To reduce the amount of fertilizer, pesticides and other inputs needed, choose adapted varieties based on environmental conditions, management level desired, and the intended use. Consider mixes because they are more adaptable than single species.
- 2. The proper **time to seed** is dependent upon the climate of the area. In Michigan, there are three different climatic areas which determine when seeding should occur. These are included in Exhibits 1 and 2.

Seeding dates <u>for permanent cover</u> and dormant seeding are given in Exhibit 1. Dormant seeding is done after the normal growing season, using seed which will lay dormant in the winter but start growing as soon as soil conditions are favorable. Note that perennial grasses should be used for all permanent cover.

To determine seeding dates <u>for temporary cover</u> use Exhibit 2. Note that the seeds listed here are annual grasses. Be sure to use annual grasses for all temporary cover. Seed mixtures for temporary seeding usually consist of rye or wheat. These species grow better after over-wintering (via a process called vernalization).

3. **Seeding mixture** for permanent cover. For permanent cover, the appropriate seeding mixture is determined in a two-step process. First, consult Exhibit 3, which lists various land uses and site conditions. Determine conditions at your site and use the table to come up with an appropriate seeding mixture number. Exhibits 4 and 5 indicate the various species and seeding rates associated with the selected seeding mixture number on a pound per acre and 1,000 square foot basis, respectively.

Seeding mixtures <u>for dormant seedings</u>. Use Exhibits 3, 4, and 5 to determine proper seeding mixtures. Dormant seedings are completed in the late fall after the soil temperature remains consistently below 50° F. Perennial grasses are to be used with all dormant seedings.

Seeding mixtures <u>for temporary cover</u>. Temporary vegetative cover is provided to protect <u>Spoil Piles</u> and larger areas which are staged. Seeding mixtures for temporary vegetative cover are given in Exhibit 2.

- 4. <u>Subsurface Drains</u> may be needed where water movement may cause seeps or soil slippage. Wet waterways should be tiled to ensure the vegetation is established.
- 5. Note: Some wildflower seed packages contain seeds of plant species which will compete with native plants. For example, some packages contain purple loosestrife, which is detrimental to cattail populations. The Department therefore does not recommend wildflower plantings unless the seed can be certified as being native to Michigan and is appropriate to the soil and other site conditions.

Site Preparation:

- 1. Consider protecting seeded areas from pedestrian access using the <u>Construction Barriers</u> BMP.
- 2. Where possible, divert concentrated flows away from the seeded area at least until the vegetation is established. Follow specifications in the <u>Diversions</u> BMP.
- 3. Soil tests should be done to determine the nutrient and pH content of the soil. Depending on the results of soil tests, <u>Soil Management</u> may be necessary to adjust the pH to between 6.5 and 7.0 (for most conditions). All lime, fertilizer and other soil amendments should be addressed following the <u>Soil Management</u> specifications. Note that sandy loam, loam, and silt loam are the preferred soils for seeding. Consideration should be given to incorporating these soils into the seedbed.
- 4. Prepare a 3-5-inch deep seedbed, with the top 3-4 inches consisting of topsoil. Note that the earth bed upon which the topsoil is to be placed should be at the required grade.
- 5. The seedbed should be firm but not compact. The top three inches of soil should be loose, moist and free of large clods and stones. For most applications, all stones larger than 2 inches in diameter, roots, litter and any foreign matter should be raked and removed. The topsoil surface should be in reasonably close conformity to the lines, grades and cross sections shown on the grading plans.
- 6. Slopes steeper than 3:1 should be roughened.

Planting:

- 1. Seed should be applied as soon after seedbed preparation as possible, when the soil is loose and moist. If the seedbed has been idle long enough for the soil to become compact, the topsoil should be harrowed with a disk, a spring tooth drag, a spike tooth drag, or other equipment designed to condition the soil for seeding. Harrowing should be done horizontally across the face of the slope.
- 2. Always apply seed before mulch.
- 3. Apply seed at the rates specified in the attached Exhibits using calibrated spreaders, cyclone seeders, mechanical drills, or hydroseeders.
- 4. Ideally, broadcast seed should be incorporated into the soil by raking or chain dragging, or otherwise floated, then lightly compacted to provide good seed-soil contact.
- 5. For hydroseeding operations:
 - Seed should be applied at recommended rates. If no rates are given, use 150-200 lbs/acre.
 - Use 2 tons/acre straw mulch, unless otherwise recommended. Use 3 tons/acre when dormant.

- If recycled newsprint is used, follow specifications in the <u>Mulching</u> BMP.
- 6. All newly seeded areas should be protected from erosive forces by mulch. See the <u>Mulching</u> BMP.
- 7. Species of grasses which cannot be planted with seed should be planted by sprigging or sodding. See the <u>Trees, Shrubs and Ground Covers</u> BMP for information on sprigging, and the <u>Sodding BMP</u> for information on sodding.
- 8. Excess topsoil should be disposed of following specifications in the <u>Spoil Piles</u> BMP.

Maintenance

Newly seeded areas need to be inspected frequently for the first few months to ensure the grass is growing. If the seeded area is damaged due to runoff, additional stormwater measures may be needed. Spot <u>Seeding</u> can be done on small areas to fill in bare spots where grass didn't grow properly.

Once the vegetation is well established:

- 1. <u>Construction Barriers</u> may be removed.
- 2. Water the grass following specifications in the <u>Lawn Maintenance</u> BMP.
- 3. If the grass is to be mowed, keep it to a height appropriate for the species selected and the intended use. Follow mowing specifications in the <u>Lawn Maintenance</u> BMP.
- 4. Occasional soil tests should be collected and analyzed to determine if the soil is appropriately fertilized. Follow the procedures in the <u>Soil Management</u> BMP.
- 5. Control pests following specifications in the <u>Pesticide Management</u> BMP.
- 6. Refer to the <u>Lawn Maintenance</u> BMP for determining the steps which can be taken to improve unhealthy turf.

<u>Exhibits</u>

- Exhibit 1: Seeding Dates for Permanent Cover. Modified from the Soil Conservation Service Technical Guide, #342.
- Exhibit 2: Seeding Dates for Temporary Vegetation. USDA Soil Conservation Service Technical Guide, #342.
- Exhibit 3: Determining the Appropriate Seed Mixture. Extracted from USDA Soil Conservation Service Technical Guide, #342.

- Exhibit 4: Seeding Mixture (in pounds/acre). Extracted from USDA Soil Conservation Service Technical Guide, #342.
- Exhibit 5: Seeding Mixture (in pounds/1,000 ft²). Extracted from USDA Soil Conservation Service Technical Guide, #342.

