*Final Basis of Design Report*

# Velsicol Chemical Corporation Superfund Site Phase 2 Adjacent or Nearby Properties, Operable Unit 1 St. Louis, Michigan

## Remedial Design

WA No. 164-RDRD-0532/Contract No. EP-S5-06-01

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CH2MHILL®

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# Acronyms and Abbreviations

| | |
|---|---|
| ANP | adjacent or nearby properties |
| ARAR | applicable or relevant and appropriate requirement |
| BMP | best management practices |
| BODR | Basis of Design Report |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| COC | contaminant of concern |
| DBCP | 1,2-dibromo-3-chloropropane |
| DDT | dichlorodiphenyl trichloroethane |
| EPA | U.S. Environmental Protection Agency |
| FBA | former burn area |
| FIELDS | Field Environmental Decision Support |
| FS | feasibility study |
| FPS | former plant site |
| MDEQ | Michigan Department of Environmental Quality |
| NREPA | Natural Resources and Environmental Protection Act |
| OU1 | Operable Unit 1 |
| PBB | polybrominated biphenyl |
| ppm | parts per million |
| RA | remedial action |
| RAO | remedial action objective |
| RD | remedial design |
| RI | remedial investigation |
| RG | remediation goal |
| ROD | Record of Decision |
| SESC | soil erosion and sedimentation control |
| TRIS | tris (2,3-dibromopropyl) phosphate |

SECTION 1

# Introduction

The U.S. Environmental Protection Agency (EPA) contracted CH2M HILL to prepare the remedial design (RD) for Operable Unit 1 (OU1) of the Velsicol Chemical Corporation Superfund Site. This final basis of design report (BODR) was prepared as Phase 2 of the RD, which specifically addresses contaminated soil at 60 residential properties located in the adjacent or nearby properties (ANP) in OU1 in accordance with Work Assignment No. 164-RDRD-0532 under Contract No. EP-S5-06-01. The work will be completed in accordance with Work Plan Revision Request No. 2 dated September 10, 2013, and the *Remedial Design/Remedial Action Handbook* (EPA 1995).

## 1.1 Site Description

The Velsicol Chemical Corporation/Pine River Superfund Site (National Superfund Database ID No. MID00722439) is located in St. Louis, Michigan, and occupies a 52-acre land parcel commonly referred to as the former plant site (FPS) in addition to the ANP. The ANP is an approximately 11-block residential area with a few commercial properties located south of the FPS. A chemical plant once occupied the FPS, which is located in a predominantly residential area. The Pine River flows along the western and northern boundary of the FPS into Mill Pond, where a hydroelectric dam is located (about 0.25 mile east of the FPS). Three nearby properties are also part of the former Velsicol operations and are referred to as the former creamery warehouse, Velsicol property 1, and the former burn area (FBA). The FBA was proposed for the National Priorities List in the early 1980s, but was not placed on the list at that time. The FBA has recently been re-evaluated, and was placed on the National Priorities List in March 2010. Figure 1-1 shows the location of the FPS and the surrounding area. EPA is the lead agency for the site.

The Velsicol Site is composed of three OUs: OU1 includes the FPS and ANP, OU2 includes the sediments and fish in the Pine River adjacent to the FPS and immediately downstream of the FPS (above the hydroelectric dam), and OU3 includes the Pine River downstream of the hydroelectric dam.

The boundary of the 52-acre FPS is fenced, and access is controlled through a main gate that remains locked at all times. The City of St. Louis distributes drinking water to the community through the operation of six drinking water wells.

## 1.2 Site History

The FPS was used for modern industrial operations beginning in the mid-1930s until the plant was closed in 1977. Historical operations at the site included a lumber mill, oil refinery, salt processing plant, and chemical manufacturing plant. In 1935, Michigan Chemical Corporation purchased the property and operated a chemical manufacturing business. In 1965, Velsicol Chemical Corporation gained a controlling interest in Michigan Chemical Corporation.

Michigan Chemical Corporation manufactured a wide variety of products at the FPS from 1936 through 1977, including various salts, magnesium oxide, rare earth chemicals, fire retardants (hexabromobenzene, polybrominated biphenyl [PBB], and tris (2,3-dibromopropyl) phosphate [TRIS]), and pesticides (dichlorodiphenyl trichloroethane [DDT] and 1,2-dibromo-3-chloropropane [DBCP]).

The FPS included numerous buildings that housed manufacturing, maintenance operations, administrative functions, and laboratories for product research and development. Storage facilities for raw and finished products, including warehouses and storage tanks constructed above and below ground, were also integrated throughout the FPS. Historical documents identify several lagoons that are either known or presumed to be associated with waste disposal practices.

Demolition and decommissioning activities began in 1978. The aboveground site buildings were razed, and some structures were buried onsite, including storage tanks and process piping. Building and tank foundations were not removed, and a significant amount of debris remains buried at the site.

In November 2006, the Michigan Department of Environmental Quality (MDEQ)[1] completed the first three phases of the remedial investigation (RI) at the FPS and FBA, including a baseline risk assessment (WESTON 2006). A determination was made by MDEQ that additional site characterization was needed to fill key data gaps. From 2006 through 2008, MDEQ performed supplemental investigations at the FPS, FBA, and ANP. Supplemental findings were summarized in the January 2009 *Remedial Investigation Addendum Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan* (WESTON 2009).

The feasibility study (FS) was released in November 2011 (WESTON 2011). On February 7, 2012, EPA released the proposed plan for the Velsicol Site for public comment (EPA 2012a). On June 19, 2012, EPA issued the Record of Decision (ROD) for OU1 (EPA 2012b). The ROD stated that existing contamination in soils in the ANP presents unacceptable risk to both human and ecological receptors.

## 1.3 Selected Remedy and Remedial Action Objectives

Phase 1 of the ANP remedial action (RA) was completed in spring 2013 and included remediation of soil within 14 fenced areas on 11 properties in the ANP. Phase 2 of the ANP RA, described in this BODR, will include remediation of portions of 60 properties identified during predesign sampling. Additional properties are currently being identified for remediation, which will be performed in future phases.

Drawings for the 60 properties with areas to be remediated in Phase 2 are provided in Appendix A. The quantities presented in this design are based on depth of contamination, which is in turn based on sampling results and lateral extent of yard areas from surveys of the properties.

The major components of the selected remedy applicable to Phase 2 of the ANP RA, as presented in the ROD, include the following:

- Excavation and offsite disposal of soils exceeding remediation goals (RGs) in the ANP to address risk to human health and the environment
- Restoring and backfilling excavated properties with topsoil

Remedial action objectives (RAOs) are goals that are specific to media or operable units for protecting human health and the environment. The RI data indicate that soils at the ANP contain contaminants of concern (COCs). The RAOs developed during the FS for the ANP include the following:

- Prevent ingestion, inhalation, and direct contact of site-related COCs in soil to human and ecological receptors.
- Prevent mobilization of site-related COCs from unsaturated soils to groundwater or surface water.

The selected remedy in the June 22, 2012, ROD includes excavation of residential soils in ANP exceeding a concentration of 5 parts per million (ppm) for total DDT, 1.2 ppm for PBB, and 4.4 ppm for TRIS. The total DDT RG of 5 ppm is based on ecological risk to avian receptors, and the PBB and TRIS criteria of 1.2 and 4.4 ppm, respectively, are based on MDEQ Part 201 residential direct-contact cleanup standards. Additional details regarding the development of the RAOs and RGs are presented in the FS (WESTON 2011).

The Field Environmental Decision Support (FIELDS) Team within EPA Region 5 calculated a decision level for total DDT of 4.1 ppm. The decision level calculation was performed to provide a level of assurance that all

[1] Throughout the history of the site, the lead state agency or name of the agency has evolved and names variably have included the Michigan Department of Natural Resources, Michigan Department of Environmental Quality (MDEQ), and Michigan Department of Natural Resources and Environment. The most recent name is Michigan Department of Environmental Quality. For purposes of this document, the term "MDEQ" will be used to represent the appropriate state agency at the relevant time period being discussed.

properties exceeding the 5 ppm cleanup level for total DDT were included in the cleanup action. An explanation of the total DDT decision level calculation is included in Appendix B. A decision level was not calculated for PBB due, in part, to the large number of nondetects in the data set. DDT is the primary COC in the ANP. The PBB detections, when present, are collocated with DDT.

This design is based on cleanup of yard areas exceeding the 4.1-ppm decision level for total DDT or the PBB RG of 1.2 ppm. At all yard areas where an exceedance of the PBB RG is observed, there is also an exceedance of the total DDT decision level. TRIS was included in the ROD based on one small exceedance in the RI data. EPA has decided to not use TRIS as basis for cleanup in the ANP due primarily to the low frequency of exceedance of the cleanup value in the ANP. EPA believes that excavation of soils exceeding the total DDT and PBB RGs will achieve the RAOs for ANP residential soils as contained in the ROD.

## 1.4 Remedial Design Activities

RD activities to support implementation of the selected remedy have been outlined in the Statement of Work Revision No. 3, dated March 27, 2013. The activities included in the Phase 2 design include the following:

- Project management
- Community involvement
- Field investigation
- Sample analysis
- Analytical support
- Data evaluation
- Preliminary design
- Final design
- Post-RD support

Project management, community involvement, and post-RD support are efforts that are required to manage the work and support EPA in related activities.

A field investigation has been performed as part of Phase 2 to characterize the yards at residential properties in the ANP, which may require remediation during future RA phases. The details of the field investigation are presented in the *Final Quality Assurance Project Plan Velsicol Chemical Superfund Site OU1—Phase 1 Remedial Design, St. Louis, Michigan* (CH2M HILL 2012) and are not described in this BODR.

Property drawings of the 60 properties to be remediated in Phase 2 were prepared based on analytical results obtained during predesign sampling. The property drawings were verified during field reconnaissance and revised based on surveys performed by a subcontracted land surveyor.

Due to the accelerated schedule for Phase 2 construction and the knowledge obtained during design and performance of the Phase 1 remedial action, detailed specifications were submitted as part of the preliminary design, and final design specifications are included in Appendix C. Property drawings are included in Appendix A. The cost estimate, based on assumptions and design quantities presented in this BODR, is included in Appendix D.

Complete contract documents, including the solicitation package with specifications and bid forms, were prepared with the final design. Bidability and constructability reviews were conducted for this final design.

Post-RD support will be performed, including soliciting bids, evaluating offers received, and informing the EPA Contracting Officer of the best-qualified and most cost-effective offer for the RA.

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Figure 1-1
**Study Areas and Operable Units**
*Velsicol Chemical Corporation Superfund Site*
*St. Louis, Michigan*

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SECTION 2

# Project Delivery Strategy

Section 2 presents the project delivery strategy for Phase 2 of the ANP RA for OU1 of the Velsicol Chemical Corporation Superfund Site. The RA consists of excavating soil from subareas of 60 residential properties in the ANP where the PBB or DDT concentration exceeds the respective RGs. Each excavation will be backfilled to the original grade, and the vegetation will be restored with like vegetation to as close to its original condition as practicable.

The implementation of this RA will consist of several components, including general activities for the project, as well as activities that will occur on a property-specific basis. Although some of the components will occur concurrently, the general sequencing of the primary components will be as follows:

- Contracting and subcontracting
- Preconstruction activities
- Mobilization
- Site preparation
- Excavation, transportation, and disposal
- Backfill and compaction
- Site restoration
- Demobilization

CH2M HILL intends to allow the bidders to propose means and methods under a given set of performance standards. The solicitation documents, to be prepared by CH2M HILL, will identify EPA as the owner of the project and CH2M HILL as the contractor.

CH2M HILL will solicit separate subcontracts for select components of the RA. The components include, but are not limited to, earthwork (including transportation and disposal of excavated soils) and analytical laboratory services. Although the primary subcontractors may choose to subcontract parts of the project to lower-tier subcontractors, in this document “subcontractors” will refer to the primary subcontractors. In order to maximize participation of small, small disadvantaged, woman-owned, hub-zone, veteran-owned, and service-disabled veteran-owned small businesses, CH2M HILL will use bidders classified under these categories from CH2M HILL’s and EPA’s lists in the prequalification process.

SECTION 3

# Basis of Design

Section 3 presents the technical details and assumptions of the RD.

## 3.1 Subcontracting

Procurement of Phase 2 subcontractors will be completed prior to the beginning of construction activities. Subcontractors for future RA activities will be competitively procured independently from Phase 2 activities.

Subcontracts will be competitively bid among qualified businesses that are able to meet the technical and schedule requirements. Under the RD, CH2M HILL will prequalify potential bidder lists from various sources, including CH2M HILL's diverse supplier database and the EPA Region 5 Small and Disadvantaged Business Utilization Coordinator.

CH2M HILL intends to allow the bidders to propose means and methods under a given set of performance standards. The solicitation documents will include instructions to bidders, project specifications, drawings, proposed subcontract agreement (including EPA Remedial Action Contract 2 flow-down provisions), and other forms for bidders to complete. Project specifications and drawings are included as a part of this design. Bidding instructions and contract terms will be prepared for the solicitation.

The costs associated with securing the laboratory subcontractor and earthwork subcontractor are already included in the RD work plan and do not represent additional costs under the RA.

## 3.2 Preconstruction

Preconstruction work includes preparation of site plans, identification of clean borrow sources and disposal facilities approved as described in Section 3.2.1.3, observation of any affected vegetation for the presence of protected migratory birds, and coordination with the City of St. Louis. The work will be conducted prior to earthwork subcontractor mobilization.

### 3.2.1 Design Assumptions

#### 3.2.1.1 Number of Properties Requiring Remediation

Sixty properties are targeted for remediation in Phase 2. Of the 60 properties, 56 will require the parkway between the sidewalk and the street to be remediated. Forty-one of the 60 properties will require all yard areas on the property to be remediated. Four properties require remediation in the parkway area only. For the 19 properties that have at least one yard area where COC concentrations are below RGs or decision levels based on predesign sampling, such yard areas will not be remediated.

#### 3.2.1.2 Site-specific Plans and Preconstruction Submittals

As part of the final design for Phase 2, CH2M HILL will revise the construction quality assurance plan that was developed for Phase 1. The site-specific health and safety plan, transportation and disposal plan, and soil erosion and sedimentation control (SESC) plan from Phase 1 will also be revised.[2] Draft versions of the transportation and disposal plan and the SESC plan will be provided to the earthwork subcontractor to revise with information specific to its approach during Phase 2 of the RA. Substantive requirements of Michigan's Permit-by-Rule for construction activities (State of Michigan 1994), including inspections by a certified

[2] Since this RA is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), no SESC permit is required to be issued, but in order to meet the permit requirements, CH2M HILL will prepare a revised SESC plan based on the accepted Phase 1 plan, complete the permit application, and discuss it with the appropriate staff at Gratiot County and/or the City of St. Louis as appropriate. Then, the earthwork subcontractor will modify the permit application and plan to fit the specific details of the RA approach. The earthwork subcontractor will also provide a certified stormwater operator to perform construction site stormwater inspections. For the remainder of this document, "SESC plan" will refer to the SESC plan and permit application that the earthwork subcontractor has modified and which has been discussed with Gratiot County and/or the City of St. Louis.

stormwater operator, will be adhered to. The certification will be done in accordance with the requirements of Michigan Administrative Rules R 323.1251.

The earthwork subcontractor will verify compliance with the substantive requirements of applicable regulations. The earthwork subcontractor will also deliver applicable preconstruction submittals to CH2M HILL for approval before mobilization. Preconstruction submittals include site-specific plans and samples of materials as required in the specifications (Appendix C) and identified in the construction quality assurance plan (Appendix E). The health and safety plan will outline procedures to be followed so that the work is completed safely and with no adverse health effects to workers or the community. The transportation and disposal plan will guide the transportation and disposal of wastes and restoration materials, and stockpiling of excavated soils or construction debris generated during the RA. The SESC plan will incorporate the use of best management practices (BMPs) for earth-disturbing activities associated with the RA and procedures to control soil erosion and potential spills.

#### 3.2.1.3 Staging Area, Borrow Source, and Disposal Source Identification

The staging area will be located at the Velsicol FPS property with the approval of EPA. The area is secured with fencing, has adequate area for stockpiling soils and storing equipment and temporary field trailers, and is located in close proximity to the properties requiring remediation. Silt fencing and appropriate erosion control measures will be placed around stockpiled materials. Contaminated soils will be stored on a bermed liner and covered. The excavated soil shall be contained in no more than two stockpiles, and neither stockpile shall exceed 1,000 tons at any time during the project unless this does not allow for additional waste characterization sampling and analysis if required by the approved disposal facility. The use of multiple stockpiles will allow for waste characterization with subsequent transportation and disposal while the other stockpile is being used. Additionally, stockpiles of borrow materials may be present at the staging area and shall not exceed 2,000 cubic yards each.

The earthwork subcontractor will identify suppliers of general backfill and topsoil as part of the preconstruction activities. CH2M HILL will collect samples of the borrow materials and submit them to the laboratory subcontractor for testing to verify that the soil is clean and appropriate for use. The earthwork subcontractor will identify the disposal facility in its proposal for review and approval as described in the following section. It is assumed that borrow source(s) and disposal facilities will be located within 60 miles of the site. The maximum distance to borrow sources and disposal facilities will be confirmed.

#### 3.2.1.4 Property Access

Access agreements had been obtained for the sampling of the properties, but new access agreements will be needed for remediation of the properties. EPA will mail access agreements to the current property owners. Access agreements will be tracked to document properties for which owners consent for access and to identify where additional attempts need to be made.

A minimum of four attempts will be made to obtain an access agreement. The first attempt consisted of the mailings sent out by EPA, the second attempt will consist of a phone call by a CH2M HILL representative, and the last two attempts will be in-person visits by CH2M HILL personnel to the property. Continued attempts to contact the property owner will occur during the RA while work is being performed in the area.

If an excavation is limited solely to a parkway, although it is not the preferred approach, the work could be performed with a signed access agreement from the City of St. Louis if the adjacent property owner has not provided access. Access approval has been obtained from the City of St. Louis for work within the city right-of-way, including parkways adjacent to the residential properties. Access approval will also be obtained from each property owner as possible to avoid potential conflict during the RA.

#### 3.2.1.5 Coordination with City of St. Louis

CH2M HILL will coordinate with the City of St. Louis through a meeting before construction begins. At the City meeting, CH2M HILL will discuss transportation routes, excavation near city-owned utilities, direct-

loading plans, EPA exempt permits, required licenses, allowable work hours, use of city water, street closings, city debris pickup, soil erosion control, and special requirements and considerations.

# 3.3 Initial Mobilization

Initial mobilization includes that of CH2M HILL and the earthwork subcontractor. Design assumptions are discussed in the following subsections.

## 3.3.1 Design Assumptions: CH2M HILL and Subcontractor Mobilization

Initial mobilization will consist of the following, as needed:

- Constructing temporary facilities such as field trailers, material storage facilities, and equipment decontamination facilities
- Grading and placing gravel at storage, laydown, and staging areas, if necessary
- Delivering equipment
- Placing erosion and sediment control features for staging areas, such as silt fencing
- Documenting the presence of trees on the property that will be kept and removed
- Documenting the condition of the properties and haul route to the FPS with pictures

Equipment to be used by subcontractors is expected to be transported by road. The earthwork subcontractor will provide and maintain required temporary facilities for the duration of the project, along with a field trailer, if desired by the earthwork subcontractor.

## 3.3.2 Design Assumptions: Site Security and Coordination

The Velsicol FPS will be used as a staging area for storage of equipment, stockpiled clean and contaminated soil, and temporary field offices. A pad is present for use for equipment decontamination. The FPS is fenced, and the earthwork subcontractor can elect to subcontract security to monitor site equipment and the staging area during nonworking hours. The earthwork subcontractor will maintain control over work areas during working hours at the site. All equipment, materials, and excavated soil will be transported to the staging area each day so that security is not required at the residential properties.

# 3.4 Site Preparation

Site preparation activities specific to the Phase 2 RA at residential properties include locating underground utilities, installing erosion and sediment control measures at stormwater inlets and other areas as specified in the SESC plan, and documenting current conditions.

## 3.4.1 Design Assumptions

The property assessment will consist of completing a Preconstruction Property Assessment Checklist with the property owner to document the existing conditions and capturing digital photographs or video recording.

A copy of the Preconstruction Property Assessment Checklist, along with a copy of the property-specific improvement drawing, will be provided to each property owner before remediation begins.

### 3.4.1.1 Preconstruction Property Visit

CH2M HILL will prepare a site visit folder prior to meeting with the property owners to plan property-specific RAs. The folder will contain a base sketch of the property created using available parcel information, aerial photography, and a preconstruction property survey. The folder will also contain a signed site access agreement.

CH2M HILL and the earthwork subcontractor will perform an initial property visit for each property in the Phase 2 RA. During the meeting, the base sketch will be updated with utility information, property features, and owner information to develop a property-specific plan for RAs at each specific property. A tree and

plant inventory will be prepared by the subcontractor identifying the existing vegetation that is designated for removal. The planned excavation areas will not change during the course of Phase 2 of the RA. If significant changes to the property-specific design are discussed during the meeting, the proposed changes will be documented and submitted to EPA for approval.

Photographs and video will be taken to document the preconstruction condition of the property and adjacent areas. Any vegetation that may be disturbed during the course of work will be observed for the presence of protected migratory birds or other species. If active nests of protected birds or habitat of other endangered species are identified, appropriate measures will be taken to minimize disturbance and to comply with the Migratory Bird Treaty Act and the Endangered Species Act. Migratory bird species in this geography begin nesting after April 1. Alternatively, consistent with the Migratory Bird Treaty Act requirements, CH2M HILL may elect to perform limited tree removal prior to April 1 or implement measures to discourage nesting of birds (such as installation of visual bird deterrents), if such trees are not also endangered species habitat or otherwise protected.