Seeding Dates for Permanent Cover

Zones	Normal Seeding Dates	Dormant* Seeding Dates
Lower Peninsula, South of U.S. 10	May 1 to October 10	Nov. 1 to freeze up
Lower Peninsula, North of U.S. 10	May 1 to October 1	Oct. 25 to freeze up
Upper Peninsula, entire area	May 1 to Sept. 20	Oct. 20 to freeze up

* <u>Dormant seeding</u> may be done in the late fall after the soil temperature remains consistently below 50°F. This is appropriate if construction on a site is completed in the fall but seed was not planted prior to Normal Seeding Dates. Since the initial temperature for seed germination is approximately 50 degrees F (soil temperature), this practice intends germination will not occur until spring. Extra cereal rye, a cool season annual grass, may be added to attempt to get some fall growth.

- <u>Mulching</u> must be used on any dormant seed. This is particularly important on erosive sites.
- Do not seed when the ground is frozen or snow covered.
- Do not use a dormant seeding on Grassed Waterways.

Source: Modified from USDA Soil Conservation Service Technical Guide.

Seeding Dates for Temporary Vegetation Cover

Planting Zones:

- 1. Lower Peninsula, South of US 10.
- 2. Lower Peninsula, North of US 10.
- 3. Upper Peninsula.

	Zone			Amount				
			Kind of Seed	Per 1,000 Sq.	Per Acre			
1	2	3		Feet				
Apr. 1 to	Apr. 15	May 1	Oats*, barley*	2 lbs.	3 bu.			
Sept. 15	to Aug. 1	to Aug. 1						
June-July	June-July	Not. rec.	Sudangrass	1 lb.	30-40 lbs.			
Aug. 1	Aug. 1	Aug. 1						
to Oct. 15	to Oct. 10	to Oct. 1	Rye*	3 lbs.	2-3 bu.			
Sept. 20	Sept. 10	Sept. 1						
to Oct. 15	to Oct. 10	to Oct. 1	Wheat	3 lbs.	2-3 bu.			

* Indicates species best suited for wildlife food.

Immediately after seeding, mulch:

-all slopes -unstable soils, and -heavy clay soils

with unweathered small grain straw or hay spread uniformly at a rate of 1.5 to 2 tons per acre, or 100 pounds (2-3 bales) per 1,000 square feet. Other suitable materials may be used, according to specifications in the <u>Mulching BMP</u>.

Site	Rough Areas	Steep Areas Ditch Banks Cuts Fills	Utility Rights- of way	Pond Edges ^b	Grassed Waterways Diversions ^b
Well and moderately well drained sand and loamy sand (coarse textured soils)	sunny-1, shady-2 or 4	4 or 6	15	4	4
Well and moderately well drained, moder- ately coarse to moderately fine textured soils (sand loam, loam, silt loam, and clay loam)	sunny-1, shady-2 or 5	4, 7, 8, 9, or 19	15	11 or 14	11, 13 17, 20
Well and moder- ately well drained clay and or 5 silty clay (fine texture soils)	sunny-1 shady-2	7, 8, 9, 13 or 19	15	11, 12 or 14	11, 13, 17, 20
Somewhat poorly drained or poorly drained soils without artificial drainage ^a	3 or 5	8, 10, 13 or 16	15	12 or 13	17, 18
Organic soils"	3	10, 16 or 18	16	11 or 12	

Determining Appropriate Seeding Mixture Numbers Based on Site Conditions.

^a With artificial drainage, use the appropriate site condition in the well-drained groups above.

^b Mixtures one and two can be used on grassed waterways that are to be given care and management as lawn.

Seeding Mixtures (in pounds per acre) Corresponding with Seeding Mixture Number

Under the seed mixture number selected in Exhibit 3, use all species shown in that column. For example: for Exhibit 3, seeding no. 6, the correct seeding mixture is 25 lbs. of creeping red fescue plus 5 lbs. of perennial ryegrass and 20 lbs. of tall fescue. These are minimum rates for ideal conditions. Use judgement to increase rates for less than ideal conditions.

Saada	Section		Seed Mixtures From Exhibit 3*																		
Per Pound	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
615000	Creeping red fescue**	20	30	10	40		25		20						20	20					
227000	Perennial ryegrass	(a)	(a)		(a)		5					5	5			5		5	5		
2177000	Kentucky bluegrass	20	10	25					5						15						
4990000	Redtop**								1							1	1	2	2		
533000	Reed canarygrass**										10						10				
8700000	Seaside bentgrass											1	1	1	1						
136000	Smooth bromegrass**											30		15		10		25			20
227000	Tall fescue					50	20		20	10			40	15		15			30	15	20
1230000	Timothy**							3	2								4				
375000	Birdsroot trefoil (b)**							10	10											10	
110000	Crownvetch (b)**									15											
TOTAL PO	DUNDS	40	40	35	40	50	50	13	58	25	10	36	46	31	36	51	15	32	37	25	40

Seed per square foot at the

- (a) Five pounds of ryegrass may be added to this mixture on erodible sites or other areas where quick cover is essential
- (b) Inoculate all legume seeds with correct inoculant.
- * Seeding rates have been rounded off.
- ** Indicates species best suited for wildlife cover.

recommended seeding rate

Appropriate Seeding Mixtures (in pounds/sq. ft.) Corresponding with Seeding Mixture Number

Under the seed mixture number selected in Exhibit 3, use all species shown in that column. For example, for Exhibit 3, seeding no. 6, the correct seeding mixture is .6 lbs. of creeping red fescue plus .2 lbs. of perennial ryegrass and .5 lbs. of tall fescue. These are minimum rates for ideal conditions. Use judgement to increase rates for less than ideal conditions.

Seeds																					
Per	Species								S	Seed M	ixture F	From Ex	hibit 3	*							
Pound		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
515000	Creeping red	.5	.7	.3	1.0		.6		.5						.75	.75					
	fescue**																				
227000	Perennial ryegrass	(a)			(a)		.2					.2	.2			.2		.2	.2		
2177000	Kentucky bluegrass	.5	.3	.6					.2						.4						
4990000	Redtop**								.03						.03	.03	.05	.05			
533000	Reed canarygrass**										.3						.3				
8700000	Seaside bentgrass											.03	.03	.03	.03						
136000	Smooth											.7		.4		.3		.6			.5
	bromegrass**																				
227000	Tall fescue					1.2	.5		.5	.3			1	.4		.4			.7	.4	.5
1230000	Timothy**							.1	.05								.1				
375000	Birdsroot trefoil ^b **							.3	.3											.3	
110000	Crownvetch ^b **									.4											

 a 0.15 pounds of cereal ryegrass may be added to this mixture on erodible sites or other areas where quick cover is essential.

^b Inoculate all legume seeds with correct inoculant.

*Seeding rates have been rounded off.

**Indicates species best suited for wildlife cover.

Hydroseeding Definition

Hydroseeding is a mechanical method of applying seed, fertilizer, and mulch to land in one step.

Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects exposed soils from erosion by water and wind.

The practice may also be called hydro mulching, hydraulic planting, hydraulic mulch seeding, hydraseeding

Pollutant(s) controlled:

• Suspended Sediments

Pollution Removal Efficiencies:

• Hydroseeding initially reduces sediment generation by 70 to 80% as compared to sediment production off bare slopes.

Companion and Alternative BMPs

- Mulching
- Seeding/Vegetation
- Rolled Erosion Control Products

Advantages and Disadvantages

Advantages:

- Tackifiers can be used with the application to help keep the seed in place
- Provides mulching medium around the seed to hold moisture

Disadvantages:

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control. Otherwise, hydroseeding must be used in conjunction with a soil binder or mulching
- Hydroseeding may be inappropriate in dry periods without supplemental irrigation
- Wood fiber hydraulic mulches are generally short-lived (only last a part of a growing season) and need 24 hours to dry before rainfall occurs to be effective.
- May not be able to access remote areas with hydroseeder

Location

Hydroseeding is applied on disturbed soil areas requiring temporary protection until permanent vegetation is established or disturbed soil areas that must be redisturbed following an extended period of inactivity

General Characteristics

- Hydraulic planting mulch is the ingredient that makes the technique possible. Water-laden mulch shot from high-pressure hose or spray gun travels farther than seed and water alone. Once the mulch is on the soil surface, it creates a "mat" or blanket that holds the seed in place, retains soil moisture, resists wind and water erosion, and creates a favorable environment for seed germination.
- Mulch materials may be made from wood chips, newsprint, or corrugated cardboard. Some products may include synthetic poly-based fibers or natural agricultural fibers, paper mill sludge, sawdust, slick papers, or some combination of these.
- Each mulch product group has unique performance characteristics and associated costs. Some materials simply perform the mulch function better than others
- Mulch Fiber length is the key to holding power, while germination is most influenced by moisture holding ability and application rates.
- Virtually any fertilizer formulation can be incorporated into the hydroseeding slurry. It is important to use soil testing to determine the appropriate fertilizer for the site.
- A difficult to access site is best fertilized with a long acting or time-release product at the same time it is seeded. An easily accessible site can be fertilized (again) after germination.
- Tackifier is powdered or granular glue, which when added to the slurry, serves to glue the mulch blanket in place, helping it to withstand wind and rain erosion. Steep slopes are best protected with a tackifier, though any site susceptible to erosion (including that caused by the project's own irrigation) should be a candidate.
- A wide variety of special use products can be incorporated into the hydroseed slurry when conditions dictate. Soil amendments, such as lime and gypsum, or organics such as sludge and humus can be applied right along with the seed and other ingredients. Dyes, surfactants, growth stimulators, fungicides, inoculants, and a host of other liquid, powdered and granular products are also widely available.

Materials

- Cellulose Fiber Mulch
- Fertilizer
- Tackifier
- Hydro seed mix.

Design Specifications

- To select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:
 - soil conditions
 - site topography
 - season and climate
 - vegetation types
 - maintenance requirements
 - sensitive adjacent areas
 - water availability
 - plans for permanent vegetation.
- <u>Paper Mulch</u> is frequently applied at 1,200-1,500 pounds per acre (approximately 25lbs.-35 lbs. per 1,000 square feet). With a polyacrylamide additive, such rates can be effective. Many contractors avoid using more than 2,000-2,500 lbs per acre of paper mulch, because too much paper mulch tends to crust, and can inhibit germination.
- <u>Wood Mulch</u> is most effective at rates beginning at 2,000 lbs per acre (about 45 lbs. per 1,000 square feet). In very hot conditions, 3,000 lbs (about 70 lbs. per 1,000 square feet) per acre will provide more moisture retention, and will therefore improve the probability of success significantly. A guar based tackifier is also highly recommended to improve the probability of yielding an excellent grass stand.
- <u>Bonded Fiber Matrix</u> rates start at about 3,000 lbs per acre. At 4,000 lbs. per acre (about 90 lbs. per 1,000 square feet), most wood based Bonded Fiber Matrix products provide an excellent probability of achieving total coverage of grass, even when pounded with destructive rains or in very hot conditions.
- Regardless of the quality of the mulch protection, rainfall or irrigation is always necessary to produce a stand of grass.
- <u>Guar tackifier</u> can be used at 25-150 lbs per acre. The standard recommend application rate is 1½ lbs per 1,000 Sq. ft. or about 60 lbs per acre. This product has been the mainstay as a glue additive for hydro-mulching for many years.
- Seed and fertilizer recommendations are dependent upon the location of the area to be treated. See the Seeding/Vegetation BMP on Page # BMP Guidebook for specific seed recommendations
- Hydroseeding can be accomplished using a multiple-step or one-step process.
 - The multiple-step process ensures maximum direct contact of the seeds to soil.
 - When the one-step process is used to apply the mixture of seed, fiber, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Follow-up applications shall be made as needed to cover weak spots.
- The time allowed between placement of seed in the hydraulic mulcher and the emptying of the hydraulic mulcher tank should not exceed 30 minutes.
- Application of the slurry should proceed until a uniform cover is achieved. The applicator should not be directed at one location for too long a period of time or the applied water will cause erosion.

Construction Guidelines

- 1. Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- 2. Hydraulic matrices require 24 hours to dry before rainfall occurs to be effective

Monitoring

• Hydromulched slopes should be inspected periodically for damage due to wind, water, or human disturbance.

Maintenance

- Repair all damaged areas immediately using hydromulching at the original specifications or straw mulch.
- Supplemental watering may be required

References

IDEQ Storm Water Best Management Practices Catalog, September 2005. Hydromulching.

Mellon, Michael. Hydroseeding: Getting All You Paid For.
Rolled Erosion Control Products Definition

Rolled erosion control products (RECPs) consist of prefabricated blankets or netting which are formed from both natural and synthetic materials.

Description and Purpose

The predominantly used RECPs generally fall into the following two categories, each having unique characteristics:

- <u>Erosion control blanket (ECB)</u>: A temporary degradable rolled erosion control product composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.
- <u>Turf reinforcement mat (TRM):</u> A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh and/or other elements, processed into a permanent, three-dimensional matrix. TRM's, which may be supplemented with degradable components, are designed to provide immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after maturation. TRM's are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated.

The practice may also be called Erosion Control Blanket, Mulch Blanket, or Erosion Control Matting

Pollutant controlled

• Suspended Sediment

Companion and Alternative BMPs

- Seeding/Vegetation
- Mulching

Advantages and Disadvantages

<u>Advantages</u>

- Can provide for some degree of immediate stabilization
- Numerous manufacturers, each with a number of different products, allow for the selection of a product which meets the individual characteristics of each site.

- Stabilizes disturbed slope and protects surface from erosive forces of raindrop impact.
- Promotes growth of vegetation.
- Most products degrade over time, eliminating potential maintenance issue.

<u>Disadvantages</u>

- Various products and manufacturers have different design and construction standards. Designer must rely on manufacturer's data.
- Permanent stabilization and protection is dependent on the establishment of vegetation unless TRMs are used.

Location

Rolled erosion control products should be used on bare ground that is highly susceptible to erosion, such as steep slopes and channels, and in locations where establishing vegetation may otherwise be difficult.