During the initial property visit, CH2M HILL will also discuss with the property owner (and resident, if applicable) the risks that are present during construction activities and the need to stay inside the residence or otherwise away from the construction during working hours.

Prior to the start of work, the property owner, CH2M HILL, and the earthwork subcontractor will all sign an agreement describing the work to be performed at each property based on the information gathered at the initial property visit.

#### 3.4.1.2 Preconstruction Survey

A preconstruction survey provides documentation for determination of post-excavation depths and post-construction restoration. The preconstruction survey was performed by a licensed surveyor subcontracted to CH2M HILL during design activities. The surveying subcontractor established a minimum 10-by-10-foot grid and then used a level and rod to measure pre-excavation elevations. Property drawings incorporating the surveyed features are provided in Appendix A. The pre-construction point elevations and other survey information will be provided to the earthwork subcontractor in electronic format.

#### 3.4.1.3 Excavation Limits

The excavation limits for Phase 2 are shown in the property drawings in Appendix A. The excavation limits were developed using field sketches and sampling information, aerial photography, available parcel information, and preconstruction survey information.

For estimation of total excavation areas, the assumptions described in the previous paragraphs were used with the analytical results for the property to delineate the appropriate areas of the yards. The analytical results for total DDT and PBB are provided in Tables 3-1 and 3-2. A summary of excavation areas by property is included in Table 3-3 and in the notes of the property drawings in Appendix A.

#### 3.4.1.4 Utility Locate

The earthwork subcontractor will be required to contact Michigan’s one-call utility location system (MISS DIG) and use a third-party utility-locating service to identify utilities within or near the excavation areas before work begins at each property. During the preconstruction property visit, the property owner (and resident, if applicable) will be interviewed to determine if there are any undocumented or private utilities, such as irrigation systems, on the property.

The earthwork subcontractor will be responsible for requesting the utility locates, verifying their completion, and submitting documentation to CH2M HILL prior to beginning any invasive activities at each property. The earthwork subcontractor will record the location of the utilities on the property sketch for permanent documentation.

Alternative utility routing may be necessary and may consist of temporary disconnection of low overhead electrical lines or shielding of electrical lines. The earthwork subcontractor will be responsible for identifying and implementing the activities, if necessary.

#### 3.4.1.5 Property Protection

Before any soil excavation can begin, the earthwork subcontractor will establish and maintain two points of continuous access for residents and property owners when possible, with one point of continuous access at all times. If it is necessary to restrict access for periods of time, the work will be done at a time when the property owner and resident will not be present at the property. Access to the property will not be restricted between the hours of 5:00 p.m. and 8:00 a.m.

The earthwork subcontractor will install appropriate signage and protective measures where required for pedestrian traffic on sidewalks or vehicular traffic on streets in accordance with its transportation and disposal plan. Temporary construction fences will be maintained around active excavation areas to demarcate zones that should not be entered by members of the public.

#### 3.4.1.6 Clearing, Grubbing, and Tree Removal

Clearing and grubbing will be performed where necessary for Phase 2 activities. Stumps will be ground up during clearing and grubbing or dug out during soil excavation. Vegetation in planting beds will be removed to within 1 inch of ground surface.

Thirty-seven large trees (diameter greater than 4 inches at breast height) and 50 small trees (diameter less than 4 inches at breast height) are estimated for removal. Large trees were evaluated on a case-by-case basis to minimize tree removal while maximizing contaminant removal. Trees are selected for removal if they are located in subareas where contamination significantly exceeds the RGs or where contamination extends more than 1 foot below the surface. Actual trees for removal may be modified during preconstruction activities.

It is expected that the property owner will remove personal items from the work areas prior to the start of work. Debris located within the excavation areas will be removed by the earthwork subcontractor with approval from the property owner. Examples of debris may consist of yard waste, wood or concrete pieces, or other materials. Personal items that are not removed by the property owner will be inventoried and temporarily stored in a secure place at the staging area. Items removed from the property (either for storage or disposal) will be identified in an inventory attached to the property owner agreement.

#### 3.4.1.7 Erosion and Sediment Control

Erosion and sediment control measures will be implemented by the earthwork subcontractor in the staging area and at residential properties as necessary during active construction activities. Erosion control measures at the staging area will be as specified in the SESC plan and consistent with the requirements of 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, R323.1701 - 1714]), and may include silt fencing, inlet protection, and appropriate BMPs at the construction site entrance and exit. BMPs will include the following: administrative controls (for example, planning- and scheduling-related BMPs); good housekeeping practices; and stormwater, erosion, and sediment controls. Contaminated materials will be stored on a bermed liner and covered. The earthwork subcontractor will install, maintain for the duration of Phase 2 construction activities, and, upon demobilization, remove the erosion and sediment control measures.

Erosion and sediment control measures at residential properties may consist of inlet protection, silt fencing, erosion control blanket, and BMPs. The earthwork subcontractor will be responsible for installing the appropriate erosion and sediment control measures prior to any ground disturbance at a residential property and maintaining them during the earthwork activities at the property. The use of silt fence at the residential properties is not the preferred erosion control measure due to maintenance requirements, but will be used if necessary. Silt fence will be installed by the earthwork subcontractor where there is a slope of 1

vertical to 5 horizontal or greater. The silt fence will be removed by the earthwork subcontractor after backfilling and placement of erosion control matting or sod has been completed. Erosion and sediment control measures used that require removal, such as inlet protection, will be removed by the earthwork subcontractor after placement of sod and final street cleaning.

Erosion control at the staging and storage areas and the residential properties will be performed in accordance with the SESC plan. Substantive requirements of Michigan's Permit-By-Rule for construction activities (State of Michigan 1994) will be adhered to, including inspection of erosion control measures.

# 3.5 Excavation, Transportation, and Disposal

The descriptions of excavation, transportation, and disposal work and design assumptions are provided in the following subsections.

## 3.5.1 Description of Work

Excavation, transportation, and disposal activities will be performed by the earthwork subcontractor. Excavation activities include mechanical and manual soil excavation.

## 3.5.2 Design Assumptions

### 3.5.2.1 Estimation of Quantities

Areas requiring remediation at each property were determined based on RD sampling results. During the RD, each property was divided into three subareas. The subareas were the parkway (between the sidewalk and the street) and yard areas 1 and 2 (representing a division of the remaining portion of the property into two portions along a logical line). Figure 3-1 shows all properties that will be remediated during Phase 2. The exceptions to this were [redacted], which had a fourth subarea (yard area 3), and [redacted], which only had two subareas (no yard area 2). Samples were collected in each of the subareas on a grid in 6-inch depth intervals. The samples were composited for each 6-inch depth interval over the entire subarea and submitted for analysis of COCs.

A subarea was designated for remediation if one of the sample intervals exceeded the decision level for DDT or RG for PBB. For estimation of quantities, the excavation in each subarea was determined by the maximum sample depth with an exceedance of RGs, plus an additional 6 inches of over-excavation in select areas. The properties subject to 6 inches of over-excavation below the maximum exceedance depth are those located between Watson Street on the west, Delaware Street on the east, Center Street to the south, and North Street on the north, as well as the eastern half of the western block south of this area and the western half of the eastern block south of this area. The 6-inch over-excavation area is shown in Figure 3-1. For the properties subject to a 6-inch over-excavation buffer below the criteria depth, the 6-inch buffer will not be excavated under the tree canopy if the tree is to be left in place.

For a detailed description of the RD sampling and analysis, refer to the *Final Quality Assurance Project Plan Velsicol Chemical Superfund Site OU1—Phase 1 Remedial Design, St. Louis, Michigan* (CH2M HILL 2012). Sample results are summarized in Table 3-1 with respective sample and property information as the basis of excavation volumes.

The total excavation soil volume is estimated at 20,303 cubic yards. To estimate the tonnage of soil per property for transport and disposal, the soil volume was multiplied by an estimated factor of 1.5 tons per cubic yard for a total of 30,454 tons. The total area to be disturbed is estimated at 452,112 square feet.

### 3.5.2.2 Excavation of Soil

Excavation activities are based on a 40-hour work week. Mechanical excavation may be used where possible. Within 8 feet of tree trunks (or more for larger-diameter trees as shown in the drawings), excavation will be limited to a depth of 6 inches and will be performed exclusively using manual excavation to minimize damage to tree roots. Manual excavation will be performed to expose and avoid damaging woody roots 1 inch in diameter or greater to preserve the roots. Manual excavation will follow the roots 1 inch in

diameter or greater to the horizontal extent of the excavation or the tree drip line to expose the roots. At a distance greater than 8 feet from the trunk, mechanical excavation is allowed using a mini-excavator and spotter to remove soils between roots exposed by manual excavation. If roots are damaged, corrective pruning will be conducted to create a clean cut and promote quick wound closure and regeneration.

Hand excavation will be done around buried utilities within or near excavation areas. Currently, according to Michigan Public Act 53, hand-digging is required where utilities are going to be exposed or are likely to be exposed (State of Michigan 1974). Legislation proposed in 2012 and possibly reintroduced in the future would require “soft excavation techniques,” including hand-digging, within a “caution zone” defined as an “area within 60 inches of either side of the approximate location marks provided by a facility owner or facility operator” (State of Michigan 2012). Excavation activities will comply with the recently proposed legislation. Hand excavation will also be performed in areas with limited access or existing site features that impede mechanical excavation, or where heavy equipment may damage structures.

If small equipment will be used to transport soil between the excavation and the truck, 0.75-inch plywood, or approved equivalent, will be placed on the ground surface where equipment will travel. The plywood will be secured to the ground to distribute the weight of the equipment, thus protecting shallow tree roots and minimizing ruts in areas outside the excavation extents. Polyethylene sheeting a minimum of 6 mil thick, or approved equivalent, will be placed on the ground between the excavation area or plywood sheeting if used and trucks to prevent spillage or tracking of contaminated soil. The sheeting will extend a minimum of 2 feet under the truck. Any spillage that may occur onto the plywood or sheeting will be cleaned up and placed into the truck.

To minimize potential damage to tree roots, excavated soil may not be stockpiled within the tree drip lines. Soil excavation will be performed to within 1 foot of structures and fences to minimize damage. Vertical excavation limits will be performed to within 0.00 foot and plus 0.10 foot. Horizontal excavation limits will be performed to within 0.00 foot to plus 0.20 foot. Excavated soil may be loaded directly into trucks or containers prior to transport to the FPS, but the means and methods used will be proposed by the earthwork subcontractor for approval. Excavated soil in temporary stockpiles or containers may not remain at residential properties overnight and must be secured at the FPS each day. At the FPS, soils can either be stockpiled with appropriate protection, or kept in containers prior to transportation offsite for disposal.

Traffic control will be used as needed during earthwork activities and will comply with the requirements of the Michigan Department of Transportation and the City of St. Louis, as applicable. A visual barrier, such as high-visibility fencing, will be placed around each excavation area to prevent accidental entry to the work site area. Signage will also be posted at the properties during earthwork activities with contact information for CH2M HILL in case of questions or concerns.

#### 3.5.2.3 Confirmation Sampling

Confirmation samples will not be collected. The excavation depth was determined based upon sampling performed during RD activities. A composite sample exhibiting COC concentrations less than RGs located below the lowermost interval exceeding RGs was used to determine the lower excavation extents. If areas of fill material are visually observed during the excavation, additional excavation may be performed in these areas at the direction of CH2M HILL.

#### 3.5.2.4 Accumulated Water

Excavations will be lined at the conclusion of each workday to prevent precipitation from contacting potentially contaminated soils inside excavations. Stormwater contained on top of the liner will be discharged as clean stormwater in accordance with the SESC plan and Michigan Stormwater during Construction Permit-by-Rule requirements. However, if standing water is present in an unlined excavation, or penetrates beneath the liner, the standing water will be allowed to infiltrate before backfilling activities begin, or the water will be containerized, sampled to determine the disposal requirements, and taken offsite to a commercial treatment facility. Water will be managed in accordance with Michigan liquid industrial

waste regulations as appropriate (Part 121 of the NREPA, 1994, PA 451 as amended [MCL 324.12101-324.12118]). The sampling and handling requirements for stormwater will be detailed in the SESC plan.

#### 3.5.2.5 Air Monitoring

The earthwork subcontractor will conduct real-time air monitoring for particulate matter continuously at each property and at the FPS where excavated soil is staged while earthwork is being performed. Data will be recorded to a data logger once per minute. The air monitoring equipment will be placed in locations to verify effectiveness of engineering controls in minimizing dust generation that may potentially leave the exclusion zone. Dust monitors will be placed upwind and downwind of earthwork activities at a property to determine the impact of the construction activities on air quality.

Dust-monitoring data will be evaluated against the EPA National Ambient Air Quality Standards for $PM_{10}$ of 150 micrograms per cubic meter. The standards are based on a 24-hour average, but work will only be performed for approximately 8 hours per day, so no dust generation is assumed during the non-working hours. During work hours, an alarm will be set at 500 micrograms per cubic meter to observe activities and determine the cause for elevated particulate concentrations and to evaluate potential mitigation measures to maintain the 24-hour average concentration below the criteria. A health and safety dust-monitoring action limit of 1.5 milligrams per cubic meter was determined based on the maximum PBB and total DDT concentrations detected in samples collected from the Phase 2 properties. Exceedances of the dust-monitoring criteria require dust abatement measures, typically application of water, or stop work and further evaluation.

The earthwork subcontractor will use personal sampling pumps in conjunction with dust-monitoring equipment and will have samples collected for laboratory analysis to determine potential exposure to DDT. These samples will be representative of the worst-case exposure that may occur to receptors outside of the excavation, such as residents or pedestrians, from a given excavation. Air monitoring will be discussed in further detail in the air monitoring plan and health and safety plan.

#### 3.5.2.6 Waste Characterization of Soil for Disposal

Waste characterization sampling was conducted during the RD. However, if required by the disposal facility, additional waste characterization sampling will be conducted during the RA, as necessary, to support establishment of waste profiles with an approved offsite nonhazardous disposal facility. The sampling frequency and analyses will be determined by the approval requirements of the selected disposal facility. Waste profiles will be reviewed by the CH2M HILL environmental manager or waste coordinator prior to signature and submittal to the landfill. Offsite disposal of soil waste will be coordinated and arranged upon receipt waste profile approval.

#### 3.5.2.7 Transportation and Disposal of Excavated Soil

The earthwork subcontractor either will load excavated soil directly into trucks, or will load containers with excavated soil onto trucks for transport to the FPS. Before a truck leaves an excavation area, the truck will undergo dry decontamination measures so the truck will be free of soil. Trucks will be tarped or otherwise covered before transport. For purposes of cost estimating, it is assumed that the excavated soils will be loaded at the property onto 5-ton dump trucks or comparable and transported from the properties to the FPS staging area for stockpiling by the earthwork subcontractor. At the staging area, the stockpiled soil will be loaded onto larger trucks for transport to the disposal facility. The procedure will allow trucks to be loaded more easily with a larger piece of equipment than would be used on the properties, such as a small excavator or skid-steer loader. The earthwork subcontractor will propose the means and methods for handling the materials for approval. Any excavated soil that is stockpiled at the FPS will be stored on a bermed liner, covered, and otherwise managed in a manner that prevents migration of the soil.

Excavated soils and materials will be transported to an approved disposal facility. Transportation firms and disposal facilities will be approved by CH2M HILL. Disposal facilities will be required to provide proof of EPA approval under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Offsite Rule, set forth in the National Contingency Plan, 40 *Code of Federal Regulations* 300.440.

Trucks will be tarped or covered, or the loads of contaminated and uncontaminated material destined for offsite disposal will be enclosed in some other manner. The earthwork subcontractor will subcontract directly with the disposal facility. Nonhazardous waste manifests will be prepared by the earthwork subcontractor and signed by trained CH2M HILL personnel on behalf of EPA prior to leaving the site.

The soil weight that will be transported offsite and disposed of is equal to the soil excavated. Therefore, the estimated soil quantity that will be transported offsite is 30,454 tons. Soil destined for disposal is assumed to be nonhazardous. The waste characterization requirements will be determined by the approved disposal facility.

As required, dust abatement will be performed during transportation operations. Activities may include a work stoppage until dust abatement measures are implemented. Frequent cleaning of the roads and application of water are anticipated abatement measures. Given the site setting, transport is anticipated to be limited primarily to paved roads used by the earthwork subcontractor to transport contaminated soils to the facility and return to the properties being remediated. A limited number of unpaved residential streets are present within the ANP, and transport on the roads will be minimized to the extent practicable. Street cleaning of paved roads is assumed to use equipment that will capture debris after sweeping, using either mechanical methods or vacuum to minimize fugitive dust emissions. To minimize spillage of excavated soil onto the roads, plastic sheeting or tarps will be placed under trucks during loading activities, and trucks will undergo dry decontamination measures. The earthwork subcontractor shall develop provisions for street cleaning and equipment decontamination as described in the final transportation and disposal plan.

## 3.6 Post-excavation Survey

A post-excavation survey will be conducted once excavation of soil is completed to confirm the final depth. The earthwork subcontractor's surveyor will use the same grid as the pre-excavation survey to the extent practicable to document post-excavation elevations.

## 3.7 Filling and Compaction

Filling and compaction activities will be conducted after excavation activities are complete. Activities include placement and compaction of general backfill, followed by placement and light compaction of topsoil.

The earthwork subcontractor will identify suppliers of general backfill and topsoil as part of the preconstruction activities. CH2M HILL will collect samples of the topsoil at the source and submit them to the laboratory subcontractor for target compound list organics, target analyte list metals, PBB, total DDT, and particle-size distribution analyses. Borrow sources will be required to meet MDEQ Part 201 residential criteria and project specifications (Specification Sections 32 23 23B Fill and Backfill and 32 91 13B Topsoil Preparation) to be approved for use.

Additional borrow samples will be collected during construction activities at a frequency of 1 sample per 1,000 cubic yards to verify continued compliance with project specifications. Additionally, a sample will be retained by CH2M HILL for visual comparison during construction activities to confirm consistency in the materials. If inconsistencies in the materials are observed, CH2M HILL may collect additional samples to determine continued compliance or nonconformance with project requirements.

The earthwork subcontractor will place general backfill in 6-inch lifts, with compaction of 85 to 90 percent of standard Proctor maximum density (ASTM International D698). Topsoil will be placed in lifts a maximum of 6 inches thick and will be compacted between 75 and 85 percent of standard Proctor maximum density (ASTM International D698). The earthwork subcontractor will perform in situ density testing using a nuclear density gauge or approved equivalent to demonstrate proper compaction. General backfill will be placed from the base of the excavation to within approximately 6 inches of original grade, except for garden areas where general backfill will be placed to within approximately 18 inches of original grade. The remaining thickness required to match preconstruction grade (minus the thickness of sod to be placed) will be lightly compacted topsoil to minimize settlement while still allowing infiltration of water and penetration of roots.

Areas used for off-street parking by residents will be compacted to a minimum of 90 percent of standard Proctor maximum density (ASTM International D698) to minimize settlement. Soil used for the top six inches for parking areas can be either general backfill or topsoil.

Final restored grade will take into account the thickness of the sod to be placed. For example, if the sod thickness is 0.2 foot, the final restored grade should be within minus 0.10 and minus 0.20 foot of the original grade.

## 3.8 Post-backfilling Survey

A post-backfilling survey will be conducted once topsoil placement has been completed to confirm that the pre-sod placement grade has been met. The earthwork subcontractor will use the same grid as the pre-excavation and post-excavation surveys to document post-construction elevations.

## 3.9 Restoration

Restoration work includes contingencies for utility repair and final street cleaning. Sidewalk and asphalt repair, if necessary, will be performed following placement of sod in backfilled areas.

### 3.9.1 Contingencies

Sprinkler systems, electrical, piping, and plumbing located within or near the limits of excavation will be inspected and tested, as appropriate, to determine whether damage occurred during the remediation. Repairs will be made by appropriately qualified and licensed subcontractors as applicable. Costs to repair damages will be borne by the earthwork subcontractor if they were the result of negligence, such as insufficient clearances or lack of or insufficient protection around the property.

Repairs will be performed according to manufacturer's instructions and applicable building codes. Unforeseen conditions encountered during excavation will be addressed on a site-specific basis.

### 3.9.2 Street Cleaning

The earthwork subcontractor will perform street cleaning daily from the time earthwork is initiated until backfilling of excavations is complete. Additional street cleaning will be performed by the earthwork subcontractor as directed by CH2M HILL, and final street cleaning will be conducted prior to the removal of the erosion and sediment control measures, such as inlet protection (if applicable). Street cleaning is assumed to use equipment that will capture debris after sweeping, using either mechanical methods or vacuum, to minimize fugitive dust emissions.

## 3.10 Landscaping and Maintenance

Landscaping and maintenance includes replacement of trees, shrubs, and perennials removed as a part of the excavation, placement of sod over the backfilled excavation areas, and watering. The earthwork subcontractor will guarantee the shrubs and replacement trees for 1 year. If the replacement plants die within 1 year of planting, they will be replaced by the earthwork subcontractor at no additional cost to CH2M HILL or EPA.

### 3.10.1 Tree, Shrub, and Perennial Replacement

Trees, shrubs, and perennials will be replaced per property as follows:

- Trees that are less than 4 inches in diameter at breast height will be removed and replaced with a 2-inch-diameter tree of similar species as practicable. Tree species that are at risk due to current or anticipated diseases or infestations in the foreseeable future (that is, Dutch Elm disease or Emerald Ash tree borer) will not be replaced with the same species.
- Trees greater than 4 inches in diameter will be removed and replaced on a case-by-case basis as described in Section 3.4.1.6.