General Characteristics

- Several factors, such as soil conditions, steepness and length of slope, depth of flow, runoff velocities, and time required to establish desired vegetation, influence the choice of product.
- RECPs and TRMs are manufactured from a wide variety of different materials including coconut fiber (coir), jute, nylon, polypropylene, PVC, straw, hay, or wood fibers. These materials may be used individually, or in combination to form nets or blankets.
- The products function by protecting the ground surface from the impact of raindrops and stabilize the surface until vegetation can be established. RECPs and TRMs also promote the growth of vegetation by helping to keep seed in place, and by maintaining a consistent temperature and moisture content in the soil.
- Most RECPs are either biodegradable or photodegradable and will decompose over a period of time.
- RECPs should generally be installed parallel to the direction of water flow.

Materials

- Seed
- Fertilizer
- RECP
- Degradable Stakes/Pegs/Pins

Design Specifications

• RECPs are produced by a number of manufacturers, and are available in a wide variety of different configurations. Competing products from different manufacturers can have completely different material compositions and construction, but be intended to serve the same purpose. Given the wide variety of RECPs available, product selection and specification can be difficult.

- Table 1 is modified from the product selection guide produced by the ECTC and classifies products based upon longevity and product description.
- Factors such as the slope on which the RECP is to be placed and the sheer stress that the RECP will experience shall be used to determine which RECP product is adequate for the application it is intended for.
- Stake placement and installation should follow manufacturer recommendations

Construction Guidelines

- Prior to placing a RECP, a topsoil seedbed should be prepared, <u>smooth graded</u>, and seeded and fertilized. It is imperative that seeding occur prior to placement of the RECP to ensure proper contact between seed and soil. Some manufacturers can embed the specified seed mixture into the product during the manufacturing process (if this process is used, follow the manufacturer's recommended installation specifications).
- After seeding, the appropriate RECP may be placed and anchored with stakes or staples. The manufacturer will provide specifications for the pattern and spacing of anchor stakes or staples, overlap between rolls (typically 6 inches), and any additional product requirements.
- It is important that the stakes or staples be properly installed to prevent "tenting" of the product as the vegetation begins to grow and push up on the matting. This can impact vegetative establishment and the product can become entangled in mowing equipment.
- 4. At the tops of slopes and at the entrance to a channel, the leading edge of the RECP should be trenched into the ground, approximately 6 inches, anchored in place with stakes or staples, and backfilled. This prevents runoff from lifting the leading edge, and flowing between the ground and the RECP.
- 5. Subsequent segments of RECPs should have their upstream edges trenched in, and the downstream edge should slightly overlap the next section to prevent water from flowing under the product.

Monitoring

Inspect weekly and after every storm event that results in a discharge from the site until adequate vegetation is established.

Maintenance

- Repair erosion and/or undermining at the top of the slope.
- Repair undermining beneath RECP(s), pull back the RECP(s), fill and compact eroded area, reseed and then secure RECP(s) firmly.
- Reposition or replace RECPs that have moved along the slope or channel and secure firmly.
- Replace damaged RECPs.

References

Erosion Control Technology Council, 2006. Standard Specification for Rolled Erosion Control Products.
Ontario. Rolled Erosion Control Product (RECP) BMP 11.
Statewide Urban Design and Specifications, 2008. Design Manual 7E-7.

Table 1. Rolled Erosion Control Product Comparison

Desired Time Scale		Туре	Product	Material	Max Slope Gradient	Max Chai Shear Str	nnel ess ¹
Description	Length	Code	Category	ry Composition		(lb/sq ft)	(Pa)
Short- Term	3-12 months	1A s 1B	Single-Net Erosion Control Blanket	Processed degradable natural and/or polymer fibers mechanically bound together by a single rapidly-degrading synthetic or natural fiber netting	3:1	1.50	72
			Open-Weave Textile	Processed rapidly-degrading natural or polymer yarns or twines woven into a continuous matrix			
			Double-Net Erosion Control Blanket	Processed degradable natural and/or polymer fibers mechanically bound together between two rapidly-degrading synthetic or natural fiber nettings	2:1	1.75	84
Extended- Term	24 months	24 2A months	Erosion Control Blanket	Processed slow-degrading natural or polymer fibers mechanically bound together between two slow-degrading synthetic or natural fiber nettings to form a continuous matrix	3:2	2.00	96
			Open-Weave Textile	Processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix			

(continued)

¹ Shear stress unvegetated rolled erosion control product can sustain without physical damage or excessive erosion (>12.7 mm (0.5 in) soil loss) during a 30-minute flow event, based on historical experience and large-scale testing of products with Manning's roughness coeffecients of 0.01-0.05. Test methods include ASTM D6459, or others deemed acceptable by the engineer.

Desired Time Scale		Туре	Product Material		Max Slope Gradient	Max Channel Shear Stress ²	
Description	Length	Code	Category	Composition	(H:V)	(lb/sq ft)	(Pa)
Long-Term	36 months	ЗA	Erosion Control Blanket Open-Weave Textile	Processed slow-degrading natural or polymer fibers mechanically bound together between two slow-degrading synthetic or natural fiber nettings to form a continuous matrix Processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix	1:1	2.25	108
Permanent		4A	Turf Reinforcement Mat	Non- or partially degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness	1:2	6.00	288
		4B				8.00	384
		4C				10.0	480

Table 1. Rolled Erosion Control Product Comparison (continued)

Source: Adapted from Erosion Control Technology Council, 2006. Standard Specification for Rolled Erosion Control Products.

² Shear stress fully vegetated turf reinforcement mat can sustain without physical damage or excessive erosion (> 12.7 mm (0.5 in.) soil loss) during a 30-minute flow event, based on large-scale testing. Test methods include ASTM D6460, or others deemed acceptable by the engineer.



Exhibit 1. Rolled Erosion Control Product Channel Installation

Source: Ontario. Rolled Erosion Control Product (RECP) BMP 11.





Source: Ontario. Rolled Erosion Control Product (RECP) BMP 11.

Silt Fence

Definition

Silt fence is a perimeter sediment control device. Generally, silt fence is constructed of porous woven geotextile fabric attached to wooden posts.

Description and Purpose

Silt fence is a linear fence installed at the edge of earth disturbances. The purpose of silt fence is to protect downslope surface waters and properties by removing suspended solids from runoff prior to leaving the site.

The practice may also be called filter fence.

Pollutant(s) controlled:

• Suspended solids

Treatment Mechanisms:

- Slowing and ponding of runoff water to promote settlement of suspended solids
- Fabric provides some filtration of larger soil particles

Pollution Removal Efficiencies:

- Moderate to good removal of silt and sand particles if properly placed, installed, and maintained
- Poor removal of clay particles

Companion and Alternative BMPs

- Perimeter Sedimentation Controls
- Storm Sewer Inlet Protection

Advantages and Disadvantages

Advantages:

- Relatively inexpensive
- Easy to install
- Readily available

Disadvantages:

- Poor effectiveness on fine sized soil particles such as clay
- May require frequent maintenance
- Effective only for sheet runoff flow, fails in concentrated flow areas due to low permeability
- Limited effectiveness at large, sloping sites

Location

Silt fence should be installed at the downslope edge of disturbed areas, along a line of equal elevation (parallel to contour lines). Place beyond the toe of steeper slopes if possible to increase the "ponding" or settling effect.