- Shrubs will be replaced with those of similar species and quantity as were removed. The replacement shrubs will be nursery grade and not mature size, regardless of the size of the removed shrubs.
- Perennial plants will be replaced with the similar quantity and species removed.
- Because annuals achieve their growth cycle in 1 year, they will not be replaced during site restoration activities.
- Mature trees that die during the RA because of the construction activities will be replaced with a 2-inch-diameter tree of the same species as practicable.

Estimated quantities are included in Table 3-3.

### 3.10.2 Sod

Sod will be placed to restore the excavation area to preconstruction extents. The use of sod allows for immediate restoration to a finished surface and provides erosion control. Sod will be placed directly over the backfill and watered immediately. Additional watering services will continue as described in the following section.

### 3.10.3 Watering Services

Watering services will be provided for sod for a maintenance period of approximately 4 weeks. Prior to the placement of sod, the prepared topsoil surface will be watered. Additional watering will be performed within 8 hours of the placement of sod and twice weekly for 4 weeks, for an estimated 8 waterings per property and as directed by CH2M HILL. The watering will also be performed during this period around mature trees where hand-excavation was performed within the tree drip line or where equipment traffic may have damaged shallow roots. If conditions are already sufficiently wet during the watering period due to rain, the subcontractor may be directed by CH2M HILL to temporarily halt watering during the maintenance period.

If sod is placed in late 2014 and weather conditions are not sufficient to allow the watering schedule to be completed, the watering schedule will be resumed in spring 2015 as soon as conditions are appropriate.

### 3.10.4 Erosion and Sediment Control

Erosion and sediment control measures will be in accordance with the SESC plan. Erosion and sediment controls that may be used and require removal, such as inlet protection, will be removed by the earthwork subcontractor after the placement of sod and final street cleaning. Inspections will be performed during excavation and restoration for as long as necessary based on the SESC plan and compliance with Michigan's Permit-by-Rule for construction activities (State of Michigan 1994). Damaged or insufficient erosion and sediment control measures will be promptly replaced or modified to be rendered effective.

## 3.11 Post-construction Property Review

Property-specific reviews will be performed after each property is restored to document the restoration and the condition of the surrounding area. Photographs and/or video of the restored work areas will be obtained to document the post-construction condition. A letter will be prepared for the property owner documenting the completion of the RA at the property. The current property owner will be asked to sign off that their property has been restored to the condition agreed to during the preconstruction meetings or to identify any outstanding issues to be addressed.

## 3.12 Demobilization

Demobilization pertains to the earthwork subcontractor facilities. Demobilization will include removal of the earthwork subcontractor's temporary facilities such as field trailer, utilities, material storage facilities, equipment decontamination facilities, and erosion and sediment control features. Until site restoration and

demobilization are completed, CH2M HILL will perform construction oversight and will verify that erosion and sediment control features comply with the subcontractor's SESC plan.

## 3.13 Post-construction Documentation

CH2M HILL will prepare an RA completion report and an ambient air monitoring report.

TABLE 3-1

**DDT Analytical Results by Property**

Phase 2 of Velsicol ANP Residential Soil Remediation

| | PW | | | | | | | | YA1 | | | | | | | | YA2 | | | | | | | | YA3 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Address** | **0 - 6** | **6 - 12** | **12 - 18** | **18 - 24** | **24 - 30** | **30 - 36** | **36 - 42** | **42 - 48** | **0 - 6** | **6 - 12** | **12 - 18** | **18 - 24** | **24 - 30** | **30 - 36** | **36 - 42** | **42 - 48** | **0 - 6** | **6 - 12** | **12 - 18** | **18 - 24** | **24 - 30** | **30 - 36** | **36 - 42** | **42 - 48** | **0 - 6** | **6 - 12** | **12 - 18** | **18 - 24** | **24 - 30** | **30 - 36** |
| [redacted] | 14,000 | 25,000 | 4,600 | 880 | | | | | 4,800 | 3,200 | 2,300 | 1,800 | | | | | 4,300 | 3,300 | 2,100 | 1,100 | | | | | | | | | | |
| | 8,500 | 2,700 | 4,200 | 990 | | | | | 8,100 | 4,000 | 1,600 | 1,100 | | | | | 8,400 | 4,000 | 1,800 | 1,500 | | | | | | | | | | |
| | 11,000 | 6,900 | 1,500 | 680 | | | | | 8,200 | 5,200 | 3,200 | 1,600 | | | | | 6,200 | 6,200 | 3,700 | 1,200 | | | | | | | | | | |
| | 12,000 | 3,100 | 1,600 | 2,800 | | | | | 4,700 | 2,700 | 1,300 | 640 | | | | | 7,600 | 4,500 | 1,500 | 1,000 | | | | | | | | | | |
| | | | | | | | | | 6,600 | 2,000 | 1,400 | 1,000 | | | | | 850 | 4,600 | 2,600 | 1,100 | | | | | | | | | | |
| | 20,000 | 34,000 | 5,700 | 7,100 | 4,200 | 3,900 | | | 14,000 | 6,000 | 4,400 | 1,500 | 970 | 930 | | | 5,700 | 4,100 | 1,500 | 940 | 950 | 1,400 | | | 10,000 | 6,500 | 1,300 | 1,600 | 1,400 | 1,100 |
| | 4,700 | 6,800 | 4,900 | 5,300 | | | | | 4,800 | 11,000 | 2,700 | 2,200 | | | | | 2,600 | 4,200 | 4,200 | 3,800 | | | | | | | | | | |
| | 41,000 | 130,000 | 18,000 | 13,000 | 14,000 | 17,000 | 510 | 290 | 16,000 | 3,700 | 3,800 | 2,100 | 3,000 | 3,400 | | | 4,700 | 1,700 | 740 | 420 | 370 | 270 | | | | | | | | |
| | 28,000 | 4,500 | 1,800 | 770 | 590 | 880 | | | 36,000 | 2,500 | 950 | 1,000 | 500 | 520 | | | 7,900 | 5,100 | 2,400 | 2,200 | 1,400 | 1,000 | | | | | | | | |
| | 20,000 | 120,000 | 7,000 | 3,200 | 4,800 | 2,700 | | | 3,000 | 19,000 | 1,200 | 1,500 | 1,200 | 990 | | | 7,600 | 7,600 | 1,500 | 780 | 570 | 330 | | | | | | | | |
| | 18,000 | 2,100 | 500 | 940 | | | | | 140,000 | 1,800 | 660 | 570 | | | | | 8,400 | 4,000 | 1,200 | 920 | | | | | | | | | | |
| | 29,000 | 1,200 | 640 | 670 | 560 | 630 | | | 40,000 | 1,200 | 760 | 1,700 | 520 | 440 | | | 9,700 | 3,800 | 870 | 430 | 310 | 450 | | | | | | | | |
| | 2,800 | 4,900 | 1,600 | 620 | | | | | 5,300 | 2,500 | 920 | 480 | | | | | 4,000 | 2,300 | 1,000 | 590 | | | | | | | | | | |
| | 4,500 | 4,000 | 940 | 380 | | | | | 3,400 | 2,300 | 720 | 370 | | | | | 5,600 | 4,500 | 1,600 | 840 | | | | | | | | | | |
| | 3,400 | 1,400 | 600 | 580 | | | | | 4,700 | 1,300 | 450 | 390 | | | | | 4,200 | 2,800 | 1,200 | 470 | | | | | | | | | | |
| | 6,400 | 5,700 | 2,300 | 1,900 | | | | | 5,900 | 3,200 | 4,600 | 2,300 | | | | | 9,700 | 4,500 | 2,100 | 1,400 | | | | | | | | | | |
| | 4,900 | 1,900 | 1,100 | 790 | | | | | 4,600 | 1,200 | 560 | 440 | | | | | 4,500 | 1,600 | 720 | 330 | | | | | | | | | | |
| | 20,000 | 20,000 | 5,600 | 9,500 | 1,300 | 1,100 | 390 | 19 | 13,000 | 7,500 | 4,100 | 3,200 | | | | | | | | | | | | | | | | | | |
| | 8,000 | 9,000 | 3,600 | 2,000 | | | | | 10,000 | 5,100 | 2,000 | 980 | | | | | 5,400 | 6,500 | 2,100 | 780 | | | | | | | | | | |
| | 16,000 | 24,000 | 12,000 | 4,700 | 3,400 | 2,400 | 1,900 | 45 | 8,100 | 3,300 | 1,400 | 890 | | | | | 5,800 | 2,500 | 1,000 | 440 | | | | | | | | | | |
| | 4,300 | 3,800 | 1,500 | 920 | | | | | 6,900 | 6,100 | 3,600 | 1,300 | | | | | 5,000 | 2,400 | 690 | 560 | | | | | | | | | | |
| | 13,000 | 15,000 | 2,900 | 1,800 | | | | | 5,600 | 1,900 | 1,100 | 490 | | | | | 9,300 | 3,800 | 1,700 | 930 | | | | | | | | | | |
| | 18,000 | 11,000 | 3,400 | 2,300 | | | | | 12,000 | 1,700 | 950 | 770 | | | | | 9,100 | 8,700 | 1,600 | 1,000 | | | | | | | | | | |
| | 15,000 | 16,000 | 5,500 | 4,900 | 790 | 470 | 240 | 50 | 7,800 | 6,500 | 1,400 | 940 | | | | | 12,000 | 6,700 | 5,500 | 1,200 | | | | | | | | | | |
| | 31,000 | 24,000 | 3,700 | 1,900 | | | | | 11,000 | 5,700 | 3,900 | 1,800 | | | | | 11,000 | 8,200 | 5,500 | 2,900 | | | | | | | | | | |
| | 26,000 | 17,000 | 3,700 | 1,600 | | | | | 12,000 | 7,900 | 4,000 | 1,600 | | | | | 5,300 | 3,200 | 1,900 | 660 | | | | | | | | | | |
| | 35,000 | 4,500 | 1,800 | 1,500 | | | | | 16,000 | 7,700 | 2,700 | 2,600 | | | | | 10,000 | 6,400 | 1,600 | 990 | | | | | | | | | | |
| | 12,000 | 41,000 | 17,000 | 12,000 | 9,900 | 3,500 | 21 | 330 | 8,400 | 4,000 | 4,500 | 1,500 | | | | | 6,500 | 5,000 | 1,700 | 1,100 | | | | | | | | | | |
| | 4,500 | 3,700 | 1,400 | 760 | | | | | 3,700 | 1,100 | 560 | 480 | | | | | 2,000 | 1,600 | 800 | 380 | | | | | | | | | | |
| | 5,000 | 4,100 | 2,500 | 890 | | | | | 4,900 | 2,200 | 1,400 | 530 | | | | | 5,700 | 4,300 | 2,200 | 1,200 | | | | | | | | | | |
| | 4,800 | 4,500 | 1,000 | 580 | | | | | 4,400 | 2,400 | 960 | 290 | | | | | 3,000 | 2,500 | 630 | 230 | | | | | | | | | | |
| | 8,300 | 7,000 | 1,200 | 910 | | | | | 3,100 | 2,100 | 750 | 360 | | | | | 3,100 | 2,600 | 770 | 410 | | | | | | | | | | |
| | 7,900 | 6,100 | 1,800 | 1,400 | | | | | 8,800 | 4,700 | 1,800 | 1,100 | | | | | 11,000 | 4,100 | 2,400 | 8,700 | 250 | 95 | 46 | 19 | | | | | | |
| | 6,300 | 4,300 | 2,800 | 1,500 | | | | | 6,400 | 2,900 | 880 | 770 | | | | | 5,300 | 5,800 | 1,700 | 1,100 | | | | | | | | | | |
| | 6,700 | 7,800 | 2,400 | 1,500 | | | | | 7,000 | 2,400 | 720 | 740 | | | | | 3,800 | 2,100 | 830 | 670 | | | | | | | | | | |
| | 5,700 | 5,200 | 1,300 | 710 | | | | | 9,400 | 3,400 | 1,100 | 1,500 | | | | | 7,500 | 3,400 | 1,000 | 570 | | | | | | | | | | |
| | 3,200 | 1,700 | 3,600 | 1,100 | | | | | 5,100 | 1,800 | 650 | 850 | | | | | 3,800 | 2,100 | 520 | 470 | | | | | | | | | | |
| | 5,100 | 4,400 | 1,300 | 1,700 | | | | | 8,800 | 4,400 | 1,100 | 1,400 | | | | | 6,700 | 3,400 | 1,800 | 1,800 | | | | | | | | | | |
| | 5,900 | 2,200 | 700 | 240 | | | | | 11,000 | 2,600 | 660 | 580 | | | | | 7,000 | 3,000 | 880 | 1,000 | | | | | | | | | | |
| | 4,000 | 4,100 | 1,700 | 850 | | | | | 3,500 | 2,100 | 1,000 | 780 | | | | | 2,000 | 3,100 | 930 | 430 | | | | | | | | | | |
| | 5,000 | 2,100 | 4,600 | 1,100 | | | | | 6,400 | 4,000 | 2,100 | 780 | | | | | 5,300 | 5,000 | 2,800 | 1,300 | | | | | | | | | | |
| | 7,300 | 5,200 | 3,400 | 910 | | | | | 4,400 | 2,500 | 1,600 | 1,000 | | | | | 3,800 | 2,200 | 1,200 | 1,600 | | | | | | | | | | |
| | 15,000 | 1,900 | 720 | 440 | | | | | 15,000 | 2,500 | 390 | 280 | | | | | 4,400 | 4,300 | 1,100 | 600 | | | | | | | | | | |
| | 11,000 | 950 | 390 | 270 | | | | | 9,200 | 5,000 | 830 | 240 | | | | | 4,800 | 1,600 | 670 | 460 | | | | | | | | | | |
| | 64,000 | 1,200 | 1,800 | 990 | | | | | 42,000 | 4,400 | 7,400 | 760 | | | | | 12,000 | 6,600 | 3,900 | 680 | | | | | | | | | | |
| | 51,000 | 5,200 | 2,400 | 1,200 | 1,500 | 2,500 | | | 66,000 | 5,900 | 3,400 | 15,000 | 2,500 | 1,000 | | | 63,000 | 9,100 | 1,700 | 2,900 | 3,200 | 1,700 | | | | | | | | |
| | 5,300 | 7,200 | 1,800 | 630 | | | | | 4,300 | 1,800 | 620 | 280 | | | | | 3,600 | 760 | 270 | 190 | | | | | | | | | | |
| | 4,800 | 2,200 | 650 | 720 | | | | | 3,600 | 1,000 | 420 | 270 | | | | | 5,300 | 2,000 | 900 | 510 | | | | | | | | | | |
| | 840 | 6,000 | 2,800 | 690 | | | | | 3,300 | 1,700 | 1,100 | 410 | | | | | 5,000 | 3,600 | 1,600 | 1,400 | | | | | | | | | | |
| | 12,000 | 15,000 | 4,100 | 3,000 | | | | | 6,700 | 4,100 | 1,600 | 1,000 | | | | | 8,600 | 4,800 | 2,600 | 1,600 | | | | | | | | | | |
| | 7,900 | 9,200 | 4,000 | 2,400 | | | | | 6,300 | 5,400 | 1,900 | 1,200 | | | | | 5,900 | 6,200 | 1,400 | 930 | | | | | | | | | | |
| | 3,000 | 5,200 | 2,600 | 1,000 | | | | | 8,200 | 8,600 | 3,800 | 1,800 | | | | | 3,900 | 3,000 | 1,600 | 1,500 | | | | | | | | | | |
| | 5,800 | 6,200 | 2,500 | 1,100 | | | | | 3,400 | 2,800 | 2,000 | 1,100 | | | | | 11,000 | 4,100 | 1,900 | 850 | | | | | | | | | | |
| | 4,700 | 4,100 | 1,000 | 540 | | | | | 2,900 | 2,800 | 600 | 350 | | | | | 2,900 | 1,500 | 380 | 120 | | | | | | | | | | |
| | 5,300 | 5,600 | 1,100 | 720 | | | | | 6,200 | 6,500 | 2,100 | 1,200 | | | | | 4,900 | 3,000 | 1,100 | 520 | | | | | | | | | | |
| | 2,000 | 8,900 | 2,000 | 5,500 | 300 | 260 | 210 | 2,300 | 10,000 | 5,300 | 1,800 | 1,000 | | | | | 3,400 | 2,200 | 790 | 480 | | | | | | | | | | |
| | 3,000 | 2,600 | 1,400 | 2,400 | | | | | 22,000 | 11,000 | 11,000 | 5,900 | 6,400 | 7,600 | 23,000 | 13,000 | 13,000 | 12,000 | 10,000 | 5,300 | 1,300 | 1,700 | 810 | 40 | | | | | | |
| | 3,500 | 4,000 | 5,500 | 3,000 | | | | | 8,400 | 8,700 | 12,000 | 11,000 | 3,100 | 730 | 120 | 86 | 4,600 | 6,700 | 7,700 | 3,600 | | | | | | | | | | |
| | 13,000 | 5,700 | 710 | 400 | | | | | 29,000 | 1,700 | 650 | 780 | | | | | 7,300 | 7,000 | 1,300 | 420 | | | | | | | | | | |

PW = Parkway

YA = Yard Area

Concentrations are shown in micrograms per kilogram (µg/kg)

Depth is shown in inches below ground surface

Shaded results are equal to or exceed the DDT cleanup criteria of 4,100 µg/kg

TABLE 3-2
**PBB Analytical Results by Property**
Phase 2 of Velsicol ANP Residential Soil Remediation

| Address | | | | | | | | | YA1 | | | | | | | | YA2 | | | | | | | | YA3 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 - 6 | 6 - 12 | 12 - 18 | 18 - 24 | 24 - 30 | 30 - 36 | 36 - 42 | 42 - 48 | 0 - 6 | 6 - 12 | 12 - 18 | 18 - 24 | 24 - 30 | 30 - 36 | 36 - 42 | 42 - 48 | 0 - 6 | 6 - 12 | 12 - 18 | 18 - 24 | 24 - 30 | 30 - 36 | 36 - 42 | 42 - 48 | 0 - 6 | 6 - 12 | 12 - 18 | 18 - 24 | 24 - 30 | 30 - 36 |
| [redacted] | 7,200 | 1,800 | 510 | 510 | | | | | 370 | 300 | 290 | 300 | | | | | 300 | 260 | 260 | 140 | | | | | | | | | | |
| | 580 | 280 | 350 | 270 | | | | | 480 | 310 | 240 | 240 | | | | | 320 | 260 | 230 | 230 | | | | | | | | | | |
| | 4,000 | 1,500 | 380 | 320 | | | | | 630 | 430 | 330 | 280 | | | | | 370 | 290 | 250 | 230 | | | | | | | | | | |
| | 1,500 | 390 | 300 | 330 | | | | | 480 | 290 | 250 | 130 | | | | | 320 | 240 | 130 | 130 | | | | | | | | | | |
| | | | | | | | | | 710 | 330 | 310 | 270 | | | | | 270 | 260 | 250 | 250 | | | | | | | | | | |
| | 3,500 | 1,100 | 430 | 760 | 640 | 460 | | | 430 | 210 | 130 | 130 | 130 | 130 | | | 310 | 130 | 130 | 130 | 130 | 130 | | | 400 | 130 | 130 | 130 | 130 | 130 |
| | 1,400 | 1,900 | 450 | 830 | | | | | 720 | 870 | 470 | 360 | | | | | 270 | 260 | 150 | 150 | | | | | | | | | | |
| | 7,300 | 1,800 | 1,600 | 1,500 | 1,900 | 2,600 | 280 | 130 | 1,200 | 520 | 560 | 270 | 330 | 760 | | | 300 | 140 | 130 | 130 | 130 | 130 | | | | | | | | |
| | 8,500 | 2,000 | 550 | 230 | 170 | 680 | | | 880 | 140 | 130 | 130 | 130 | 130 | | | 140 | 140 | 140 | 140 | 140 | 140 | | | | | | | | |
| | 17,000 | 5,000 | 1,100 | 750 | 1,200 | 520 | | | 430 | 1,400 | 130 | 290 | 130 | 130 | | | 460 | 250 | 130 | 130 | 130 | 130 | | | | | | | | |
| | 3,900 | 130 | 130 | 540 | | | | | 1,200 | 130 | 130 | 130 | | | | | 170 | 140 | 130 | 130 | | | | | | | | | | |
| | 1,400 | 130 | 130 | 130 | 130 | 130 | | | 1,200 | 130 | 130 | 130 | 130 | 130 | | | 280 | 140 | 130 | 130 | 130 | 130 | | | | | | | | |
| | 190 | 220 | 92 | 90 | | | | | 230 | 230 | 90 | 90 | | | | | 94 | 93 | 91 | 89 | | | | | | | | | | |
| | 300 | 220 | 220 | 220 | | | | | 96 | 92 | 91 | 88 | | | | | 490 | 230 | 91 | 89 | | | | | | | | | | |
| | 150 | 130 | 130 | 130 | | | | | 150 | 130 | 130 | 130 | | | | | 150 | 140 | 130 | 130 | | | | | | | | | | |
| | 190 | 140 | 91 | 90 | | | | | 140 | 140 | 140 | 140 | | | | | 110 | 91 | 92 | 90 | | | | | | | | | | |
| | 410 | 220 | 210 | 210 | | | | | 320 | 220 | 220 | 210 | | | | | 230 | 88 | 87 | 86 | | | | | | | | | | |
| | 640 | 390 | 230 | 240 | 120 | 130 | 130 | 130 | 260 | 130 | 130 | 130 | | | | | | | | | | | | | | | | | | |
| | 130 | 91 | 91 | 90 | | | | | 130 | 230 | 89 | 88 | | | | | 96 | 92 | 89 | 88 | | | | | | | | | | |
| | 1,200 | 400 | 220 | 140 | 170 | 140 | 130 | 130 | 150 | 140 | 140 | 130 | | | | | 150 | 130 | 130 | 130 | | | | | | | | | | |
| | 160 | 88 | 90 | 90 | | | | | 150 | 91 | 91 | 90 | | | | | 97 | 92 | 88 | 86 | | | | | | | | | | |
| | 6,800 | 590 | 300 | 350 | | | | | 350 | 220 | 89 | 86 | | | | | 230 | 91 | 89 | 88 | | | | | | | | | | |
| | 800 | 380 | 290 | 280 | | | | | 530 | 280 | 230 | 240 | | | | | 330 | 260 | 130 | 130 | | | | | | | | | | |
| | 440 | 400 | 180 | 240 | 130 | 130 | 130 | 130 | 150 | 140 | 140 | 140 | | | | | 150 | 150 | 140 | 140 | | | | | | | | | | |
| | 260 | 140 | 130 | 130 | | | | | 140 | 140 | 140 | 140 | | | | | 150 | 140 | 140 | 140 | | | | | | | | | | |
| | 150 | 140 | 130 | 130 | | | | | 150 | 140 | 140 | 130 | | | | | 140 | 130 | 130 | 130 | | | | | | | | | | |
| | 310 | 240 | 130 | 230 | | | | | 300 | 240 | 140 | 130 | | | | | 300 | 230 | 130 | 130 | | | | | | | | | | |
| | 4,700 | 1,800 | 750 | 710 | 180 | 370 | 140 | 140 | 380 | 140 | 310 | 290 | | | | | 240 | 300 | 140 | 140 | | | | | | | | | | |
| | 330 | 270 | 140 | 140 | | | | | 140 | 140 | 140 | 140 | | | | | 140 | 140 | 140 | 140 | | | | | | | | | | |
| | 150 | 140 | 340 | 140 | | | | | 140 | 140 | 140 | 140 | | | | | 160 | 150 | 140 | 140 | | | | | | | | | | |
| | 260 | 140 | 140 | 140 | | | | | 150 | 140 | 140 | 140 | | | | | 140 | 140 | 130 | 130 | | | | | | | | | | |
| | 340 | 340 | 140 | 140 | | | | | 140 | 140 | 130 | 130 | | | | | 150 | 140 | 140 | 130 | | | | | | | | | | |
| | 230 | 110 | 92 | 92 | | | | | 120 | 93 | 95 | 92 | | | | | 92 | 91 | 91 | 90 | 120 | 120 | 130 | 120 | | | | | | |
| | 550 | 200 | 130 | 130 | | | | | 150 | 140 | 140 | 130 | | | | | 170 | 140 | 140 | 130 | | | | | | | | | | |
| | 170 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | | | | | | |
| | 200 | 140 | 130 | 130 | | | | | 280 | 130 | 130 | 130 | | | | | 190 | 130 | 130 | 130 | | | | | | | | | | |
| | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | | | | | | |
| | 160 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | | | | | | |
| | 340 | 140 | 130 | 130 | | | | | 280 | 130 | 130 | 130 | | | | | 290 | 140 | 130 | 130 | | | | | | | | | | |
| | 430 | 350 | 250 | 290 | | | | | 240 | 140 | 130 | 130 | | | | | 210 | 140 | 130 | 130 | | | | | | | | | | |
| | 240 | 360 | 160 | 150 | | | | | 250 | 90 | 88 | 87 | | | | | 190 | 94 | 92 | 89 | | | | | | | | | | |
| | 210 | 89 | 87 | 88 | | | | | 93 | 90 | 89 | 89 | | | | | 140 | 89 | 89 | 87 | | | | | | | | | | |
| | 950 | 630 | 190 | 130 | | | | | 740 | 140 | 130 | 130 | | | | | 320 | 290 | 140 | 130 | | | | | | | | | | |
| | 1,600 | 130 | 130 | 130 | | | | | 540 | 130 | 130 | 130 | | | | | 500 | 130 | 130 | 130 | | | | | | | | | | |
| | 600 | 140 | 180 | 170 | | | | | 680 | 140 | 190 | 130 | | | | | 420 | 170 | 130 | 130 | | | | | | | | | | |
| | 380 | 140 | 130 | 130 | 130 | 130 | | | 490 | 130 | 130 | 130 | 130 | 130 | | | 280 | 140 | 130 | 130 | 130 | 140 | | | | | | | | |
| | 130 | 130 | 130 | 130 | | | | | 140 | 130 | 140 | 130 | | | | | 140 | 140 | 130 | 130 | | | | | | | | | | |
| | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | 130 | 130 | 130 | 130 | | | | | | | | | | |
| | 230 | 250 | 150 | 160 | | | | | 170 | 150 | 150 | 150 | | | | | 170 | 140 | 150 | 150 | | | | | | | | | | |
| | 4,200 | 1,000 | 570 | 590 | | | | | 440 | 330 | 270 | 260 | | | | | 880 | 390 | 370 | 310 | | | | | | | | | | |
| | 1,000 | 870 | 550 | 380 | | | | | 300 | 270 | 140 | 140 | | | | | 340 | 320 | 250 | 140 | | | | | | | | | | |
| | 420 | 350 | 300 | 290 | | | | | 310 | 290 | 270 | 260 | | | | | 300 | 270 | 140 | 140 | | | | | | | | | | |
| | 340 | 260 | 140 | 140 | | | | | 160 | 140 | 150 | 140 | | | | | 150 | 150 | 140 | 130 | | | | | | | | | | |
| | 680 | 330 | 140 | 140 | | | | | 240 | 140 | 140 | 140 | | | | | 230 | 140 | 140 | 140 | | | | | | | | | | |
| | 300 | 240 | 130 | 130 | | | | | 300 | 250 | 130 | 130 | | | | | 280 | 250 | 130 | 130 | | | | | | | | | | |
| | 180 | 180 | 130 | 130 | 130 | 120 | 120 | 320 | 200 | 140 | 140 | 130 | | | | | 140 | 130 | 130 | 130 | | | | | | | | | | |
| | 91 | 90 | 89 | 91 | | | | | 95 | 93 | 92 | 93 | 130 | 140 | 170 | 140 | 97 | 93 | 170 | 93 | 140 | 140 | 140 | 140 | | | | | | |
| | 95 | 110 | 160 | 90 | | | | | 120 | 150 | 190 | 110 | 130 | 130 | 130 | 140 | 97 | 94 | 93 | 92 | | | | | | | | | | |
| | 3,800 | 1,200 | 290 | 250 | | | | | 2,500 | 360 | 130 | 130 | | | | | 1,800 | 370 | 140 | 130 | | | | | | | | | | |

PW = Parkway
YA = Yard Area
Concentrations are shown in micrograms per kilogram (µg/kg)
Depth is shown in inches below ground surface
Shaded results are equal to or exceed the PBB cleanup criteria of 1,200 µg/kg

TABLE 3-3
**Summary and Evaluation of Remediation Areas**
Phase 2 of Velsicol ANP Residential Soil Remediation

| | | Max Exceedance Depth (in) | | | | PW | | | | | | | | | | | YA1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Figure # | Address | PW | YA1 | YA2 | YA3 | Excavation Depth (in) | Area of Typical Excavation (sf) | Area of 6" manual excavation (sf) | Area without 6" over-excavation (sf) | Excavation Volume (cy) | Landscape Area (sf) | Topsoil Volume (cy) | Backfill Volume (cy) | Large Trees for Removal | Small Trees for Removal | Tree Stumps | Excavation Depth (in) | Area of Typical Excavation (sf) | Area of 6" manual excavation (sf) | Area without 6" over-excavation (sf) | Excavation Volume (cy) | Landscape Area (sf) | Topsoil Volume (cy) | Backfill Volume (cy) | Large Trees for Removal | Small Trees for Removal | Tree Stumps |
| 1 | [redacted] | 18 | 6 | 6 | - | 24 | 747 | | | 55.3 | | 11.5 | 41.5 | 1 | 0 | 0 | 12 | 2,124 | 183 | 103 | 84.0 | 66 | 38.6 | 38.1 | 0 | 0 | 0 |
| 2 | [redacted] | 18 | 6 | 6 | - | 24 | 799 | | | 59.2 | | 12.3 | 44.4 | 0 | 0 | 0 | 12 | 1,082 | 207 | 319 | 49.8 | 42 | 25.7 | 19.3 | 0 | 0 | 0 |
| 3 | [redacted] | 12 | 12 | 12 | - | 18 | 432 | 0 | 26 | 25.0 | | 7.1 | 16.5 | 0 | 0 | 0 | 18 | 280 | 126 | 354 | 31.0 | 0 | 11.7 | 16.9 | 0 | 0 | 0 |
| 4 | [redacted] | 6 | 6 | 12 | - | 12 | 642 | 617 | 585 | 46.0 | | 28.5 | 11.9 | 0 | 0 | 0 | 12 | 4,663 | 835 | 882 | 204.5 | | 98.5 | 86.4 | 0 | 5 | 0 |
| 5 | [redacted] | 0 | 6 | 12 | - | 0 | | | | | | | | | | | 12 | 563 | 297 | 970 | 44.3 | | 28.2 | 10.4 | 0 | 0 | 0 |
| 6 | [redacted] | 30 | 18 | 12 | 12 | 36 | 747 | | | 83.0 | | 11.5 | 69.2 | 0 | 0 | 0 | 24 | 1,100 | 197 | 442 | 109.7 | 72 | 29.7 | 74.8 | 0 | 0 | 0 |
| 7 | [redacted] | 24 | 12 | 18 | - | 30 | 871 | | | 80.6 | | 13.4 | 64.5 | 0 | 0 | 0 | 18 | 1,288 | 238 | 393 | 90.5 | 86 | 33.1 | 51.8 | 0 | 0 | 0 |
| 8 | [redacted] | 36 | 6 | 6 | - | 42 | 602 | | | 78.0 | | 9.3 | 66.9 | 2 | 0 | 0 | 12 | 717 | 21 | 58 | 28.0 | 74 | 13.9 | 11.9 | 0 | 0 | 0 |
| 9 | [redacted] | 12 | 6 | 12 | - | 18 | 879 | | | 48.8 | | 13.6 | 32.6 | 0 | 0 | 0 | 12 | 1,547 | 201 | 454 | 69.4 | | 34.0 | 28.6 | 0 | 1 | 0 |
| 10 | [redacted] | 30 | 12 | 12 | - | 36 | 664 | | | 73.8 | | 10.2 | 61.5 | 2 | 0 | 0 | 18 | 660 | 41 | 73 | 40.1 | 143 | 17.7 | 20.5 | 0 | 0 | 0 |
| 11 | [redacted] | 6 | 6 | 6 | - | 12 | 685 | | | 25.4 | | 10.6 | 12.7 | 0 | 0 | 0 | 12 | 1,645 | 194 | 36 | 65.2 | 55 | 30.1 | 29.4 | 0 | 2 | 0 |
| 12 | [redacted] | 6 | 6 | 6 | - | 12 | 4,645 | 163 | 116 | 177.2 | | 76.0 | 86.0 | 0 | 0 | 0 | 12 | 1,158 | 513 | | 52.4 | 44 | 26.7 | 20.6 | 0 | 0 | 0 |
| 13 | [redacted] | 12 | 6 | 0 | - | 12 | 396 | 141 | | 17.3 | | 8.3 | 7.3 | 0 | 0 | 0 | 6 | 508 | | | 9.4 | 267 | 8.7 | 0.0 | 0 | 0 | 0 |
| 14 | [redacted] | 6 | 0 | 12 | - | 6 | 1,469 | 470 | | 35.9 | | 29.9 | 0.0 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 15 | [redacted] | 0 | 6 | 6 | - | 0 | | | | | | | | | | | 6 | 1,745 | 231 | | 36.6 | 216 | 31.2 | 0.0 | 0 | 0 | 0 |
| 16 | [redacted] | 12 | 6 | 0 | - | 18 | 685 | 850 | 1,897 | 124.1 | | 53.0 | 60.5 | 0 | 0 | 0 | 12 | 652 | 347 | 1,036 | 49.8 | 307 | 38.0 | 6.4 | 0 | 2 | 0 |
| 17 | [redacted] | 12 | 18 | 12 | - | 12 | 2,197 | 138 | | 83.9 | 85 | 37.9 | 39.1 | 0 | 0 | 0 | 18 | 752 | 119 | | 44.0 | | 13.4 | 27.9 | 0 | 0 | 0 |
| 18 | [redacted] | 24 | 18 | - | - | 24 | 1,154 | 230 | | 89.7 | | 21.4 | 64.1 | 2 | 0 | 0 | 18 | 2,590 | 273 | | 148.9 | | 44.2 | 95.9 | 0 | 0 | 0 |
| 19 | [redacted] | 12 | 12 | 12 | - | 18 | 728 | 121 | 336 | 55.1 | | 18.3 | 33.2 | 0 | 0 | 0 | 18 | 1,012 | 129 | 233 | 67.2 | | 21.2 | 41.8 | 0 | 2 | 0 |
| 20 | [redacted] | 24 | 6 | 6 | - | 30 | 1,652 | | | 153.0 | | 25.5 | 122.4 | 3 | 0 | 0 | 12 | 3,057 | 30 | 701 | 126.8 | 122 | 61.1 | 54.4 | 0 | 0 | 0 |
| 21 | [redacted] | 6 | 12 | 6 | - | 12 | 604 | | | 22.4 | | 9.3 | 11.2 | 0 | 0 | 0 | 18 | 1,479 | 368 | | 89.0 | 278 | 39.7 | 44.5 | 0 | 0 | 0 |
| 22 | [redacted] | 12 | 6 | 6 | - | 18 | 2,987 | | 141 | 171.2 | | 48.3 | 113.2 | 0 | 0 | 0 | 12 | 2,353 | 579 | 1,004 | 116.5 | 106 | 63.0 | 41.6 | 0 | 0 | 1 |
| 23 | [redacted] | 12 | 6 | 12 | - | 18 | 5,404 | | | 300.2 | | 83.4 | 200.1 | 2 | 0 | 0 | 12 | 1,620 | 203 | 10 | 63.9 | 82 | 30.1 | 28.5 | 0 | 0 | 0 |
| 24 | [redacted] | 24 | 12 | 18 | - | 30 | 4,986 | | | 461.7 | 246 | 86.8 | 360.2 | 13 | 0 | 0 | 18 | 7,519 | 665 | 1,206 | 474.7 | 1031 | 186.3 | 262.6 | 0 | 2 | 0 |
| 25 | [redacted] | 12 | 12 | 18 | - | 18 | 1,651 | | 80 | 94.7 | | 26.7 | 62.6 | 0 | 0 | 0 | 18 | 6,848 | 589 | 2,242 | 474.4 | | 149.4 | 295.1 | 0 | 0 | 0 |
| 26 | [redacted] | 12 | 12 | 6 | - | 12 | 1,542 | 120 | | 59.3 | | 25.6 | 28.6 | 0 | 0 | 0 | 12 | 1,672 | 521 | | 71.6 | | 33.8 | 31.0 | 0 | 0 | 0 |
| 27 | [redacted] | 12 | 12 | 12 | - | 12 | 5,354 | 113 | | 200.4 | | 84.4 | 99.1 | 0 | 0 | 0 | 12 | 2,778 | 8 | | 103.0 | | 43.0 | 51.4 | 0 | 0 | 0 |
| 28 | [redacted] | 30 | 18 | 12 | - | 36 | 3,029 | | | 336.6 | | 46.7 | 280.5 | 1 | 0 | 0 | 24 | 3,496 | 201 | 101 | 268.3 | | 58.6 | 198.0 | 1 | 0 | 0 |
| 29 | [redacted] | 6 | 0 | 0 | - | 6 | 4,673 | 797 | | 101.3 | | 84.4 | 0.0 | 0 | 0 | 1 | 0 | | | | | | | | | | |
| 30 | [redacted] | 12 | 6 | 12 | - | 12 | 878 | | | 32.5 | | 13.5 | 16.3 | 0 | 0 | 0 | 6 | 1,615 | | | 29.9 | | 24.9 | 0.0 | 0 | 0 | 1 |
| 31 | [redacted] | 12 | 6 | 0 | - | 12 | 828 | 121 | | 32.9 | | 14.6 | 15.3 | 0 | 0 | 0 | 6 | 1,338 | 117 | | 26.9 | | 22.5 | 0.0 | 0 | 0 | 0 |
| 32 | [redacted] | 12 | 0 | 0 | - | 12 | 962 | 243 | | 40.1 | | 18.6 | 17.8 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 33 | [redacted] | 12 | 12 | 24 | - | 12 | 446 | | | 16.5 | | 6.9 | 8.3 | 0 | 0 | 0 | 12 | 339 | | | 12.6 | 51 | 6.3 | 5.3 | 0 | 0 | 0 |
| 34 | [redacted] | 12 | 6 | 12 | - | 18 | 288 | 530 | 817 | 56.1 | | 25.2 | 25.8 | 0 | 0 | 0 | 12 | 1,602 | | 484 | 68.3 | 1007 | 53.9 | 11.0 | 0 | 0 | 0 |
| 35 | [redacted] | 12 | 6 | 0 | - | 12 | 788 | 212 | | 33.1 | | 15.4 | 14.6 | 0 | 0 | 0 | 6 | 1,927 | 126 | | 38.0 | | 31.7 | 0.0 | 0 | 0 | 0 |
| 36 | [redacted] | 12 | 6 | 6 | - | 18 | 950 | | 22 | 53.6 | | 15.0 | 35.6 | 0 | 0 | 0 | 12 | 1,105 | | | 40.9 | | 17.1 | 20.5 | 0 | 3 | 0 |
| 37 | [redacted] | 0 | 6 | 0 | - | 0 | | | | | | | | | | | 6 | 1,284 | | | 23.8 | 77 | 20.1 | 0.0 | 0 | 0 | 0 |
| 38 | [redacted] | 12 | 12 | 6 | - | 12 | 576 | 471 | | 30.1 | | 16.2 | 10.7 | 0 | 0 | 0 | 12 | 1,763 | 116 | | 67.4 | | 29.0 | 32.6 | 0 | 4 | 0 |
| 39 | [redacted] | 6 | 6 | 6 | - | 12 | 338 | 59 | 59 | 14.7 | | 7.0 | 6.3 | 0 | 0 | 0 | 12 | 1,118 | | 239 | 45.8 | 103 | 23.2 | 18.8 | 0 | 0 | 0 |
| 40 | [redacted] | 12 | 0 | 0 | - | 12 | 997 | 30 | | 37.5 | | 15.8 | 18.5 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 41 | [redacted] | 18 | 6 | 12 | - | 18 | 787 | 313 | | 49.5 | | 17.0 | 29.1 | 0 | 0 | 0 | 6 | 1,161 | 698 | | 34.4 | | 28.7 | 0.0 | 0 | 0 | 0 |
| 42 | [redacted] | 6 | 6 | 6 | - | 12 | 1,589 | 309 | 1,063 | 84.3 | | 45.7 | 29.4 | 0 | 0 | 0 | 12 | 765 | | 295 | 33.8 | 70 | 17.9 | 12.9 | 0 | 0 | 0 |
| 43 | [redacted] | 6 | 6 | 12 | - | 12 | 1,851 | | | 68.6 | | 28.6 | 34.3 | 0 | 0 | 0 | 12 | 1,011 | | | 37.4 | 36 | 16.4 | 18.1 | 0 | 0 | 0 |
| 44 | [redacted] | 6 | 12 | 6 | - | 12 | 1,371 | | | 50.8 | | 21.2 | 25.4 | 0 | 0 | 0 | 18 | 1,666 | 90 | 38 | 95.6 | | 27.7 | 62.4 | 0 | 0 | 0 |
| 45 | [redacted] | 6 | 18 | 12 | - | 12 | 1,464 | | | 54.2 | | 22.6 | 27.1 | 0 | 0 | 0 | 24 | 3,175 | | | 235.2 | 326 | 62.1 | 164.3 | 0 | 0 | 0 |
| 46 | [redacted] | 12 | 24 | 12 | - | 18 | 3,094 | | | 171.9 | | 47.7 | 114.6 | 0 | 0 | 0 | 30 | 3,603 | | 24 | 335.4 | 23 | 56.9 | 267.4 | 3 | 0 | 0 |
| 47 | [redacted] | 12 | 6 | 0 | - | 12 | 2,651 | 193 | | 101.8 | | 43.9 | 49.1 | 0 | 0 | 0 | 6 | 854 | | | 15.8 | | 13.2 | 0.0 | 0 | 0 | 0 |
| 48 | [redacted] | 6 | 0 | 6 | - | 6 | 3,104 | 529 | | 67.3 | | 56.1 | 0.0 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 49 | [redacted] | 12 | 0 | 6 | - | 18 | 1,188 | | | 66.0 | | 18.3 | 44.0 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 50 | [redacted] | 18 | 12 | 12 | - | 24 | 2,856 | | | 211.6 | | 44.1 | 158.7 | 2 | 0 | 0 | 18 | 1,540 | 334 | 296 | 102.7 | | 33.5 | 62.5 | 0 | 6 | 0 |
| 51 | [redacted] | 12 | 12 | 12 | - | 18 | 3,213 | 380 | 504 | 204.2 | | 63.2 | 128.3 | 0 | 0 | 0 | 18 | 3,601 | 116 | | 202.2 | 98 | 61.3 | 129.7 | 0 | 0 | 0 |
| 52 | [redacted] | 12 | 12 | 0 | - | 12 | 3 | 29 | | 0.6 | | 0.5 | 0.1 | 0 | 0 | 0 | 12 | 1,109 | 416 | | 48.8 | 126 | 26.3 | 18.2 | 0 | 1 | 0 |
| 53 | [redacted] | 12 | 0 | 12 | - | 12 | 3,417 | 256 | | 131.3 | | 56.7 | 63.3 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 54 | [redacted] | 12 | 0 | 0 | - | 12 | 1,615 | 273 | | 64.9 | | 29.1 | 29.9 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| 55 | [redacted] | 12 | 12 | 6 | - | 12 | 1,419 | 201 | | 56.3 | | 25.0 | 26.3 | 0 | 0 | 0 | 12 | 1,724 | 402 | | 71.3 | 85 | 34.6 | 30.4 | 0 | 0 | 0 |
| 55 | [redacted] | 12 | 12 | 6 | - | 12 | 1,033 | | | 38.3 | | 15.9 | 19.1 | 0 | 0 | 0 | 12 | 1,634 | 224 | | 64.7 | | 28.7 | 30.3 | 0 | 0 | 0 |
| 56 | [redacted] | 24 | 12 | 0 | - | 24 | 1,233 | | | 91.3 | | 19.0 | 68.5 | 1 | 0 | 0 | 12 | 1,796 | 376 | | 73.5 | 22 | 34.0 | 32.9 | 0 | 0 | 0 |
| 57 | [redacted] | 0 | 48 | 24 | - | 0 | | | | | | | | | | | 48 | 1,965 | | | 291.1 | | 30.3 | 254.7 | 0 | 0 | 0 |
| 58 | [redacted] | 18 | 24 | 18 | - | 24 | 1,134 | | | 84.0 | | 17.5 | 63.0 | 0 | 0 | 0 | 30 | 9,664 | | | 894.8 | 879 | 184.4 | 683.3 | 0 | 2 | 0 |
| 59 | [redacted] | 12 | 6 | 12 | - | 18 | 2,944 | 964 | 615 | 204.2 | | 69.8 | 120.4 | 0 | 0 | 0 | 12 | 3,062 | 2,131 | 189 | 156.4 | | 83.1 | 56.7 | 0 | 0 | 0 |
| | [redacted] | | | | | | 93,241 | 8,873 | 6,261 | 5,207 | 331 | 1,684 | 3,189 | 29 | 0 | 1 | | 105,329 | 12,462 | 12,182 | 6,060 | 5,894 | 2,177 | 3,500 | 4 | 30 | 2 |