Materials

Table 1: Materials and properties for silt fence construction

	Min.		Min.		
Woven	Hardwood	Min. Grab	Trapezoidal	Min.	Max. Apparent
Geotextile	Post	Tensile (lbs)	Tear Strength	Permittivity	Opening Size
Fabric	Length	(ASTM D	((lbs) (ASTM D	(sec ⁻¹) (ASTM	(mm) (ASTM
Width (in)	(in)*	4632)	4533)	D 4491)	D 4751)
24	36	100	45	0.1	0.6
36	48	100	45	0.1	0.6
411			6 4 4 / 0 1 1	4 4 /0 1 4 1	

*Hardwood posts shall be a minimum of 1 1/8 inches x 1 1/8 inches thickness

Source: Adapted from Michigan Department of Transportation 2003 Standard Specifications for Construction

Additional materials:

- Metal Staples or nails for attaching lath and fabric to posts
- Hardwood Lath six to eight inches shorter than fabric width

Design Specifications

- Fabric attached to post by stapling or nailing through lath and into hardwood posts, at a minimum of four locations, evenly spaced along lath to prevent fabric tear out.
- six-inch loose bury flap unattached to post at bottom of lath
- Maximum post spacing: ten feet
- Whenever possible, place silt fence in flat areas at least ten feet from the toe of slopes (silt fence is not an appropriate measure for placement on steep slopes)
- Maximum contributing drainage area is 1/2 acre per 100 linear feet of fence

Performance Enhancers

- Wider Fabric and longer posts (i.e. 36-inch fabric and 48-inch posts)
- Heavier posts (i.e. two inches by two inches)
- More frequent post spacing (i.e. 6.5 feet)
- Reinforcing mesh on fabric
- Placing multiple parallel rows may provide a factor of safety

Construction Guidelines

Construction guidelines in consecutive order are:

- 1. Dig a six-inch trench at equal elevation (parallel to contour lines) at the downslope edge of earth disturbance (avoid placement on steep slopes);
- 2. Unroll and extend silt fence along trench line. Orient fence such that the posts are down slope of the fabric and lath (i.e. storm water will push the lath and fabric against the post);
- 3. Turn end post 360 degrees so that fabric surrounds the post;
- 4. Pound end post into the ground at the downslope edge of the trench until the top of the six-inch bury flap is at ground elevation;
- 5. Continue to pound in posts consecutively starting with post adjacent to the end already installed. Assure fabric is as taught as possible;
- 6. Join consecutive rolls by rolling end posts similar to item 3 above. Cross over the end posts or place them side by side and roll them (180 or 360 degrees). Drive the end posts together;
- 7. Backfill the trench and compact. If possible, leave a compacted ridge of soil along the upslope edge of the fabric.

Acceptable alternate construction methods include:

- 1. In situations where the bury flap cannot be trenched in, backfill and compact over the bury flap. Note that this method is less effective and more prone to failure;
- 2. In some cases, it may be advantageous to construct silt fence in the field; i.e. fabric, posts, and lath come separate and must be put together. The same construction guidelines apply;
- 3. Silt fence installation machines may make the process of installing silt fence easier. The machines "slice" the fabric into the ground, then posts and lath are manually installed.

Monitoring

Silt Fence should be inspected at least weekly, immediately before a forecasted runoff event, and after each runoff event from rain or snowmelt. Look for fabric tears, post failure, undermining, sediment build up, overtopping, side cutting around the silt fence, and areas damaged by construction activities.

Maintenance

- Fabric tears, post failures, vehicle damage, and/or undermining should be repaired immediately;
- Sediment build up should be removed when it reaches 1/3 to 1/2 the height of the silt fence above ground elevation;
- Overtopping and side cutting are signs that the silt fence is either not appropriately placed or that additional measures are necessary due to site runoff conditions;

• <u>Remove the silt fence after the site has been stabilized with permanent</u> <u>soil erosion/sedimentation control (SESC) measures.</u>

References

Michigan Department of Transportation. 2003. Standard Specifications for Construction.

Oakland County, Michigan Water Resources Commissioner. Individual Soil Erosion and Sedimentation Details, SP-2-Silt Fence.



Exhibit 1: Silt fence construction and installation diagram

Source: Adapted from Oakland County (Michigan) Erosion Control Manual

Storm Sewer Inlet Protection Definition

Storm sewer inlet protection consists of a sediment filter or an impounding area around or upstream of a storm sewer, drop inlet, or curb inlet.

Description and Purpose

Storm sewer inlet protection measures temporarily pond runoff before it enters the storm sewer, allowing sediment to settle, or remove sediment by filtering.

The practice may also be called Storm Sewer Inlet Protection or Inlet Protection

Pollutant(s) controlled:

Suspended Solids

Treatment Mechanisms:

- Settling of sediment through detention
- Filtration of sediment

Pollution Removal Efficiencies:

• Varies with soil type on site and type of inlet protection selected

Companion and Alternative BMPs

- Silt fence
- Sediment basins

Advantages and Disadvantages

Advantages:

- Will reduce the amount of sediment entering the storm sewer system, potentially extending the time until maintenance is needed
- In many cases, provides a last chance to remove suspended particles from runoff
- Areas requiring protection are easy to indentify during both planning and construction

Disadvantages:

- Requires an adequate area for water to pond without encroaching into portions of the site where active construction is occurring or onto roadways subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm sewer system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden.

- Frequent maintenance is required.
- May be improperly used as the sole method of erosion and sedimentation control

Location

Every storm sewer inlet receiving sediment-laden runoff should be protected.

General Characteristics

- Three types of inlet protection are detailed in this specification:
 - 1. <u>Silt Fence Barrier</u>: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
 - 2. <u>Block and Gravel Filter</u>: Appropriate for flows greater than 0.5 cfs.
 - 3. <u>Premanufactured devices</u>: A variety of manufactured products are available including: storm inlet filter socks, synthetic filter tubes for open throat curb inlets, inlet inserts, pop-up filters for area inlets, and many others. These products should be used and installed according to the manufacturer's recommendations.
- DEQ does not recommend the use of filter fabric under the grate as an inlet protection measure. Fabric blinds off quickly when the pores space in the fabric close with sediment causing flooding to occur. When flooding occurs the fabric is often tampered with (slits cut in) rendering it ineffective at reducing or preventing sediment discharge into the stormwater system. In addition fabric is often unable to be effectively removed without causing the sediment on top of the fabric to drop into the catch basin.