PW = Parkway
YA = Yard Area
in = inches below ground surface
sf = square feet
cy = cubic yards
Excavation depth is 6 inches greater than maximum exceedance depth

TABLE 3-3
**Summary and Evaluation of Remediation Areas**
Phase 2 of Velsicol ANP Residential Soil Remediation

| | | Max Exceedance Depth (in) | | | | YA2 | | | | | | | | | | | YA3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Figure # | Address | PW | YA1 | YA2 | YA3 | Excavation Depth (in) | Area of Typical Excavation (sf) | Area of 6" manual excavation (sf) | Area without 6" over-excavation (sf) | Excavation Volume (cy) | Landscape Area (sf) | Topsoil Volume (cy) | Backfill Volume (cy) | Large Trees for Removal | Small Trees for Removal | Tree Stumps | Excavation Depth (in) | Area of Typical Excavation (sf) | Area of 6" manual excavation (sf) | Area without 6" over-excavation (sf) | Excavation Volume (cy) | Landscape Area (sf) | Topsoil Volume (cy) | Backfill Volume (cy) | Large Trees for Removal | Small Trees for Removal | Tree Stumps |
| 1 | [redacted] | 18 | 6 | 6 | - | 12 | 5,611 | 198 | 69 | 212.8 | 448 | 100.4 | 95.6 | 0 | 0 | 0 | | | | | | | | | | | |
| 2 | [redacted] | 18 | 6 | 6 | - | 12 | 2,690 | 735 | 3,767 | 183.0 | | 111.0 | 49.8 | 0 | 0 | 0 | | | | | | | | | | | |
| 3 | [redacted] | 12 | 12 | 12 | - | 18 | 3,133 | 348 | 1,842 | 248.7 | 0 | 82.1 | 150.1 | 0 | 0 | 0 | | | | | | | | | | | |
| 4 | [redacted] | 6 | 6 | 12 | - | 18 | 6,305 | 1,788 | 2,274 | 467.6 | 771 | 190.9 | 247.1 | 0 | 0 | 0 | | | | | | | | | | | |
| 5 | [redacted] | 0 | 6 | 12 | - | 18 | 2,663 | 522 | 1,112 | 198.8 | 240 | 75.9 | 110.3 | 0 | 0 | 0 | | | | | | | | | | | |
| 6 | [redacted] | 30 | 18 | 12 | 12 | 18 | 2,826 | 493 | 392 | 180.6 | 29 | 58.4 | 110.9 | 0 | 0 | 0 | 18 | 172 | | 43 | 11.1 | | 3.3 | 7.2 | 0 | 0 | 0 |
| 7 | [redacted] | 24 | 12 | 18 | - | 24 | 5,191 | 663 | 260 | 411.2 | | 94.4 | 298.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 8 | [redacted] | 36 | 6 | 6 | - | 12 | 4,619 | 399 | 344 | 184.8 | 275 | 88.7 | 80.4 | 0 | 0 | 0 | | | | | | | | | | | |
| 9 | [redacted] | 12 | 6 | 12 | - | 18 | 4,079 | 402 | 1,658 | 295.5 | | 94.7 | 181.8 | 0 | 0 | 0 | | | | | | | | | | | |
| 10 | [redacted] | 30 | 12 | 12 | - | 18 | 1,914 | 253 | 130 | 115.8 | 60 | 37.9 | 71.1 | 0 | 13 | 0 | | | | | | | | | | | |
| 11 | [redacted] | 6 | 6 | 6 | - | 12 | 2,465 | 525 | 906 | 117.8 | | 60.1 | 45.6 | 0 | 0 | 0 | | | | | | | | | | | |
| 12 | [redacted] | 6 | 6 | 6 | - | 12 | 5,804 | 132 | 48 | 218.3 | | 92.3 | 107.5 | 0 | 0 | 0 | | | | | | | | | | | |
| 13 | [redacted] | 12 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 14 | [redacted] | 6 | 0 | 12 | - | 12 | 1,583 | 320 | | 64.6 | 809 | 46.8 | 14.3 | 0 | 0 | 0 | | | | | | | | | | | |
| 15 | [redacted] | 0 | 6 | 6 | - | 6 | 3,419 | 1,143 | | 84.5 | 187 | 71.0 | 0.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 16 | [redacted] | 12 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 17 | [redacted] | 12 | 18 | 12 | - | 12 | 666 | 65 | | 25.9 | 76 | 12.9 | 10.9 | 0 | 0 | 0 | | | | | | | | | | | |
| 18 | [redacted] | 24 | 18 | - | - | - | | | | | | | | | | | | | | | | | | | | | |
| 19 | [redacted] | 12 | 12 | 12 | - | 18 | 2,635 | | | 146.4 | | 40.7 | 97.6 | 0 | 0 | 0 | | | | | | | | | | | |
| 20 | [redacted] | 24 | 6 | 6 | - | 12 | 2,043 | 231 | 2,364 | 123.7 | 287 | 77.8 | 32.5 | 0 | 0 | 1 | | | | | | | | | | | |
| 21 | [redacted] | 6 | 12 | 6 | - | 12 | 2,569 | 636 | 658 | 119.1 | 567 | 71.9 | 37.1 | 0 | 0 | 0 | | | | | | | | | | | |
| 22 | [redacted] | 12 | 6 | 6 | - | 12 | 1,940 | | 44 | 72.7 | 101 | 32.8 | 34.1 | 0 | 0 | 0 | | | | | | | | | | | |
| 23 | [redacted] | 12 | 6 | 12 | - | 18 | 4,381 | 699 | 1,085 | 296.5 | | 95.1 | 182.4 | 0 | 0 | 1 | | | | | | | | | | | |
| 24 | [redacted] | 24 | 12 | 18 | - | 24 | 5,464 | 1,263 | 1,094 | 488.9 | 2305 | 213.2 | 258.7 | 0 | 1 | 0 | | | | | | | | | | | |
| 25 | [redacted] | 12 | 12 | 18 | - | 24 | 1,336 | | 28 | 100.5 | 223 | 30.0 | 67.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 26 | [redacted] | 12 | 12 | 6 | - | 6 | 3,704 | 653 | | 80.7 | | 67.2 | 0.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 27 | [redacted] | 12 | 12 | 12 | - | 12 | 6,067 | | | 224.7 | | 93.6 | 112.4 | 0 | 0 | 0 | | | | | | | | | | | |
| 28 | [redacted] | 30 | 18 | 12 | - | 18 | 2,319 | 58 | 59 | 132.1 | 120 | 42.4 | 82.5 | 0 | 0 | 0 | | | | | | | | | | | |
| 29 | [redacted] | 6 | 0 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 30 | [redacted] | 12 | 6 | 12 | - | 12 | 5,100 | 443 | | 197.1 | | 85.5 | 94.4 | 0 | 0 | 4 | | | | | | | | | | | |
| 31 | [redacted] | 12 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 32 | [redacted] | 12 | 0 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 33 | [redacted] | 12 | 12 | 24 | - | 24 | 755 | 166 | | 59.0 | | 14.2 | 41.9 | 0 | 0 | 0 | | | | | | | | | | | |
| 34 | [redacted] | 12 | 6 | 12 | - | 18 | 6,540 | 735 | 1,466 | 431.2 | 753 | 165.1 | 241.5 | 0 | 1 | 0 | | | | | | | | | | | |
| 35 | [redacted] | 12 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 36 | [redacted] | 12 | 6 | 6 | - | 12 | 5,502 | 357 | 1,691 | 241.7 | | 116.5 | 101.9 | 0 | 0 | 0 | | | | | | | | | | | |
| 37 | [redacted] | 0 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 38 | [redacted] | 12 | 12 | 6 | - | 6 | 798 | 354 | | 21.3 | | 17.8 | 0.0 | 0 | 1 | 0 | | | | | | | | | | | |
| 39 | [redacted] | 6 | 6 | 6 | - | 12 | 4,146 | 363 | 1,123 | 181.1 | | 86.9 | 76.8 | 0 | 0 | 0 | | | | | | | | | | | |
| 40 | [redacted] | 12 | 0 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 41 | [redacted] | 18 | 6 | 12 | - | 12 | 2,546 | 664 | | 106.6 | 503 | 60.4 | 37.8 | 0 | 0 | 0 | | | | | | | | | | | |
| 42 | [redacted] | 6 | 6 | 6 | - | 12 | 866 | | 104 | 34.0 | | 15.0 | 16.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 43 | [redacted] | 6 | 6 | 12 | - | 18 | 2,227 | 117 | 408 | 141.0 | | 42.5 | 90.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 44 | [redacted] | 6 | 12 | 6 | - | 12 | 3,985 | 1,005 | 710 | 179.4 | | 88.0 | 73.8 | 0 | 0 | 0 | | | | | | | | | | | |
| 45 | [redacted] | 6 | 18 | 12 | - | 18 | 3,517 | 246 | 876 | 232.4 | | 71.6 | 146.5 | 0 | 0 | 0 | | | | | | | | | | | |
| 46 | [redacted] | 12 | 24 | 12 | - | 18 | 5,242 | 603 | 1,143 | 344.7 | | 107.8 | 215.3 | 0 | 2 | 0 | | | | | | | | | | | |
| 47 | [redacted] | 12 | 6 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 48 | [redacted] | 6 | 0 | 6 | - | 6 | 1,288 | | | 23.9 | | 19.9 | 0.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 49 | [redacted] | 12 | 0 | 6 | - | 12 | 3,890 | 201 | 798 | 162.6 | 9 | 75.6 | 71.9 | 0 | 0 | 0 | | | | | | | | | | | |
| 50 | [redacted] | 18 | 12 | 12 | - | 18 | 3,428 | 323 | 1,629 | 256.8 | | 83.0 | 157.1 | 0 | 1 | 0 | | | | | | | | | | | |
| 51 | [redacted] | 12 | 12 | 12 | - | 18 | 1,719 | 694 | 2,675 | 207.4 | | 78.5 | 113.2 | 0 | 0 | 0 | | | | | | | | | | | |
| 52 | [redacted] | 12 | 12 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 53 | [redacted] | 12 | 0 | 12 | - | 12 | 2,286 | 302 | | 90.3 | 44 | 40.9 | 41.5 | 0 | 0 | 1 | | | | | | | | | | | |
| 54 | [redacted] | 12 | 0 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 55 | [redacted] | 12 | 12 | 6 | - | 6 | 5,952 | 402 | | 117.7 | | 98.1 | 0.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 55 | [redacted] | 12 | 12 | 6 | - | 6 | 1,819 | | | 33.7 | | 28.1 | 0.0 | 0 | 0 | 0 | | | | | | | | | | | |
| 56 | [redacted] | 24 | 12 | 0 | - | 0 | | | | | | | | | | | | | | | | | | | | | |
| 57 | [redacted] | 0 | 48 | 24 | - | 30 | 4,209 | | | 389.7 | | 65.0 | 311.8 | 3 | 0 | 0 | | | | | | | | | | | |
| 58 | [redacted] | 18 | 24 | 18 | - | 24 | 6,615 | 201 | 240 | 507.1 | 212 | 117.4 | 368.5 | 1 | 1 | 0 | | | | | | | | | | | |
| 59 | [redacted] | 12 | 6 | 12 | - | 18 | 4,072 | 1,421 | 501 | 271.1 | 108 | 96.8 | 156.1 | 0 | 0 | 0 | | | | | | | | | | | |
| | [redacted] | | | | | | 161,928 | 20,123 | 31,498 | 9,025 | 8,127 | 3,557 | 4,834 | 4 | 20 | 7 | | 172 | 0 | 43 | 11 | 0 | 3 | 7 | 0 | 0 | 0 |

PW = Parkway
YA = Yard Area
in = inches below ground surface
sf = square feet
cy = cubic yards
Excavation depth is 6 inches greater than maximum exceedance depth

TABLE 3-3
**Summary and Evaluation of Remediation Areas**
Phase 2 of Velsicol ANP Residential Soil Remediation

| | | Max Exceedance Depth (in) | | | | Entire Property | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Figure # | Address | PW | YA1 | YA2 | YA3 | Area of Typical Excavation (sf) | Area of 6" manual excavation (sf) | Area without 6" over-excavation (sf) | Excavation Volume (cy) | Landscape Area (sf) | Topsoil Volume (cy) | Backfill Volume (cy) | Large Trees for Removal | Small Trees for Removal | Tree Stumps |
| 1 | [redacted] | 18 | 6 | 6 | - | 8,482 | 381 | 172 | 352 | 514 | 151 | 175 | 1 | 0 | 0 |
| 2 | [redacted] | 18 | 6 | 6 | - | 4,571 | 942 | 4,086 | 292 | 42 | 149 | 113 | 0 | 0 | 0 |
| 3 | [redacted] | 12 | 12 | 12 | - | 3,845 | 474 | 2,222 | 305 | 0 | 101 | 184 | 0 | 0 | 0 |
| 4 | [redacted] | 6 | 6 | 12 | - | 11,610 | 3,240 | 3,741 | 718 | 771 | 318 | 345 | 0 | 5 | 0 |
| 5 | [redacted] | 0 | 6 | 12 | - | 3,226 | 819 | 2,082 | 243 | 240 | 104 | 121 | 0 | 0 | 0 |
| 6 | [redacted] | 30 | 18 | 12 | 12 | 4,845 | 690 | 877 | 384 | 101 | 103 | 262 | 0 | 0 | 0 |
| 7 | [redacted] | 24 | 12 | 18 | - | 7,350 | 901 | 653 | 582 | 86 | 141 | 414 | 0 | 0 | 0 |
| 8 | [redacted] | 36 | 6 | 6 | - | 5,938 | 420 | 402 | 291 | 349 | 112 | 159 | 2 | 0 | 0 |
| 9 | [redacted] | 12 | 6 | 12 | - | 6,505 | 603 | 2,112 | 414 | 0 | 142 | 243 | 0 | 1 | 0 |
| 10 | [redacted] | 30 | 12 | 12 | - | 3,238 | 294 | 203 | 230 | 203 | 66 | 153 | 2 | 13 | 0 |
| 11 | [redacted] | 6 | 6 | 6 | - | 4,795 | 719 | 942 | 208 | 55 | 101 | 88 | 0 | 2 | 0 |
| 12 | [redacted] | 6 | 6 | 6 | - | 11,607 | 808 | 164 | 448 | 44 | 195 | 214 | 0 | 0 | 0 |
| 13 | [redacted] | 12 | 6 | 0 | - | 904 | 141 | 0 | 27 | 267 | 17 | 7 | 0 | 0 | 0 |
| 14 | [redacted] | 6 | 0 | 12 | - | 3,052 | 790 | 0 | 100 | 809 | 77 | 14 | 0 | 0 | 0 |
| 15 | [redacted] | 0 | 6 | 6 | - | 5,164 | 1,374 | 0 | 121 | 403 | 102 | 0 | 0 | 0 | 0 |
| 16 | [redacted] | 12 | 6 | 0 | - | 1,337 | 1,197 | 2,933 | 174 | 307 | 91 | 67 | 0 | 2 | 0 |
| 17 | [redacted] | 12 | 18 | 12 | - | 3,615 | 322 | 0 | 154 | 161 | 64 | 78 | 0 | 0 | 0 |
| 18 | [redacted] | 24 | 18 | - | - | 3,744 | 503 | 0 | 239 | 0 | 66 | 160 | 2 | 0 | 0 |
| 19 | [redacted] | 12 | 12 | 12 | - | 4,375 | 250 | 569 | 269 | 0 | 80 | 173 | 0 | 2 | 0 |
| 20 | [redacted] | 24 | 6 | 6 | - | 6,752 | 261 | 3,065 | 403 | 409 | 164 | 209 | 3 | 0 | 1 |
| 21 | [redacted] | 6 | 12 | 6 | - | 4,652 | 1,004 | 658 | 230 | 845 | 121 | 93 | 0 | 0 | 0 |
| 22 | [redacted] | 12 | 6 | 6 | - | 7,280 | 579 | 1,189 | 360 | 207 | 144 | 189 | 0 | 0 | 1 |
| 23 | [redacted] | 12 | 6 | 12 | - | 11,405 | 902 | 1,095 | 661 | 82 | 209 | 411 | 2 | 0 | 1 |
| 24 | [redacted] | 24 | 12 | 18 | - | 17,969 | 1,928 | 2,300 | 1,425 | 3,582 | 486 | 882 | 13 | 3 | 0 |
| 25 | [redacted] | 12 | 12 | 18 | - | 9,835 | 589 | 2,350 | 670 | 223 | 206 | 425 | 0 | 0 | 0 |
| 26 | [redacted] | 12 | 12 | 6 | - | 6,918 | 1,294 | 0 | 212 | 0 | 127 | 60 | 0 | 0 | 0 |
| 27 | [redacted] | 12 | 12 | 12 | - | 14,199 | 121 | 0 | 528 | 0 | 221 | 263 | 0 | 0 | 0 |
| 28 | [redacted] | 30 | 18 | 12 | - | 8,844 | 259 | 160 | 737 | 120 | 148 | 561 | 2 | 0 | 0 |
| 29 | [redacted] | 6 | 0 | 0 | - | 4,673 | 797 | 0 | 101 | 0 | 84 | 0 | 0 | 0 | 1 |
| 30 | [redacted] | 12 | 6 | 12 | - | 7,593 | 443 | 0 | 260 | 0 | 124 | 111 | 0 | 0 | 5 |
| 31 | [redacted] | 12 | 6 | 0 | - | 2,166 | 238 | 0 | 60 | 0 | 37 | 15 | 0 | 0 | 0 |
| 32 | [redacted] | 12 | 0 | 0 | - | 962 | 243 | 0 | 40 | 0 | 19 | 18 | 0 | 0 | 0 |
| 33 | [redacted] | 12 | 12 | 24 | - | 1,540 | 166 | 0 | 88 | 51 | 27 | 56 | 0 | 0 | 0 |
| 34 | [redacted] | 12 | 6 | 12 | - | 8,430 | 1,265 | 2,767 | 556 | 1,760 | 244 | 278 | 0 | 1 | 0 |
| 35 | [redacted] | 12 | 6 | 0 | - | 2,715 | 338 | 0 | 71 | 0 | 47 | 15 | 0 | 0 | 0 |
| 36 | [redacted] | 12 | 6 | 6 | - | 7,557 | 357 | 1,713 | 336 | 0 | 149 | 158 | 0 | 3 | 0 |
| 37 | [redacted] | 0 | 6 | 0 | - | 1,284 | 0 | 0 | 24 | 77 | 20 | 0 | 0 | 0 | 0 |
| 38 | [redacted] | 12 | 12 | 6 | - | 3,137 | 941 | 0 | 119 | 0 | 63 | 43 | 0 | 5 | 0 |
| 39 | [redacted] | 6 | 6 | 6 | - | 5,602 | 422 | 1,421 | 242 | 103 | 117 | 102 | 0 | 0 | 0 |
| 40 | [redacted] | 12 | 0 | 0 | - | 997 | 30 | 0 | 37 | 0 | 16 | 18 | 0 | 0 | 0 |
| 41 | [redacted] | 18 | 6 | 12 | - | 4,494 | 1,675 | 0 | 191 | 503 | 106 | 67 | 0 | 0 | 0 |
| 42 | [redacted] | 6 | 6 | 6 | - | 3,220 | 309 | 1,462 | 152 | 70 | 79 | 58 | 0 | 0 | 0 |
| 43 | [redacted] | 6 | 6 | 12 | - | 5,089 | 117 | 408 | 247 | 36 | 87 | 142 | 0 | 0 | 0 |
| 44 | [redacted] | 6 | 12 | 6 | - | 7,022 | 1,095 | 748 | 326 | 0 | 137 | 162 | 0 | 0 | 0 |
| 45 | [redacted] | 6 | 18 | 12 | - | 8,156 | 246 | 876 | 522 | 326 | 156 | 338 | 0 | 0 | 0 |
| 46 | [redacted] | 12 | 24 | 12 | - | 11,939 | 603 | 1,167 | 852 | 23 | 212 | 597 | 3 | 2 | 0 |
| 47 | [redacted] | 12 | 6 | 0 | - | 3,505 | 193 | 0 | 118 | 0 | 57 | 49 | 0 | 0 | 0 |
| 48 | [redacted] | 6 | 0 | 6 | - | 4,392 | 529 | 0 | 91 | 0 | 76 | 0 | 0 | 0 | 0 |
| 49 | [redacted] | 12 | 0 | 6 | - | 5,078 | 201 | 798 | 229 | 9 | 94 | 116 | 0 | 0 | 0 |
| 50 | [redacted] | 18 | 12 | 12 | - | 7,824 | 657 | 1,925 | 571 | 0 | 161 | 378 | 2 | 7 | 0 |
| 51 | [redacted] | 12 | 12 | 12 | - | 8,533 | 1,190 | 3,179 | 614 | 98 | 203 | 371 | 0 | 0 | 0 |
| 52 | [redacted] | 12 | 12 | 0 | - | 1,112 | 445 | 0 | 49 | 126 | 27 | 18 | 0 | 1 | 0 |
| 53 | [redacted] | 12 | 0 | 12 | - | 5,703 | 558 | 0 | 222 | 44 | 98 | 105 | 0 | 0 | 1 |
| 54 | [redacted] | 12 | 0 | 0 | - | 1,615 | 273 | 0 | 65 | 0 | 29 | 30 | 0 | 0 | 0 |
| 55 | [redacted] | 12 | 12 | 6 | - | 9,095 | 1,005 | 0 | 245 | 85 | 158 | 57 | 0 | 0 | 0 |
| 55 | [redacted] | 12 | 12 | 6 | - | 4,486 | 224 | 0 | 137 | 0 | 73 | 49 | 0 | 0 | 0 |
| 56 | [redacted] | 24 | 12 | 0 | - | 3,029 | 376 | 0 | 165 | 22 | 53 | 101 | 1 | 0 | 0 |
| 57 | [redacted] | 0 | 48 | 24 | - | 6,174 | 0 | 0 | 681 | 0 | 95 | 567 | 3 | 0 | 0 |
| 58 | [redacted] | 18 | 24 | 18 | - | 17,413 | 201 | 240 | 1,486 | 1,091 | 319 | 1,115 | 1 | 3 | 0 |
| 59 | [redacted] | 12 | 6 | 12 | - | 10,078 | 4,516 | 1,305 | 632 | 108 | 250 | 333 | 0 | 0 | 0 |
| | [redacted] | | | | | 360,670 | 41,458 | 49,984 | 20,303 | 14,352 | 7,421 | 11,530 | 37 | 50 | 10 |

PW = Parkway
YA = Yard Area
in = inches below ground surface
sf = square feet
cy = cubic yards
Excavation depth is 6 inches greater than maximum exceedance depth

Figure 3-1 was redacted.

SECTION 4

# Compliance with Applicable or Relevant and Appropriate Requirements

This project is being performed in accordance with the CERCLA ROD for OU1 (EPA 2012b). Under CERCLA, a requirement under environmental laws may be either applicable or relevant and appropriate to a removal action, but not both. *Applicable requirements* are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstances found at a CERCLA site. *Relevant and appropriate requirements* are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, RA, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Under CERCLA 121(e), onsite remedial actions (that is, activities within OU1) do not need to comply with the administrative requirements of applicable or relevant and appropriate requirements (ARARs) (environmental laws and regulations, such as permitting). Substantive requirements, however, must be met.

Only state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. The statutes and regulations listed in Table 4-1 contain requirements deemed to be ARARs for Phase 2 of the ANP RA, and describe how the design will comply with those requirements.

EPA recognizes the following three types of ARARs:

- Chemical-specific ARARs: Health- or risk-based numeric values or methodologies that establish the acceptable amount or concentration of a chemical that may be found in or discharged to the ambient environment.
- Location-specific ARARs: Restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.
- Action-specific ARARs: Technology- or activity-based requirements or limitations on actions involving the management of hazardous wastes.

Other federal and state advisories, criteria, or guidance may, as appropriate, be considered in formulation of the removal action selected in the ROD. Other information to be considered generally falls within the following three categories: (1) health effects information with a high degree of credibility, (2) technical information on how to perform or evaluate site investigations or response actions, and (3) policy. Table 4-1 is organized by the two types of ARARs: action-specific and location-specific. Chemical-specific ARARs were described in the FS and the ROD and were used to develop the RAOs described in Section 1.3. Of the ARARs described in the ROD, only those determined to be applicable to the selected remedy for Phase 2 of the ANP RA are included in Table 4-1.

TABLE 4-1
**Applicable or Relevant and Appropriate Requirements**
*Velsicol Chemical Corporation Superfund Site Phase 2 Adjacent or Nearby Properties, Operable Unit 1*

| Requirement | Requirement Synopsis | Status |
|---|---|---|
| **Action-specific ARARs** | | |
| Air Pollution Control Rules (Mich. Admin. Code R 336.1301 - 1374) | Emission Limitations and Prohibitions—Particulate Matter. Opacity from activities may not exceed a 6-minute average of 20% opacity, except for one 6-minute average per hour of not more than 27% opacity (336.1301(1)(a)). | Applicable. A fugitive dust control program will be developed for the management of stockpiles and transport of bulk materials to meet the regulatory criteria. Anticipated dust-control measures will include covering the piles when not working, wetting the pile with water, covering trucks during transport, and cleaning the wheels and body of the truck after loading. |
| Air Pollution Control Rules (Mich. Admin. Code R 336.1901- 1950) | Prohibits the discharge of contaminants in quantities that are injurious to humans, animal life, plant life of significant value, or property, or that interferes with the enjoyment of life and property. | Applicable. A fugitive dust-control program will be developed for the management of stockpiles and transport of bulk materials if necessary to meet the regulatory criteria. Anticipated dust-control measures will include covering the piles when not working, wetting the piles with water, covering trucks during transport, and cleaning the wheels and body of the truck after loading. |
| Water Resources Protection—Part 21, Wastewater Discharge Permits (R 323.2101 -323.2197) (R 323.2190). | Establishes requirements for treatment and discharge under the Michigan National Pollutant Discharge Elimination System Construction Stormwater Permit-by-Rule. | Applicable. The site disturbance is approximately 10 acres. Substantive requirements of the Permit-by-Rule will be met through implementation of the SESC plan. |
| Part 91 (Soil Erosion and Sedimentation Control) of NREPA 1994 P.A. 451, as amended (MCL 324.9101-324.9123a) | Prevents uncontrolled erosion and sedimentation in lakes, streams, and rivers from soil disturbance activities. Requires soil erosion control and sedimentation controls for soil disturbance of 1 or more acres or that is within 500 feet of the water's edge of a lake or stream. | Applicable. Soil disturbances will be within 500 feet of the Pine River. The design will incorporate appropriate best management practices, erosion and sediment control measures, and inspections in accordance with a SESC plan and the substantive requirements of the Michigan National Pollutant Discharge Elimination System Construction Stormwater Permit-by-Rule. |
| Hazardous Waste Management Rules (Mich. Admin. Code R 299.9101-11107) | Establishes general provisions, definitions, rule-making petitions, and other procedures. | Applicable. The identification and listing rules will be used to determine whether the RA generates waste that can be classified as hazardous. However, hazardous waste is not anticipated during Phase 2 of the ANP RA. If hazardous waste is identified, the applicable rules will be followed. Note that if found to be hazardous, excavated soil may be subject to Land Disposal Restrictions (R 299.9620). |
| Transportation Standards and Recordkeeping (Mich. Admin. Code R 299.9608-9609) | Requirements for using a manifest system to track the type and quantity of hazardous waste received by or shipped from a facility. The rules may apply and will be adhered to if the RA generates waste that can be classified as hazardous. | Potentially Applicable. Hazardous waste is not anticipated during Phase 2 of the ANP RA. A manifest system will be used for transport of contaminated soils. The requirements will be identified in the transportation and disposal plan. |
| Part 115 (Solid Waste Management) of NREPA 1994 P.A. 451, as amended (MCL 324.11501-11550) | Addresses solid waste management, including storage of solid waste in a waste pile and characterization of solid waste. | Applicable. The excavated soils are expected to be managed as solid wastes. Characterization will be performed to demonstrate that wastes are nonhazardous. Stockpiles of excavated soil will have secondary containment and will be managed in accordance with these regulations. |

TABLE 4-1
**Applicable or Relevant and Appropriate Requirements**
*Velsicol Chemical Corporation Superfund Site Phase 2 Adjacent or Nearby Properties, Operable Unit 1*

| Requirement | Requirement Synopsis | Status |
|---|---|---|
| Part 121 (Liquid Industrial Waste) of NREPA 1994 P.A. 451, as amended (MCL 324.12101-12118) | Provides for the control of wastes with free liquids, including manifest requirements and storage and transport. | Applicable. Decontamination activities will generate liquid wastes requiring management in accordance with this rule. Wastes will be containerized, characterized, stored, manifested, and transported for disposal in accordance with Part 121. |
| **Location-specific ARARs** | | |
| Endangered Species Act (16 United States Code 1531) | Requires action to conserve endangered species and critical habitats upon which endangered species depend. Includes consultation with the Department of the Interior. | Activities at remedial sites must be performed to identify the presence of and protect endangered or threatened plants and animals at the site. For the Phase 2 RA, two species of bats, the Indiana bat and the Northern long-eared bat, have been identified as endangered or proposed as endangered and could have suitable habitat within the project area. Preliminary discussions with the U.S. Fish and Wildlife Service have indicated that the project's impact on these species might be minimal. The agency will continue to be consulted for appropriate recommendations as the project design proceeds. |
| Migratory Bird Treaty Act (16 United States Code 703) | Prohibits unlawful taking, possession, and sale of almost all species of native birds in the U.S. Applicable to remediation activities that could result in a "take" of a migratory bird (for example, killing migratory birds or destroying their eggs). | If trees, shrubs, or structures suitable for nesting are removed within the migratory bird nesting season (April 1 to September 15), nest clearance surveys will be completed. If nests are identified and determined to be active (contain eggs or hatchlings), the U.S. Fish and Wildlife Service will be consulted or that property delayed until after the nest is determined to be inactive (no eggs or hatchlings). Alternately, clearing of trees and shrubs may be performed prior to the migratory bird nesting season for properties where RA is anticipated to be performed during the nesting season. Trees, shrubs, or structures suitable for nesting that are removed outside of the migratory bird nesting season will not require a nest clearance survey. |

# 4.1 Minimizing Public and Environmental Impacts

Environmental and public health and welfare impacts will be minimized through the following methods:

- Site access control
- Development of and adherence to SESC plan
- Transportation and disposal of contaminated and backfill materials
- Compliance with permits/codes

## 4.1.1 Site Access Control

Access control to the site during construction is necessary to prevent exposure of trespassers to contaminated soil and open excavations. Access will be controlled by installing fencing around work areas. Typical working hours for construction activities will be 8:00 a.m. to 5:00 p.m., Monday through Friday. Approval will need to be obtained for alternate work hours during the week or for work on the weekend.

The earthwork subcontractor will establish and maintain two points of continuous access for residents and property owners when possible, with one point of continuous access at all times. If it is necessary to restrict access for periods of time, it will be necessary to coordinate the work to be done at a time when the

property owner and resident will not be present at the property. Access to the property will not be restricted between the hours of 5:00 p.m. and 8:00 a.m.

### 4.1.2 Stormwater Management

Subcontractors will be required to implement procedures during construction activities to prevent or reduce pollutants in stormwater discharges, consistent with substantive requirements of Part 21 R 323.2190 (National Permit for Stormwater Discharge during Construction) and Part 91 (Soil Erosion and Sedimentation Control) of NREPA 1994 P.A. 451, as amended. As a matter of coordination, Gratiot County requirements will also be considered. Erosion control features will be described in a SESC plan designed to reduce stormwater pollution potential at the site. The following erosion and sediment control measures will be identified in the plan:

- Silt fence
- Inlet protection
- Appropriate best management practices at construction site entrance and exit and the excavation areas
- Inspections and maintenance procedures

Spill and release accident scenarios could occur and involve rinsates from decontamination activities or contaminated soil. Also, the potential exists for spills of vehicle fuel and hydraulic oils. A SESC plan will address the following activities:

- Preplanning for spill control
- Spill and fire control materials and equipment
- Spill control measures
- Drum, container, and tank handling and moving procedures

The plan will also provide instructions to respond to and mitigate releases on the project site.

### 4.1.3 Transportation and Disposal

A transportation and disposal plan will describe transporting and disposing of contaminated soil to the approved disposal facility and importing materials from approved borrow sources. The earthwork subcontractor will be required to tarp, cover, or enclose all loads of contaminated and non-contaminated material during all phases of transportation, including transportation from the residences to the staging area and from the staging area to the disposal facility. The earthwork subcontractor will submit a transportation and disposal plan to CH2M HILL for approval prior to mobilization. The transportation and disposal plan will address the following:

- Identification of all waste streams
- Decontamination procedures
- Waste characterization and profiling
- Waste and container management, storage, labeling, and marking
- Waste transportation practices
- Manifests/haul tickets and other shipping documentation
- Waste disposal
- Spill response and reporting
- Dust abatement
- Traffic control, including any necessary road closure permits or protective measures
- Records and reporting

SECTION 5

# Construction Schedule

Phase 2 of the ANP RA is assumed to occur over a period of approximately 6 months in spring, summer, and fall of 2014. Figure 5-1 shows the construction schedule.

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **Remedial Design - Phase 2** | **5 days** | **Mon 3/10/14** | **Fri 3/14/14** |
| 2 | Submit Final Design | 0 days | Mon 3/10/14 | Mon 3/10/14 |
| 3 | EPA Approve Final Design | 0 days | Fri 3/14/14 | Fri 3/14/14 |
| 4 | **Bid Process/Subcontracting - Phase 2** | **63 days** | **Mon 2/3/14** | **Wed 4/30/14** |
| 5 | Prequalify potential bidders | 20 days | Mon 2/3/14 | Fri 2/28/14 |
| 6 | Prepare RA Subcontractor SOW | 10 days | Tue 2/25/14 | Mon 3/10/14 |
| 7 | Issue bid documents | 0 days | Mon 3/10/14 | Mon 3/10/14 |
| 8 | Bidders develop proposals | 15 days | Mon 3/10/14 | Fri 3/28/14 |
| 9 | Site walk | 0 days | Fri 3/21/14 | Fri 3/21/14 |
| 10 | Review bids | 5 days | Mon 3/31/14 | Fri 4/4/14 |
| 11 | Prepare consent package for EPA | 3 days | Mon 4/7/14 | Wed 4/9/14 |
| 12 | EPA CO review consent package | 10 days | Thu 4/10/14 | Wed 4/23/14 |
| 13 | Issue NOA to successful bidder | 0 days | Wed 4/23/14 | Wed 4/23/14 |
| 14 | Successful bidder signs subcontract | 0 days | Wed 4/30/14 | Wed 4/30/14 |
| 15 | **Remedial Activities - Phase 2** | **154 days** | **Mon 4/21/14** | **Thu 11/20/14** |
| 16 | Subcontractor provides premob submittals | 15 days | Thu 5/1/14 | Wed 5/21/14 |
| 17 | Residential preconstruction meetings | 10 days | Mon 4/21/14 | Fri 5/2/14 |
| 18 | Subcontractor mobilizes to site | 0 days | Wed 5/21/14 | Wed 5/21/14 |
| 19 | Removal & disposal of 21,000 CY soil | 80 days | Thu 5/22/14 | Wed 9/10/14 |
| 20 | Backfill 21,000 CY soil | 80 days | Thu 5/29/14 | Wed 9/17/14 |
| 21 | Place sod | 80 days | Thu 6/26/14 | Wed 10/15/14 |
| 22 | Plant trees & shrubs | 80 days | Thu 7/3/14 | Wed 10/22/14 |
| 23 | Residential post-construction meetings | 80 days | Thu 7/10/14 | Wed 10/29/14 |
| 24 | Maintenance watering period | 105 days | Thu 6/26/14 | Wed 11/19/14 |
| 25 | Demobilize from site | 0 days | Thu 11/20/14 | Thu 11/20/14 |

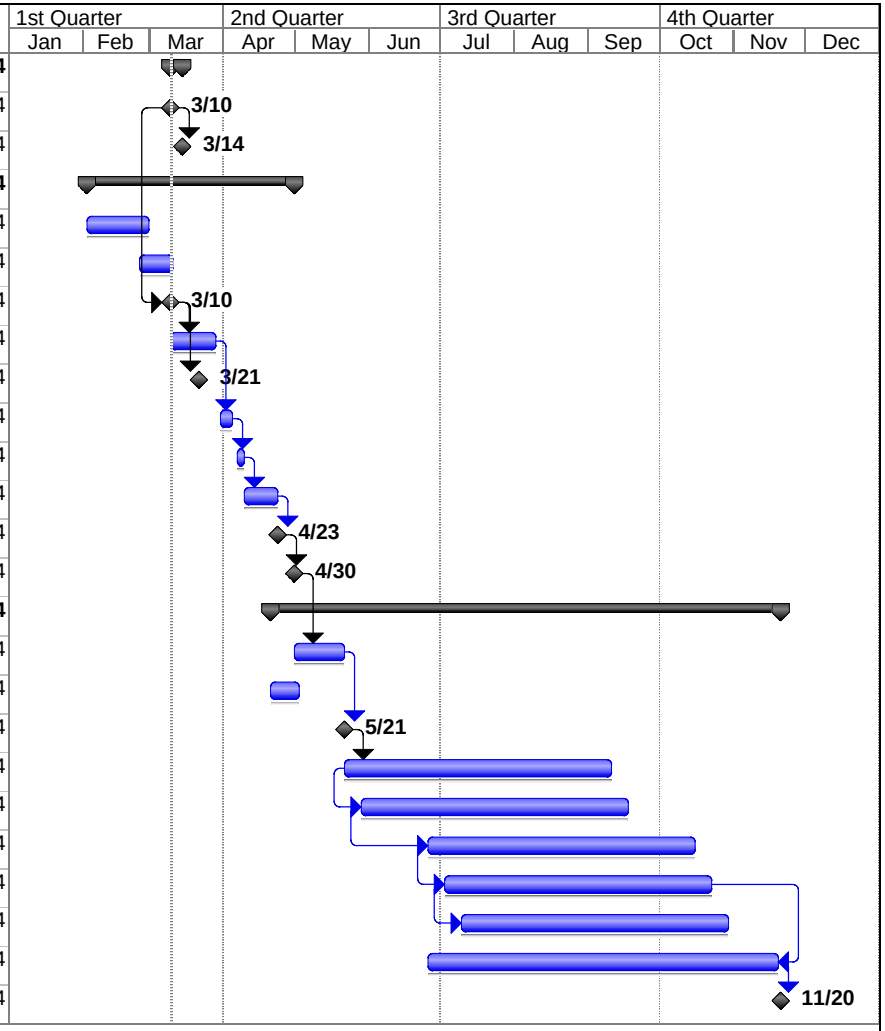


Figure 5-1
Project: Phase 2 ANP RA Schedule
Date: Mon 3/10/14

| | | | |
|---|---|---|---|
| Task | | Project Summary | |
| Split | | External Tasks | |
| Progress | | External Milestone | |
| Milestone | | Deadline | |
| Summary | | | |

SECTION 6

# Engineer's Estimate of Construction Cost

The engineer's estimate of construction costs for the RA, as described in this report, is estimated at [redacted] (Class 1 with an accuracy of plus 15 percent to minus 10 percent) based on the results of the Phase 2 RD soil sampling and the assumptions presented in this RD. Appendix D contains the cost estimate.

The cost estimates have been prepared for guidance in project evaluation and implementation from the information available at the time that the cost estimate was prepared. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, implementation schedule, and other variable factors. As a result, the final project costs will vary from the cost estimates presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before specific financial decisions are made or project budgets are established to help ensure project evaluation and adequate funding.

SECTION 7

# Drawings

SECTION 8

# Specifications

The following specifications are included in Appendix C:

| DIVISION 1—GENERAL REQUIREMENTS | |
|---|---|
| 01 11 00 | Summary of Work |
| 01 26 00 | Subcontract Modification Procedures |
| 01 29 00 | Payment Procedures |
| 01 31 13 | Project Coordination |
| 01 31 19 | Project Meetings |
| 01 32 00 | Construction Progress Documentation |
| 01 33 00 | Submittal Procedures |
| 01 42 13 | Abbreviations and Acronyms |
| 01 45 16.13 | Subcontractor Quality Control |
| 01 50 00 | Temporary Facilities and Controls |
| 01 57 19 | Temporary Environmental Controls |
| 01 77 00 | Closeout Procedures |
| **DIVISION 31—EARTHWORK** | |
| 31 23 16 | Excavation |
| 31 23 23 | Fill and Backfill |
| **DIVISION 32—EXTERIOR IMPROVEMENTS** | |
| 32 10 01 | Site Restoration |
| 32 91 13 | Topsoil Preparation |
| 32 92 00 | Turf and Grasses |
| 32 93 00B | Trees, Shrubs, and Perennials |

SECTION 9

# Bidability, Constructability, and Operability Review

Staff from CH2M HILL's affiliate, CH2M HILL Constructors, Inc., reviewed the BODR, drawings, and specifications with an emphasis on bidability and constructability. In addition, this BODR, drawings, and specifications were reviewed by the project review team, and comments were incorporated, as appropriate. The review did not identify significant concerns.