Materials

1. <u>Silt Fence Barrier:</u>

Table 1: Materials and properties for silt fence construction

			Min.		
			Trapezoidal		Max.
Woven	Min.	Min. Grab	Tear	Min.	Apparent
Geotextile	Hardwood	Tensile	Strength	Permittivity	Opening
Fabric	Post	(ASTM D	(ASTM D	(ASTM D	Size (ASTM
Width	Length*	4632)	4533)	4491)	D 4751)
24"	36"	100 lbs	45 lbs	0.1 sec ⁻¹	0.6 mm
36"	42"	100 lbs	45 lbs	0.1 sec ⁻¹	0.6 mm

*Hardwood posts shall be a minimum of 1 1/8" x 1 1/8" thickness

Source: Adapted from Michigan Department of Transportation 2003 Standard Specifications for Construction

Additional materials:

- Metal Staples or nails for attaching lath and fabric to posts
- Hardwood Lath 6 to 8 inches shorter than fabric width

2. Block and Gravel Filter:

- Hardware cloth or comparable wire mesh with 0.5 in. openings
- Concrete blocks
- Washed stone 0.75 to 3 in.

Design Specifications

- If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.
- Using any inlet protection device that restricts the flow into the inlet should be avoided for inlets that are on-grade. Because of the flow restriction, a majority of the flow to an on-grade inlet will be bypassed to the downstream inlet. This creates the potential for flooding problems downstream.
- To limit the potential for flooding, limit the upstream drainage area to 1 acre
- Runoff should be routed to a sediment-trapping device designed for larger flows (e.g. sediment basin) when the drainage area exceeds 1/2 acre.
- Silt Fence Barrier (see figure 1)
 - 1. Silt fence must be installed per <u>Silt Fence Specification</u>.
 - 2. Stakes must be a maximum of 3ft apart
 - 3. Fabric must be trenched in
 - 4. You may want to consider spill-over protection on the inlet side of the silt fence barrier such as mulch blanket, geotextile fabric, stone, etc. This prevents the dislodging of soil on the inside of the silt fence barrier by water passing through or over top of the silt fence.
- Block and Gravel Filter (see figure 2)
 - 1. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
 - 2. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
 - 3. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Performance Enhancers

• An excavated drop inlet sediment trap can be used in conjunction with other inlet protection to enhance the settling of large sediment particles prior to it entering the storm sewer system.

Construction Guidelines

- Identify existing and planned storm sewer inlets that have the potential to receive sediment laden surface runoff. Determine if storm sewer inlet protection is needed and which method to use.
- Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm sewer inlet protection device.
- Select the appropriate type of inlet protection and design
- Inlet protection should be placed immediately after storm sewer inlets are installed.
- Inlet protection should be left in place and maintained until the drainage area is stabilized with established vegetation and pavement.
- Remove storm sewer inlet protection once the drainage area is stabilized.

Monitoring

Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

Maintenance

- <u>Silt Fence Barriers</u>. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- <u>Block and Gravel Filters</u>. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 – 1/2 of the silt fence height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

References

California Stormwater BMP Handbook, Construction, 2003

Figure 1. Silt Fence Barrier



Source: California Stormwater BMP Handbook, Construction, 2003



Figure 2. Block and Gravel Filter

Source: California Stormwater BMP Handbook, Construction, 2003

Appendix D Soil Erosion and Sedimentation Control Inspection Form

SOIL EROSION & SEDIMENTATION CONTROL/CONSTRUCTION STORM WATER INSPECTION LOG						
Project Name or Description: NPDES Number (if applicable): Page o	f					
Date: Time: Reason for Inspection: 🗌 Weekly Inspection 🗌 Inspection within 24 hrs. of Storm Water Runoff						
SESC measures installed since the last inspection and their location:						
Are SESC measures installed according to the SESC Plan? \Box Y \Box N Are there other potential areas of concern? \Box Y \Box N If NO , identify measures, locations, and actions needed below.						
Are the SESC measures: Properly installed? Y N Maintained? Y N Appropriate for site conditions? Y N Failed? Y N If NO , identify measure locations and actions needed below.						
Are additional SESC measures recommended? Y N Are there other concerns or improvements noted for the site? Y N <i>I</i> YES , identify locations and recommendations below.						
Corrective Actions Taken/Needed to repair or improve the prescribed control measures:						
Certified Operator Signature: Operator Number:						
Print Name:						
The details included in this report were provided to: Date: By method of delivery:						

SECTION 01 72 00 DECONTAMINATION OF PERSONNEL AND EQUIPMENT

PART 1 GENERAL

1.01 GENERAL

- A. Onsite decontamination stations as shown on Drawings, large enough to accommodate the largest piece of construction equipment to be used at the site, shall be provided by the Subcontractor in conformance with this section and the Subcontractor's Site Health and Safety Plan. The Subcontractor will be responsible for providing the appropriate decontamination tools, equipment, solutions, liquids, containers, and supplies.
- B. All water generated during decontamination activities will be collected, and contained, and stored at a staging area in accordance with the approved Transportation and Disposal Plan. The Contractor will sample the water for disposal at an appropriate treatment facility with assistance from the Subcontractor. The treatment facility is subject to the approval of the USEPA.
- C. All personnel must be decontaminated before leaving the site, as specified in the Subcontractor's Site Health and Safety Plan. "Leaving the site" is defined as leaving the exclusion area and entering the contamination reduction area. Decontamination is required prior to breaks, when picking up tools, equipment, or materials in the support zone, or any other activities where the potential exists for contaminant transfer.
- D. Equipment must be cleaned and decontaminated prior to use onsite, and prior to leaving the site.
- E. All equipment will be washed and cleaned under Level D requirements or as specified by the Site Safety Officer prior to initiation of work at the Site.
- F. All decontamination operations will be conducted by Subcontractor personnel wearing Level D protective equipment and a face shield or additional protection as specified by the Site Safety Officer.

1.02 SUBMITTALS

A. Action Submittals: Subcontractor will prepare and submit a decontamination station design for approval. This will be included in the Ancillary Services Subcontractor's Transportation and Disposal Plan and the ISTT Subcontractor's Work Plan.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Subcontractor will furnish all equipment and supplies necessary for the decontamination process such as clean water supply tank, tri-sodium phosphate detergent, a mobile steam cleaner or hot water high pressure washer, buckets, brushes, etc., as required.
- B. The Subcontractor will furnish new sealable United States Department of Transportation (U.S. DOT)-approved containers (55-gallon drums) having watertight lids stored in a containment area as required, or new poly tank for the storage of decontamination water.
- C. Tanks or drums will be stored in a lined containment area or on a containment pad.
- D. The Subcontractor will also supply labeling materials and appropriately label all containers.

PART 3 EXECUTION

- 3.01 GENERAL
 - A. The Subcontractor will follow the general decontamination plans, as specified in the Subcontractor's Site Health and Safety Plan and Transportation and Disposal Plan. Prior to mobilization, the Subcontractor shall finalize all personnel decontamination needs, equipment, and procedures with the Contractor. A decontamination station, meeting specifications and equipped with a means of catching all water, will be constructed by the Subcontractor at the locations indicated in the Ancillary Services Subcontractor's Transportation and Disposal Plan and the ISTT Subcontractor's Work Plan.