SECTION 10

# References


CH2M HILL. 2012. *Final Quality Assurance Project Plan Velsicol Chemical Superfund Site OU1 — Phase 1 Remedial Design, St. Louis, Michigan.* November.

State of Michigan Compiled Laws. 1974. P.A. 53 as amended.

State of Michigan. 1994. Michigan Permit-by-Rule. R 323.2190 of the Part 21, Wastewater Discharge Permits Administrative Rules, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, MCL 324.3101 et seq.

State of Michigan. 2012. (96th Legislature of the State of Michigan). Senate Bill 1083. April 19.

U.S. Environmental Protection Agency (EPA). 1995. *Remedial Design/Remedial Action Handbook.* Office of Emergency and Remedial Response. Publication 540/R-95/059. June.

U.S. Environmental Protection Agency (EPA). 2012a. *Velsicol Chemical Corporation Superfund Site – Proposed Plan for Operable Unit 1, St. Louis, Michigan.* February 7.

U.S. Environmental Protection Agency (EPA). 2012b. *Record of Decision – Velsicol Chemical Corporation/Pine River Superfund Site, Former Plant Site – Operable Unit 1, St. Louis, Michigan.* June 19.

U.S. National Archives and Records Administration. 40 *Code of Federal Regulations* Part 261, Identification and Listing of Hazardous Waste.

WESTON. 2006. *Remedial Investigation Report for Operable Unit 1 – Velsicol Chemical Corporation Site, St. Louis, MI.* Prepared for the Michigan Department of Environmental Quality. November.

WESTON. 2009. *Remedial Investigation Addendum Report for Operable Unit One – Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan.* Prepared for the Michigan Department of Environmental Quality. January.

WESTON. 2011. *Feasibility Study for Operable Unit One – Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan.* Prepared for the Michigan Department of Environmental Quality. November.

# Appendix A
## Property Drawings

Appendix A was redacted.

# Appendix B
# Memorandum: Development of Decision Level for Total DDT by FIELDS

# Appendix B
# Development of Decision Level for Total DDT by USEPA Region 5 FIELDS
# Section 1—Technical Memorandum

# Development of Decision Level for Total DDT by FIELDS Phase 2A of Velsicol OU1 ANP RA

PREPARED FOR: File

COPY TO:

PREPARED BY: Rob Stryker/MKE

DATE: August 6, 2013

PROJECT NUMBER: 456991.PD.01

The Field Environmental Decision Support (FIELDS) Group within Region 5 of the U.S. Environmental Protection Agency calculated a decision level of 4.1 ppm for total DDT. The decision level calculation was performed to provide a level of assurance that all properties exceeding the 5 ppm remediation goal (RG) for Total DDT were included in the cleanup action. The decision level was calculated by performing a one-tailed 95 percent confidence interval on data from replicate field samples obtained at a rate of 15 percent of all sampling areas to assess the variance of DDT concentrations within the sampling areas. To arrive at the decision level, the standard deviation of the replicate data was multiplied by the Z-score for a one-tailed 95 percent confidence interval, and the resulting product subtracted from the Total DDT of 5 ppm. For the calculation of standard deviation, FIELDS Group used the range of replicate data between 2 ppm and 8 ppm because that is the main range of concern (that is, it has the greatest effect on decisions close to the 5 ppm RG) and because the variance above 8 ppm was a magnitude higher and the variance below 2 ppm a magnitude lower than the variance within the 2 to 8 ppm range.

# Appendix B
# Development of Decision Level for Total DDT by USEPA Region 5 FIELDS
# Section 2—All Replicate Data

**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 12-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 98 | U | 1,600 | 1,733 | 133.333333 |
| 12-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 97 | U | 1,600 | 1,733 | 133.333333 |
| 12-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 97 | U | 2,000 | 1,733 | 266.666667 |
| 12-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 95 | U | 610 | 497 | 113.333333 |
| 12-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 97 | U | 430 | 497 | 66.6666667 |
| 12-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 96 | U | 450 | 497 | 46.6666667 |
| 12-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 97 | U | 150 | 153 | 3.33333333 |
| 12-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 97 | U | 100 | 153 | 53.3333333 |
| 12-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 95 | U | 210 | 153 | 56.6666667 |
| 12-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 96 | U | 80.5 | 87 | 6.33333333 |
| 12-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 95 | U | 50 | 87 | 36.8333333 |
| 12-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 93 | U | 130 | 87 | 43.1666667 |
| 14-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 3,600 | 4,133 | 533.333333 |
| 14-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 3,800 | 4,133 | 333.333333 |
| 14-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 150 | U | 5,000 | 4,133 | 866.666667 |
| 14-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 1950 | 2,750 | 800 |
| 14-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 2,750 | 550 |
| 14-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 4,100 | 2,750 | 1350 |
| 14-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 140 | U | 750 | 1,650 | 900 |
| 14-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 140 | U | 1,700 | 1,650 | 50 |
| 14-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 340 | J | 2,500 | 1,650 | 850 |
| 14-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 470 | 717 | 246.666667 |
| 14-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 890 | 717 | 173.333333 |
| 14-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 790 | 717 | 73.3333333 |
| 11-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 180 | J | 7,600 | 7,800 | 200 |
| 11-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 180 | P | 7,900 | 7,800 | 100 |
| 11-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 230 | J | 7,900 | 7,800 | 100 |
| 11-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 120 | J | 7,300 | 7,933 | 633.333333 |
| 11-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 95 | U | 7,700 | 7,933 | 233.333333 |
| 11-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 95 | U | 8,800 | 7,933 | 866.666667 |
| 11-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 92 | U | 9,000 | 10,333 | 1333.33333 |
| 11-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 91 | U | 11,000 | 10,333 | 666.666667 |
| 11-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 90 | U | 11,000 | 10,333 | 666.666667 |
| 11-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 94 | J | 5,700 | 5,450 | 250 |
| 11-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 94 | U | 4,600 | 5,450 | 850 |
| 11-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 110 | J | 6050 | 5,450 | 600 |
| 11-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 93 | U | 4,700 | 4,167 | 533.333333 |
| 11-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 93 | U | 3,300 | 4,167 | 866.666667 |

CONFIDENTIAL

**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 11-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 93 | U | 4,500 | 4,167 | 333.333333 |
| 11-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 2,100 | 3,400 | 1300 |
| 11-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 88 | U | 4,100 | 3,400 | 700 |
| 11-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 91 | U | 4,000 | 3,400 | 600 |
| 11-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 90 | U | 1,800 | 1,440 | 360 |
| 11-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 92 | U | 1,700 | 1,440 | 260 |
| 11-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 91 | U | 820 | 1,440 | 620 |
| 11-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 92 | U | 1,800 | 1,500 | 300 |
| 11-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 95 | U | 1,700 | 1,500 | 200 |
| 11-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 94 | U | 1,000 | 1,500 | 500 |
| 11-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 91 | U | 2,400 | 1,800 | 600 |
| 11-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 90 | U | 1,600 | 1,800 | 200 |
| 11-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 89 | U | 1,400 | 1,800 | 400 |
| 11-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 91 | U | 1350 | 907 | 443.333333 |
| 11-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 89 | U | 910 | 907 | 3.33333333 |
| 11-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 92 | U | 460 | 907 | 446.666667 |
| 11-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 92 | U | 1,000 | 983 | 16.6666667 |
| 11-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 92 | U | 850 | 983 | 133.333333 |
| 11-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 92 | U | 1,100 | 983 | 116.666667 |
| 11-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 89 | U | 7300 | 3,733 | 3566.66667 |
| 11-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 90 | U | 2,900 | 3,733 | 833.333333 |
| 11-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 87 | U | 1,000 | 3,733 | 2733.33333 |
| 21-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 550 | | 5,700 | 6,067 | 366.666667 |
| 21-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 430 | J | 6,200 | 6,067 | 133.333333 |
| 21-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 360 | J | 6,300 | 6,067 | 233.333333 |
| 21-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 200 | J | 3950 | 3,717 | 233.333333 |
| 21-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 2,900 | 3,717 | 816.666667 |
| 21-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 190 | J | 4,300 | 3,717 | 583.333333 |
| 21-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,400 | 2,033 | 633.333333 |
| 21-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 2,800 | 2,033 | 766.666667 |
| 21-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,900 | 2,033 | 133.333333 |
| 21-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 570 | 903 | 333.333333 |
| 21-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 640 | 903 | 263.333333 |
| 21-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 1,500 | 903 | 596.666667 |
| 04-YA1R1 | Yard1 | [redacted] | 0-6 | 1 | 91 | U | 2,700 | 4,000 | 1300 |
| 04-YA1R2 | Yard1 | [redacted] | 0-6 | 1 | 110 | J | 5,300 | 4,000 | 1300 |
| 04-YA1R3 | Yard1 | [redacted] | 0-6 | 1 | 230 | U | 4,000 | 4,000 | 0 |
| 04-YA1R1 | Yard1 | [redacted] | 6-12 | 2 | 89 | U | 2,400 | 2,433 | 33.3333333 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 04-YA1R2 | Yard1 | [redacted] | 6-12 | 2 | 90 | U | 2,500 | 2,433 | 66.6666667 |
| 04-YA1R3 | Yard1 | [redacted] | 6-12 | 2 | 230 | U | 2,400 | 2,433 | 33.3333333 |
| 04-YA1R1 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 660 | 720 | 60 |
| 04-YA1R2 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 920 | 720 | 200 |
| 04-YA1R3 | Yard1 | [redacted] | 12-18 | 3 | 89 | U | 580 | 720 | 140 |
| 04-YA1R1 | Yard1 | [redacted] | 18-24 | 4 | 89 | U | 480 | 392 | 88.3333333 |
| 04-YA1R2 | Yard1 | [redacted] | 18-24 | 4 | 89 | U | 360 | 392 | 31.6666667 |
| 04-YA1R3 | Yard1 | [redacted] | 18-24 | 4 | 90 | U | 335 | 392 | 56.6666667 |
| 27-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 430 | J | 4,000 | 3,533 | 466.666667 |
| 27-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 410 | J | 3,200 | 3,533 | 333.333333 |
| 27-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 410 | J | 3,400 | 3,533 | 133.333333 |
| 27-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | U | 2,000 | 1,867 | 133.333333 |
| 27-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 210 | J | 1,800 | 1,867 | 66.6666667 |
| 27-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | U | 1,800 | 1,867 | 66.6666667 |
| 27-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 350 | J | 3,700 | 3,600 | 100 |
| 27-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 190 | J | 3,000 | 3,600 | 600 |
| 27-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 310 | J | 4,100 | 3,600 | 500 |
| 27-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,700 | 2,650 | 50 |
| 27-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,300 | 2,650 | 350 |
| 27-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2950 | 2,650 | 300 |
| 27-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 190 | J | 1450 | 1,300 | 150 |
| 27-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 750 | 1,300 | 550 |
| 27-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 250 | J | 1,700 | 1,300 | 400 |
| 27-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 930 | 877 | 53.3333333 |
| 27-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 840 | 877 | 36.6666667 |
| 27-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 860 | 877 | 16.6666667 |
| 27-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 220 | J | 850 | 767 | 83.3333333 |
| 27-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 200 | J | 710 | 767 | 56.6666667 |
| 27-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 190 | J | 740 | 767 | 26.6666667 |
| 27-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 260 | 357 | 96.6666667 |
| 27-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 380 | 357 | 23.3333333 |
| 27-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 430 | 357 | 73.3333333 |
| 19-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 200 | J | 5,200 | 4,633 | 566.666667 |
| 19-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 180 | J | 3,000 | 4,633 | 1633.33333 |
| 19-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 5,700 | 4,633 | 1066.66667 |
| 19-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 140 | J | 3,500 | 4,067 | 566.666667 |
| 19-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 3500 | 4,067 | 566.666667 |
| 19-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 5,200 | 4,067 | 1133.33333 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 19-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,300 | 963 | 336.666667 |
| 19-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,000 | 963 | 36.6666667 |
| 19-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 590 | 963 | 373.333333 |
| 19-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 550 | 520 | 30 |
| 19-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 710 | 520 | 190 |
| 19-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 300 | 520 | 220 |
| 08-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | J | 4,700 | 3,867 | 833.333333 |
| 08-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 190 | J | 1,600 | 3,867 | 2266.66667 |
| 08-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | J | 5,300 | 3,867 | 1433.33333 |
| 08-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 94 | U | 4900 | 4,433 | 466.666667 |
| 08-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 92 | U | 4,400 | 4,433 | 33.3333333 |
| 08-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 92 | U | 4,000 | 4,433 | 433.333333 |
| 08-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 90 | U | 2,300 | 2,400 | 100 |
| 08-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 90 | U | 2,800 | 2,400 | 400 |
| 08-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 92 | U | 2,100 | 2,400 | 300 |
| 08-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 89 | U | 1,000 | 1,040 | 40 |
| 08-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 89 | U | 1,300 | 1,040 | 260 |
| 08-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 88 | U | 820 | 1,040 | 220 |
| 01-YA2R1 | Yard2 | [redacted] | 0-6 | 1 | 97 | J | 4,500 | 4,833 | 333.333333 |
| 01-YA2R2 | Yard2 | [redacted] | 0-6 | 1 | 97 | U | 4,400 | 4,833 | 433.333333 |
| 01-YA2R3 | Yard2 | [redacted] | 0-6 | 1 | 490 | U | 5,600 | 4,833 | 766.666667 |
| 01-YA2R1 | Yard2 | [redacted] | 6-12 | 2 | 93 | U | 3,600 | 3,500 | 100 |
| 01-YA2R2 | Yard2 | [redacted] | 6-12 | 2 | 94 | U | 4,500 | 3,500 | 1000 |
| 01-YA2R3 | Yard2 | [redacted] | 6-12 | 2 | 230 | U | 2,400 | 3,500 | 1100 |
| 01-YA2R1 | Yard2 | [redacted] | 12-18 | 3 | 91 | U | 1,200 | 1,367 | 166.666667 |
| 01-YA2R2 | Yard2 | [redacted] | 12-18 | 3 | 91 | U | 1,600 | 1,367 | 233.333333 |
| 01-YA2R3 | Yard2 | [redacted] | 12-18 | 3 | 91 | U | 1300 | 1,367 | 66.6666667 |
| 01-YA2R1 | Yard2 | [redacted] | 18-24 | 4 | 89 | U | 730 | 777 | 46.6666667 |
| 01-YA2R2 | Yard2 | [redacted] | 18-24 | 4 | 89 | U | 760 | 777 | 16.6666667 |
| 01-YA2R3 | Yard2 | [redacted] | 18-24 | 4 | 89 | U | 840 | 777 | 63.3333333 |
| 17-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 3,600 | 3,833 | 233.333333 |
| 17-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 4,200 | 3,833 | 366.666667 |
| 17-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 3,700 | 3,833 | 133.333333 |
| 17-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,800 | 2,733 | 66.6666667 |
| 17-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,800 | 2,733 | 66.6666667 |
| 17-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2600 | 2,733 | 133.333333 |
| 17-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,200 | 1,100 | 100 |
| 17-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,100 | 1,100 | 0 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 17-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,000 | 1,100 | 100 |
| 17-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 470 | 370 | 100 |
| 17-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 300 | 370 | 70 |
| 17-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 340 | 370 | 30 |
| 13-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 140 | U | 5,900 | 5,400 | 500 |
| 13-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 140 | U | 5,900 | 5,400 | 500 |
| 13-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 140 | U | 4,400 | 5,400 | 1000 |
| 13-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 2,567 | 366.666667 |
| 13-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 92 | U | 2,300 | 2,567 | 266.666667 |
| 13-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 3,200 | 2,567 | 633.333333 |
| 13-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 1,400 | 2,433 | 1033.33333 |
| 13-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 1,300 | 2,433 | 1133.33333 |
| 13-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 4,600 | 2,433 | 2166.66667 |
| 13-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 140 | U | 535 | 1,118 | 583.333333 |
| 13-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 130 | U | 520 | 1,118 | 598.333333 |
| 13-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 140 | U | 2,300 | 1,118 | 1181.66667 |
| 25-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 800 | | 15,000 | 13,000 | 2000 |
| 25-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 870 | | 11,000 | 13,000 | 2000 |
| 25-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 950 | | 13,000 | 13,000 | 0 |
| 25-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 660 | | 15,000 | 14,333 | 666.666667 |
| 25-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 720 | | 15,000 | 14,333 | 666.666667 |
| 25-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 740 | | 13,000 | 14,333 | 1333.33333 |
| 25-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 190 | J | 1,400 | 1,600 | 200 |
| 25-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 180 | J | 1,600 | 1,600 | 0 |
| 25-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 630 | | 1800 | 1,600 | 200 |
| 25-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 1,800 | 1,967 | 166.666667 |
| 25-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 130 | U | 1,600 | 1,967 | 366.666667 |
| 25-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,500 | 1,967 | 533.333333 |
| 25-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 420 | 583 | 163.333333 |
| 25-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 610 | 583 | 26.6666667 |
| 25-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 190 | J | 720 | 583 | 136.666667 |
| 25-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 130 | U | 390 | 360 | 30 |
| 25-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 130 | U | 360 | 360 | 0 |
| 25-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 130 | U | 330 | 360 | 30 |
| 25-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 250 | 317 | 66.6666667 |
| 25-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 440 | 317 | 123.333333 |
| 25-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 260 | 317 | 56.6666667 |
| 25-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 130 | U | 130 | 188 | 58.3333333 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 25-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 130 | U | 155 | 188 | 33.3333333 |
| 25-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 130 | U | 280 | 188 | 91.6666667 |
| 05-YA1R1 | Yard1 | [redacted] | 0-6 | 1 | 92 | U | 7,600 | 8,900 | 1300 |
| 05-YA1R2 | Yard1 | [redacted] | 0-6 | 1 | 130 | J | 10,000 | 8,900 | 1100 |
| 05-YA1R3 | Yard1 | [redacted] | 0-6 | 1 | 90 | U | 9,100 | 8,900 | 200 |
| 05-YA1R1 | Yard1 | [redacted] | 6-12 | 2 | 230 | U | 4,400 | 4,333 | 66.6666667 |
| 05-YA1R2 | Yard1 | [redacted] | 6-12 | 2 | 220 | U | 5,100 | 4,333 | 766.666667 |
| 05-YA1R3 | Yard1 | [redacted] | 6-12 | 2 | 220 | U | 3,500 | 4,333 | 833.333333 |
| 05-YA1R1 | Yard1 | [redacted] | 12-18 | 3 | 88 | U | 1,100 | 1,550 | 450 |
| 05-YA1R2 | Yard1 | [redacted] | 12-18 | 3 | 89 | U | 1850 | 1,550 | 300 |
| 05-YA1R3 | Yard1 | [redacted] | 12-18 | 3 | 89 | U | 1,700 | 1,550 | 150 |
| 05-YA1R1 | Yard1 | [redacted] | 18-24 | 4 | 87 | U | 490 | 767 | 276.666667 |
| 05-YA1R2 | Yard1 | [redacted] | 18-24 | 4 | 88 | U | 980 | 767 | 213.333333 |
| 05-YA1R3 | Yard1 | [redacted] | 18-24 | 4 | 88 | U | 830 | 767 | 63.3333333 |
| 23-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 170 | U | 3,300 | 2,900 | 400 |
| 23-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 160 | U | 2,500 | 2,900 | 400 |
| 23-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 170 | U | 2,900 | 2,900 | 0 |
| 23-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | U | 4,500 | 4,567 | 66.6666667 |
| 23-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 170 | U | 4,200 | 4,567 | 366.666667 |
| 23-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 170 | U | 5,000 | 4,567 | 433.333333 |
| 23-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 150 | U | 1,700 | 1,600 | 100 |
| 23-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 150 | U | 1,600 | 1,600 | 0 |
| 23-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 1,500 | 1,600 | 100 |
| 23-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 3,050 | 850 |
| 23-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 3350 | 3,050 | 300 |
| 23-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 3,600 | 3,050 | 550 |
| 23-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 150 | U | 1,100 | 1,100 | 0 |
| 23-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 150 | U | 1,100 | 1,100 | 0 |
| 23-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 150 | U | 1,100 | 1,100 | 0 |
| 23-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 1,000 | 1,333 | 333.333333 |
| 23-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 1,400 | 1,333 | 66.6666667 |
| 23-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 150 | U | 1,600 | 1,333 | 266.666667 |
| 23-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 150 | U | 360 | 362 | 1.66666667 |
| 23-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 150 | U | 375 | 362 | 13.3333333 |
| 23-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 150 | U | 350 | 362 | 11.6666667 |
| 23-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 560 | 930 | 370 |
| 23-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 830 | 930 | 100 |
| 23-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 150 | U | 1,400 | 930 | 470 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 06-PWR1 | Parkway | [redacted] | 0-6 | 1 | 120 | J | 4,300 | 3,817 | 483.333333 |
| 06-PWR2 | Parkway | [redacted] | 0-6 | 1 | 130 | J | 3250 | 3,817 | 566.666667 |
| 06-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 160 | J | 3,900 | 3,817 | 83.3333333 |
| 06-YA1R1 | Yard1 | [redacted] | 0-6 | 1 | 130 | J | 6,750 | 6,683 | 67 |
| 06-YA1R2 | Yard1 | [redacted] | 0-6 | 1 | 150 | J | 6,400 | 6,683 | 283 |
| 06-YA1R3 | Yard1 | [redacted] | 0-6 | 1 | 120 | J | 6,900 | 6,683 | 217 |
| 06-PWR1 | Parkway | [redacted] | 6-12 | 2 | 88 | U | 3,500 | 3,100 | 400 |
| 06-PWR2 | Parkway | [redacted] | 6-12 | 2 | 88 | U | 2,000 | 3,100 | 1100 |
| 06-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 88 | U | 3,800 | 3,100 | 700 |
| 06-YA1R1 | Yard1 | [redacted] | 6-12 | 2 | 140 | J | 5,100 | 5,300 | 200 |
| 06-YA1R2 | Yard1 | [redacted] | 6-12 | 2 | 91 | U | 4,700 | 5,300 | 600 |
| 06-YA1R3 | Yard1 | [redacted] | 6-12 | 2 | 91 | U | 6,100 | 5,300 | 800 |
| 06-PWR1 | Parkway | [redacted] | 12-18 | 3 | 88 | U | 1,500 | 1,367 | 133.333333 |
| 06-PWR2 | Parkway | [redacted] | 12-18 | 3 | 90 | U | 1,300 | 1,367 | 66.6666667 |
| 06-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 89 | U | 1,300 | 1,367 | 66.6666667 |
| 06-YA1R1 | Yard1 | [redacted] | 12-18 | 3 | 91 | U | 2,100 | 2,733 | 633 |
| 06-YA1R2 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 3,600 | 2,733 | 867 |
| 06-YA1R3 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 2500 | 2,733 | 233 |
| 06-PWR1 | Parkway | [redacted] | 18-24 | 4 | 88 | U | 920 | 627 | 293.333333 |
| 06-PWR2 | Parkway | [redacted] | 18-24 | 4 | 89 | U | 390 | 627 | 236.666667 |
| 06-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 90 | U | 570 | 627 | 56.6666667 |
| 06-YA1R1 | Yard1 | [redacted] | 18-24 | 4 | 89 | U | 1,200 | 1,233 | 33 |
| 06-YA1R2 | Yard1 | [redacted] | 18-24 | 4 | 89 | U | 1,300 | 1,233 | 67 |
| 06-YA1R3 | Yard1 | [redacted] | 18-24 | 4 | 90 | U | 1,200 | 1,233 | 33 |
| 07-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 230 | U | 4,100 | 6,267 | 2166.66667 |
| 07-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | J | 5400 | 6,267 | 866.666667 |
| 07-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 190 | J | 9,300 | 6,267 | 3033.33333 |
| 07-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 91 | U | 2,800 | 2,967 | 166.666667 |
| 07-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 2,300 | 2,967 | 666.666667 |
| 07-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 3,800 | 2,967 | 833.333333 |
| 07-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 89 | U | 1,100 | 1,400 | 300 |
| 07-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 89 | U | 1,700 | 1,400 | 300 |
| 07-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 89 | U | 1,400 | 1,400 | 0 |
| 07-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 88 | U | 930 | 713 | 216.666667 |
| 07-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 87 | U | 650 | 713 | 63.3333333 |
| 07-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 88 | U | 560 | 713 | 153.333333 |
| 26-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 550 | | 3,900 | 4,333 | 433.333333 |
| 26-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 640 | | 4,700 | 4,333 | 366.666667 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 26-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 680 | | 4,400 | 4,333 | 66.6666667 |
| 26-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 330 | J | 3,100 | 3,533 | 433.333333 |
| 26-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 230 | J | 3,400 | 3,533 | 133.333333 |
| 26-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 260 | J | 4,100 | 3,533 | 566.666667 |
| 26-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 140 | U | 1,000 | 937 | 63.3333333 |
| 26-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 140 | U | 910 | 937 | 26.6666667 |
| 26-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 140 | U | 900 | 937 | 36.6666667 |
| 26-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 260 | 360 | 100 |
| 26-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 280 | 360 | 80 |
| 26-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 140 | U | 540 | 360 | 180 |
| 28-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 420 | J | 10,000 | 10,533 | 533.333333 |
| 28-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 420 | J | 12,000 | 10,533 | 1466.66667 |
| 28-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 420 | J | 9,600 | 10,533 | 933.333333 |
| 28-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 150 | U | 5,600 | 5,417 | 183.333333 |
| 28-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 4,700 | 5,417 | 716.666667 |
| 28-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 170 | J | 5950 | 5,417 | 533.333333 |
| 28-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,600 | 2,333 | 733.333333 |
| 28-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 3,900 | 2,333 | 1566.66667 |
| 28-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,500 | 2,333 | 833.333333 |
| 28-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 640 | 663 | 23.3333333 |
| 28-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 680 | 663 | 16.6666667 |
| 28-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 130 | U | 670 | 663 | 6.66666667 |
| 29-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 8,400 | 10,133 | 1733.33333 |
| 29-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 11,000 | 10,133 | 866.666667 |
| 29-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 11,000 | 10,133 | 866.666667 |
| 29-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 8,200 | 7,500 | 700 |
| 29-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 6,500 | 7,500 | 1000 |
| 29-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 7800 | 7,500 | 300 |
| 29-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 5,500 | 4,567 | 933.333333 |
| 29-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 3,900 | 4,567 | 666.666667 |
| 29-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 4,300 | 4,567 | 266.666667 |
| 29-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,500 | 2,667 | 166.666667 |
| 29-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,600 | 2,667 | 66.6666667 |
| 29-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,900 | 2,667 | 233.333333 |
| 22-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 150 | U | 21,000 | 24,000 | 3000 |
| 22-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 150 | U | 26,000 | 24,000 | 2000 |
| 22-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 150 | U | 25,000 | 24,000 | 1000 |
| 22-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 16500 | 10,700 | 5800 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth.Factor | PBB(BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 22-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 6,600 | 10,700 | 4100 |
| 22-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 9,000 | 10,700 | 1700 |
| 22-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 3,700 | 2,967 | 733.333333 |
| 22-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 3,200 | 2,967 | 233.333333 |
| 22-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 2,000 | 2,967 | 966.666667 |
| 22-PW-R1 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 1,600 | 1,433 | 166.666667 |
| 22-PW-R2 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 1,600 | 1,433 | 166.666667 |
| 22-PW-R3 | Parkway | [redacted] | 18 - 24 | 4 | 130 | U | 1,100 | 1,433 | 333.333333 |
| 24-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 150 | U | 3,300 | 3,133 | 166.666667 |
| 24-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 160 | U | 3,400 | 3,133 | 266.666667 |
| 24-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 140 | U | 2,700 | 3,133 | 433.333333 |
| 24-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,700 | 2,583 | 116.666667 |
| 24-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2650 | 2,583 | 66.6666667 |
| 24-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,400 | 2,583 | 183.333333 |
| 24-YA1-R1 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 1,500 | 1,667 | 166.666667 |
| 24-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 150 | U | 2,000 | 1,667 | 333.333333 |
| 24-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 1,500 | 1,667 | 166.666667 |
| 24-YA1-R1 | Yard1 | [redacted] | 18 - 24 | 4 | 140 | U | 640 | 803 | 163.333333 |
| 24-YA1-R2 | Yard1 | [redacted] | 18 - 24 | 4 | 140 | U | 1,100 | 803 | 296.666667 |
| 24-YA1-R3 | Yard1 | [redacted] | 18 - 24 | 4 | 140 | U | 670 | 803 | 133.333333 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results through April 4, 2013**
**Phase 2A of Velsicol OU1 ANP RA**