3.02 EQUIPMENT DECONTAMINATION

- A. General Decontamination:
 - 1. The Subcontractor will decontaminate the equipment after use and trucks hauling sediment offsite for disposal in the following manner:
 - a. Scrape and remove all earthen materials from the equipment.
 - b. Hose down equipment with a portable high-pressure, hot-water washer (steam cleaner).
 - c. Collect rinsate and scrapings. Place rinsate in approved tanks or drums, if needed, and transport to the staging area for offsite disposal.

DECONTAMINATION OF PERSONNEL AND EQUIPMENT 01 72 00 - 2

- d. Scrapings shall be stored on-site and covered until it can be disposed of at an approved offsite disposal facility.
- e. Contractor is responsible for waste characterization sampling, shipment of samples to Laboratory Subcontractor, and analyzing results for offsite disposal.
- f. Subcontractor is responsible for management, assisting the Contractor with waste characterization sample collection, and disposal of all decontamination water.
- g. Subcontractor is responsible for management, assisting the Contractor with waste characterization sample collection, and disposal of all scrapings.
- B. On the completion of the Work the Subcontractor shall remove the decontamination pad.
- C. Contact Contractor for inspection and approval of intermediate and final clean-ups of equipment and transfer and disposal sites.

3.03 PERSONNEL DECONTAMINATION

A. Personnel decontamination procedures to be used must be performed prior to leaving the excavation location. The Subcontractor will provide all protective clothing and the equipment necessary for its own personnel to comply with the decontamination procedures as specified in the Subcontractor's Site Health and Safety Plan.

END OF SECTION

SECTION 01 77 00 CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Informational Submittals:
 - 1. Submit prior to application for final payment.
 - a. Record Documents: All remaining record documents not previously submitted.
 - b. Approved Shop Drawings and Samples: As required in the General Conditions.
 - c. Special bonds, Special Guarantees, and Service Agreements.
 - d. Consent of Surety to Final Payment: As required in General Conditions.
 - e. Releases or Waivers of Liens and Claims: As required in General Conditions.
 - f. Releases from Agreements.
 - g. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01 29 00, Payment Procedures.
 - h. Extra Materials: As required by individual Specification sections.
 - i. Summary of communications with OSHA.

1.02 RECORD DOCUMENTS

- A. Quality Assurance:
 - 1. Furnish qualified and experienced person, whose duty and responsibility is to maintain record documents.
 - 2. Accuracy of Records:
 - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
 - b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
 - 3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.

PW/DEN001/668402 MARCH 2018 ©COPYRIGHT 2018 CH2M HILL CLOSEOUT PROCEDURES 01 77 00 - 1 4. Prior to submitting each request for progress payment, request Contractor's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Contractor to recommend whole or any part of Subcontractor's Application for Payment, either partial or final.

1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Subcontractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event Subcontractor is unable to secure written releases:
 - 1. Inform Owner or Contractor of the reasons.
 - 2. Owner or its representatives will examine the Site, and Owner or Contractor will direct Subcontractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
 - 3. Should Subcontractor refuse to perform this Work, Contractor reserves right to have it done by separate subcontract and deduct cost of same from Subcontract Price, or require Subcontractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
 - 4. When Contractor is satisfied that the Work has been completed in agreement with Subcontract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Subcontractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Subcontractor has failed to fulfill terms of side agreement or special easement, or (ii) Subcontractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

- A. General:
 - 1. Promptly following commencement of Subcontract Times, secure from Contractor at no cost to Subcontractor, one complete set of Subcontract Documents. Drawings will be full size.

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- 2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
- 3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.
- B. Preservation:
 - 1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
 - 2. Make documents and Samples available at all times for observation by Contractor.
- C. Making Entries on Drawings:
 - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
 - a. Color Coding:
 - 1) Green when showing information deleted from Drawings.
 - 2) Red when showing information added to Drawings.
 - 3) Blue and circled in blue to show notes.
 - 2. Date entries.
 - 3. Call attention to entry by "cloud" drawn around area or areas affected.
 - 4. Legibly mark to record actual changes made during construction, including, but not limited to:
 - a. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Horizontal and vertical locations of new laydown areas, utilities, equipment pads, Pine River outfall, and new roads. Reference to at least two measurements to permanent surface improvements.
 - b. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - c. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
 - 5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
 - a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.

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- b. Show, by symbol or note, vertical location of item "existing", "abandoned."
- c. Make identification so descriptive that it may be related reliably to Specifications.

3.02 FINAL CLEANING

- A. At completion of the Work or of a part thereof and immediately prior to Subcontractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Subcontractor's notice of completion, clean entire Site or parts thereof, as applicable.
 - 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Contractor.
 - 1. Clean all heavy equipment with power washer before leaving the site.
 - 2. Remove all stockpiles of dirt and debris from the site, which may have been accumulated during construction activities.
 - 3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
 - 4. Broom clean exterior paved driveways, sidewalks, and parking areas.
 - 5. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
 - 6. Leave no traces of sediment on the tracks, haul roads and public access roads.
 - 7. Leave water courses, gutters, and ditches open and clean.

3.03 FINAL TOPOGRAPHICAL SURVEY

- A. The Contractor shall be responsible for providing all personnel and equipment necessary to complete the following:
 - 1. Research, recover, and confirm the existing horizontal and vertical control as found on the design drawings and provide a report that includes definition of the monumentation to be used as a basis of survey.
 - 2. A final topographical survey of the former plant site where Work has been completed as part of this effort.
 - 3. Provide additional deliverables as described in Exhibit 1 of Section 01 31 13, Project Coordination.

END OF SECTION

SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Detailed information for the preparation, submission, and Contractor's review of Operations and Maintenance (O&M) Data, as required by individual Specification sections.

1.02 DEFINITIONS

- A. Preliminary Data: Initial and subsequent submissions for Contractor's review.
- B. Final Data: Contractor-accepted data, submitted as specified herein.
- C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
 - 1. Preliminary Data:
 - a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by Contractor.
 - b. Submit prior to shipment date.
 - 2. Final Data: Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.
- B. Materials and Finishes Data:
 - 1. Preliminary Data: Submit at least 15 days prior to request for final inspection.
 - 2. Final Data: Submit within 10 days after final inspection.

1.04 DATA FORMAT

A. Prepare final data in data compilation format on electronic media.

- B. Instructional Manual Format:
 - 1. Electronic PDF format with bookmarks for each section.
 - 2. PDF Page Size: 8-1/2 inches by 11 inches, minimum.
 - 3. Cover: Identify manual as "OPERATION AND MAINTENANCE DATA" and list:
 - a. Project title.
 - b. Designate applicable system, equipment, material, or finish.
 - c. Identity of separate structure as applicable.
 - d. Identify volume number if more than one volume.
 - e. Identity of general subject matter covered in manual.
 - f. Identity of equipment number and Specification section.
 - 4. Title Page:
 - a. Subcontractor name, address, and telephone number.
 - b. Additional subcontractor's, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
 - 1) Identify area of responsibility of each.
 - 2) Provide name and telephone number of local source of supply for parts and replacement.
 - 5. Table of Contents:
 - a. Arranged in systematic order with consecutive page numbers.
 - b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
 - 6. Text: Manufacturer's printed data.
 - 7. Material will be suitable for printing.
- C. Data Compilation Format:
 - 1. Compile all Contractor-accepted preliminary O&M data into electronic PDF file(s) with bookmarks for each section.
 - 2. Each set will consist of the following:
 - a. Cover: Identify each volume as "OPERATION AND MAINTENANCE DATA, VOLUME NO. ____ OF ____", and list:
 - 1) Project title.
 - 2) Subcontractor's name, address, and telephone number.
 - 3) If entire volume covers equipment or system provided by one Supplier include the following:
 - a) Identity of general subject matter covered in manual.
 - b) Identity of equipment number and Specification section.
 - b. Provide each volume with title page and table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each PDF file.

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- c. Table of contents arranged in a systematic order:
 - 1) Include list of each product, indexed to content of each volume.
 - 2) Designate system or equipment for which it is intended.
 - 3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
- d. Section Dividers:
 - 1) Fly-Leaf:
 - a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
 - b) List with Each Product:
 - (1) Name, address, and telephone number of Subcontractor, Supplier, installer, and maintenance subcontractor, as appropriate.
 - (2) Identify area of responsibility of each.
 - (3) Provide local source of supply for parts and replacement.
 - c) Identity of separate structure as applicable.
- e. Assemble material, as much as possible, in same order as specified in the Contract Documents.
- D. Electronic Media Format:
 - 1. Portable Document Format (PDF):
 - a. After all preliminary data has been found to be acceptable to Contractor, submit Operation and Maintenance data in PDF format.
 - b. Files to be exact duplicates of Contractor-accepted preliminary data. Arrange by specification number and name.
 - c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.
 - 2. Manufacturers' standard electronic format.

1.05 SUBMITTALS

- A. Informational:
 - 1. Data Outline: Submit two copies of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
 - 2. Preliminary Data:
 - a. Submit two copies for Contractor's review.

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- b. If data meets conditions of the Contract:
 - 1) One copy will be returned to Subcontractor.
 - 2) One copy will be forwarded to Resident Project Representative.
- c. If data does not meet conditions of the Contract:
 - 1) All copies will be returned to Subcontractor with Contractor's comments (on separate document) for revision.
 - 2) Contractor's comments will be retained in Contractor's file.
 - 3) Resubmit two copies revised in accordance with Contractor's comments.
- 3. Final Data: Submit two copies in format specified herein.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

- A. Content For Each Unit (or Common Units) and System:
 - 1. Product Data:
 - a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:
 - 1) Identify specific product or part installed.
 - 2) Identify data applicable to installation.
 - 3) Delete references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.
 - d. Performance curves, engineering data, nameplate data, and tests.
 - e. Complete nomenclature and commercial number of replaceable parts.
 - f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
 - g. Spare parts ordering instructions.
 - h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).
 - 2. As-installed, color-coded piping diagrams.
 - 3. Charts of valve tag numbers, with the location and function of each valve.
 - 4. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
 - a. Format:
 - 1) Provide reinforced, punched, binder tab; bind in with text.
 - 2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.

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- 3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
- 4) Identify Specification section and product on Drawings and envelopes.
- b. Relations of component parts of equipment and systems.
- c. Control and flow diagrams.
- d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
- 5. Instructions and Procedures: Within text, as required to supplement product data.
 - a. Format:
 - 1) Organize in consistent format under separate heading for each different procedure.
 - 2) Provide logical sequence of instructions for each procedure.
 - 3) Provide information sheet for Owner's personnel, including:
 - a) Proper procedures in event of failure.
 - b) Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 - 1) Startup, break-in, routine, and normal operating instructions.
 - 2) Test procedures and results of factory tests where required.
 - 3) Regulation, control, stopping, and emergency instructions.
 - 4) Description of operation sequence by control manufacturer.
 - 5) Shutdown instructions for both short and extended duration.
 - 6) Summer and winter operating instructions, as applicable.
 - 7) Safety precautions.
 - 8) Special operating instructions.
 - d. Maintenance and Overhaul Procedures:
 - 1) Routine maintenance.
 - 2) Guide to troubleshooting.
 - 3) Disassembly, removal, repair, reinstallation, and reassembly.
- 6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00, Closeout Procedures.
- B. Content for Each Electric or Electronic Item or System:
 - 1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.

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- c. Complete nomenclature and commercial number of replaceable parts.
- d. Interconnection wiring diagrams, including control and lighting systems.
- 2. Circuit Directories of Panelboards:
- 3. Electrical service.
- 4. Control requirements and interfaces.
- 5. Communication requirements and interfaces.
- 6. List of electrical relay settings, and control and alarm contact settings.
- 7. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
- 8. As-installed control diagrams by control manufacturer.
- 9. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
- 10. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.
 - c. Adjustment and checking.
 - d. List of relay settings, control and alarm contact settings.
- 11. Manufacturer's printed operating and maintenance instructions.
- 12. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- C. Maintenance Summary:
 - 1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
 - 2. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
 - b. Each Maintenance Summary may take as many pages as required.
 - c. Use only 8-1/2-inch by 11-inch size paper.
 - d. Complete using typewriter or electronic printing.
 - 3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
 - 4. Recommended Spare Parts:
 - a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.

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- b. "Unit" is the unit of measure for ordering the part.
- c. "Quantity" is the number of units recommended.
- d. "Unit Cost" is the current purchase price.

1.07 DATA FOR MATERIALS AND FINISHES

- A. Content for Architectural Products, Applied Materials, and Finishes:
 - 1. Manufacturer's data, giving full information on products:
 - a. Catalog number, size, and composition.
 - b. Color and texture designations.
 - c. Information required for reordering special-manufactured products.
 - 2. Instructions for Care and Maintenance:
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods that are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- B. Content for Moisture Protection and Weather Exposed Products:
 - 1. Manufacturer's data, giving full information on products:
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 - 2. Instructions for inspection, maintenance, and repair.

1.08 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this Specification.
 - 1. Forms: Maintenance Summary Form.
- PART 2 PRODUCTS (NOT USED)
- PART 3 EXECUTION (NOT USED)

END OF SECTION
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MAINTENANCE SUMMARY FORM

PROJECT:	CONTRACT NO.:
1. EQUIPMENT ITEM	
2. MANUFACTURER	
3. EQUIPMENT/TAG NUMBER(S)	
4. WEIGHT OF INDIVIDUAL COMPONENTS (C	OVER 100 POUNDS)

5. NAMEPLATE DATA (hp, voltage, speed, etc.)

6. MANUFACTURER'S LOCAL REPRESENTATIVE _____

- a. Name_____ Telephone No. _____
- b. Address

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (If Applicable)
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

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