St Dev 636.8347

**LCL 95% one-tailed cutoff = 3955**
z(0.05)=1.64

**LCL 97.5% one-tailed cutoff = 3751**
z(0.025)=1.96

**LCL 99% one-tailed cutoff = 3516**
z(0.01)=2.33

| | sd | 95% |
|---|---|---|
| all reps | 637 | 3955 |
| | 637 | 3751 |
| | 637 | 3516 |

Formula=5000-($Z_{alpha}$*standard deviation)

# Appendix B
# Development of Decision Level for Total DDT by USEPA Region 5 FIELDS
# Section 3—All Replicate Data between 2,000 and 8,000 µg/L

**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth. Factor | PBB (BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 14-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 3,600 | 4,133 | 533 |
| 14-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 3,800 | 4,133 | 333 |
| 14-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 150 | U | 5,000 | 4,133 | 867 |
| 14-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 1950 | 2,750 | 800 |
| 14-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 2,750 | 550 |
| 14-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 4,100 | 2,750 | 1350 |
| 11-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 180 | J | 7,600 | 7,800 | 200 |
| 11-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 180 | P | 7,900 | 7,800 | 100 |
| 11-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 230 | J | 7,900 | 7,800 | 100 |
| 11-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 94 | J | 5,700 | 5,450 | 250 |
| 11-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 94 | U | 4,600 | 5,450 | 850 |
| 11-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 110 | J | 6050 | 5,450 | 600 |
| 21-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 550 | | 5,700 | 6,067 | 367 |
| 21-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 430 | J | 6,200 | 6,067 | 133 |
| 21-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 360 | J | 6,300 | 6,067 | 233 |
| 21-PW-R1 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,400 | 2,033 | 633 |
| 21-PW-R2 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 2,800 | 2,033 | 767 |
| 21-PW-R3 | Parkway | [redacted] | 12 - 18 | 3 | 130 | U | 1,900 | 2,033 | 133 |
| 21-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 200 | J | 3950 | 3,717 | 233 |
| 21-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 2,900 | 3,717 | 817 |
| 21-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 190 | J | 4,300 | 3,717 | 583 |
| 27-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 430 | J | 4,000 | 3,533 | 467 |
| 27-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 410 | J | 3,200 | 3,533 | 333 |
| 27-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 410 | J | 3,400 | 3,533 | 133 |
| 27-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 350 | J | 3,700 | 3,600 | 100 |
| 27-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 190 | J | 3,000 | 3,600 | 600 |
| 27-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 310 | J | 4,100 | 3,600 | 500 |
| 19-PW-R1 | Parkway | [redacted] | 0 - 6 | 1 | 200 | J | 5,200 | 4,633 | 567 |
| 19-PW-R2 | Parkway | [redacted] | 0 - 6 | 1 | 180 | J | 3,000 | 4,633 | 1633 |
| 19-PW-R3 | Parkway | [redacted] | 0 - 6 | 1 | 140 | U | 5,700 | 4,633 | 1067 |
| 19-PW-R1 | Parkway | [redacted] | 6 - 12 | 2 | 140 | J | 3,500 | 4,067 | 567 |
| 19-PW-R2 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 3500 | 4,067 | 567 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth. Factor | PBB (BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 19-PW-R3 | Parkway | [redacted] | 6 - 12 | 2 | 140 | U | 5,200 | 4,067 | 1133 |
| 06-PW-R3 | Parkway | | 0 - 6 | 1 | 160 | J | 3,900 | 3,817 | 83 |
| 06-PWR1 | Parkway | | 0-6 | 1 | 120 | J | 4,300 | 3,817 | 483 |
| 06-PWR2 | Parkway | | 0-6 | 1 | 130 | J | 3250 | 3,817 | 567 |
| 06-PW-R3 | Parkway | | 6 - 12 | 2 | 88 | U | 3,800 | 3,100 | 700 |
| 06-PWR1 | Parkway | | 6-12 | 2 | 88 | U | 3,500 | 3,100 | 400 |
| 06-PWR2 | Parkway | | 6-12 | 2 | 88 | U | 2,000 | 3,100 | 1100 |
| 26-PW-R1 | Parkway | | 0 - 6 | 1 | 550 | | 3,900 | 4,333 | 433 |
| 26-PW-R2 | Parkway | | 0 - 6 | 1 | 640 | | 4,700 | 4,333 | 367 |
| 26-PW-R3 | Parkway | | 0 - 6 | 1 | 680 | | 4,400 | 4,333 | 67 |
| 26-PW-R1 | Parkway | | 6 - 12 | 2 | 330 | J | 3,100 | 3,533 | 433 |
| 26-PW-R2 | Parkway | | 6 - 12 | 2 | 230 | J | 3,400 | 3,533 | 133 |
| 26-PW-R3 | Parkway | | 6 - 12 | 2 | 260 | J | 4,100 | 3,533 | 567 |
| 22-PW-R1 | Parkway | | 12 - 18 | 3 | 130 | U | 3,700 | 2,967 | 733 |
| 22-PW-R2 | Parkway | | 12 - 18 | 3 | 130 | U | 3,200 | 2,967 | 233 |
| 22-PW-R3 | Parkway | | 12 - 18 | 3 | 130 | U | 2,000 | 2,967 | 967 |
| 11-YA1-R1 | Yard1 | | 0 - 6 | 1 | 120 | J | 7,300 | 7,933 | 633 |
| 11-YA1-R2 | Yard1 | | 0 - 6 | 1 | 95 | U | 7,700 | 7,933 | 233 |
| 11-YA1-R3 | Yard1 | | 0 - 6 | 1 | 95 | U | 8,800 | 7,933 | 867 |
| 11-YA1-R1 | Yard1 | | 6 - 12 | 2 | 93 | U | 4,700 | 4,167 | 533 |
| 11-YA1-R2 | Yard1 | | 6 - 12 | 2 | 93 | U | 3,300 | 4,167 | 867 |
| 11-YA1-R3 | Yard1 | | 6 - 12 | 2 | 93 | U | 4,500 | 4,167 | 333 |
| 04-YA1R1 | Yard1 | | 0-6 | 1 | 91 | U | 2,700 | 4,000 | 1300 |
| 04-YA1R2 | Yard1 | | 0-6 | 1 | 110 | J | 5,300 | 4,000 | 1300 |
| 04-YA1R3 | Yard1 | | 0-6 | 1 | 230 | U | 4,000 | 4,000 | 0 |
| 04-YA1R1 | Yard1 | | 6-12 | 2 | 89 | U | 2,400 | 2,433 | 33 |
| 04-YA1R2 | Yard1 | | 6-12 | 2 | 90 | U | 2,500 | 2,433 | 67 |
| 04-YA1R3 | Yard1 | | 6-12 | 2 | 230 | U | 2,400 | 2,433 | 33 |
| 13-YA1-R1 | Yard1 | | 0 - 6 | 1 | 140 | U | 5,900 | 5,400 | 500 |
| 13-YA1-R2 | Yard1 | | 0 - 6 | 1 | 140 | U | 5,900 | 5,400 | 500 |
| 13-YA1-R3 | Yard1 | | 0 - 6 | 1 | 140 | U | 4,400 | 5,400 | 1000 |
| 13-YA1-R1 | Yard1 | | 12 - 18 | 3 | 140 | U | 1,400 | 2,433 | 1033 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth. Factor | PBB (BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 13-YA1-R2 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 1,300 | 2,433 | 1133 |
| 13-YA1-R3 | Yard1 | [redacted] | 12 - 18 | 3 | 140 | U | 4,600 | 2,433 | 2167 |
| 13-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 2,567 | 367 |
| 13-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 92 | U | 2,300 | 2,567 | 267 |
| 13-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 3,200 | 2,567 | 633 |
| 05-YA1R1 | Yard1 | [redacted] | 6-12 | 2 | 230 | U | 4,400 | 4,333 | 67 |
| 05-YA1R2 | Yard1 | [redacted] | 6-12 | 2 | 220 | U | 5,100 | 4,333 | 767 |
| 05-YA1R3 | Yard1 | [redacted] | 6-12 | 2 | 220 | U | 3,500 | 4,333 | 833 |
| 23-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 170 | U | 3,300 | 2,900 | 400 |
| 23-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 160 | U | 2,500 | 2,900 | 400 |
| 23-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 170 | U | 2,900 | 2,900 | 0 |
| 06-YA1R1 | Yard1 | [redacted] | 0-6 | 1 | 130 | J | 6,750 | 6,683 | 67 |
| 06-YA1R2 | Yard1 | [redacted] | 0-6 | 1 | 150 | J | 6,400 | 6,683 | 283 |
| 06-YA1R3 | Yard1 | [redacted] | 0-6 | 1 | 120 | J | 6,900 | 6,683 | 217 |
| 06-YA1R1 | Yard1 | [redacted] | 12-18 | 3 | 91 | U | 2,100 | 2,733 | 633 |
| 06-YA1R2 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 3,600 | 2,733 | 867 |
| 06-YA1R3 | Yard1 | [redacted] | 12-18 | 3 | 90 | U | 2500 | 2,733 | 233 |
| 06-YA1R1 | Yard1 | [redacted] | 6-12 | 2 | 140 | J | 5,100 | 5,300 | 200 |
| 06-YA1R2 | Yard1 | [redacted] | 6-12 | 2 | 91 | U | 4,700 | 5,300 | 600 |
| 06-YA1R3 | Yard1 | [redacted] | 6-12 | 2 | 91 | U | 6,100 | 5,300 | 800 |
| 24-YA1-R1 | Yard1 | [redacted] | 0 - 6 | 1 | 150 | U | 3,300 | 3,133 | 167 |
| 24-YA1-R2 | Yard1 | [redacted] | 0 - 6 | 1 | 160 | U | 3,400 | 3,133 | 267 |
| 24-YA1-R3 | Yard1 | [redacted] | 0 - 6 | 1 | 140 | U | 2,700 | 3,133 | 433 |
| 24-YA1-R1 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,700 | 2,583 | 117 |
| 24-YA1-R2 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2650 | 2,583 | 67 |
| 24-YA1-R3 | Yard1 | [redacted] | 6 - 12 | 2 | 140 | U | 2,400 | 2,583 | 183 |
| 11-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 89 | U | 7300 | 3,733 | 3567 |
| 11-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 90 | U | 2,900 | 3,733 | 833 |
| 11-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 87 | U | 1,000 | 3,733 | 2733 |
| 11-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 2,100 | 3,400 | 1300 |
| 11-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 88 | U | 4,100 | 3,400 | 700 |
| 11-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 91 | U | 4,000 | 3,400 | 600 |

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**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth. Factor | PBB (BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 27-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,700 | 2,650 | 50 |
| 27-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,300 | 2,650 | 350 |
| 27-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2950 | 2,650 | 300 |
| 08-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | J | 4,700 | 3,867 | 833 |
| 08-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 190 | J | 1,600 | 3,867 | 2267 |
| 08-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | J | 5,300 | 3,867 | 1433 |
| 08-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 90 | U | 2,300 | 2,400 | 100 |
| 08-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 90 | U | 2,800 | 2,400 | 400 |
| 08-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 92 | U | 2,100 | 2,400 | 300 |
| 08-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 94 | U | 4900 | 4,433 | 467 |
| 08-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 92 | U | 4,400 | 4,433 | 33 |
| 08-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 92 | U | 4,000 | 4,433 | 433 |
| 01-YA2R1 | Yard2 | [redacted] | 0-6 | 1 | 97 | J | 4,500 | 4,833 | 333 |
| 01-YA2R2 | Yard2 | [redacted] | 0-6 | 1 | 97 | U | 4,400 | 4,833 | 433 |
| 01-YA2R3 | Yard2 | [redacted] | 0-6 | 1 | 490 | U | 5,600 | 4,833 | 767 |
| 01-YA2R1 | Yard2 | [redacted] | 6-12 | 2 | 93 | U | 3,600 | 3,500 | 100 |
| 01-YA2R2 | Yard2 | [redacted] | 6-12 | 2 | 94 | U | 4,500 | 3,500 | 1000 |
| 01-YA2R3 | Yard2 | [redacted] | 6-12 | 2 | 230 | U | 2,400 | 3,500 | 1100 |
| 17-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 3,600 | 3,833 | 233 |
| 17-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 4,200 | 3,833 | 367 |
| 17-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | U | 3,700 | 3,833 | 133 |
| 17-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,800 | 2,733 | 67 |
| 17-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,800 | 2,733 | 67 |
| 17-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2600 | 2,733 | 133 |
| 23-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 160 | U | 4,500 | 4,567 | 67 |
| 23-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 170 | U | 4,200 | 4,567 | 367 |
| 23-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 170 | U | 5,000 | 4,567 | 433 |
| 23-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 2,200 | 3,050 | 850 |
| 23-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 3350 | 3,050 | 300 |
| 23-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 3,600 | 3,050 | 550 |
| 07-YA2-R1 | Yard2 | [redacted] | 0 - 6 | 1 | 230 | U | 4,100 | 6,267 | 2167 |
| 07-YA2-R2 | Yard2 | [redacted] | 0 - 6 | 1 | 150 | J | 5400 | 6,267 | 867 |

CONFIDENTIAL

**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

| Sample.ID | Yard | Address | Depth | Depth. Factor | PBB (BP-6) (ug/kg) | Q | DDT TOTAL (ug/kg) | Average | \|Diff\| |
|---|---|---|---|---|---|---|---|---|---|
| 07-YA2-R3 | Yard2 | [redacted] | 0 - 6 | 1 | 190 | J | 9,300 | 6,267 | 3033 |
| 07-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 91 | U | 2,800 | 2,967 | 167 |
| 07-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 2,300 | 2,967 | 667 |
| 07-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 90 | U | 3,800 | 2,967 | 833 |
| 28-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,600 | 2,333 | 733 |
| 28-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 3,900 | 2,333 | 1567 |
| 28-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 130 | U | 1,500 | 2,333 | 833 |
| 28-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 150 | U | 5,600 | 5,417 | 183 |
| 28-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 4,700 | 5,417 | 717 |
| 28-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 170 | J | 5950 | 5,417 | 533 |
| 29-YA2-R1 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 5,500 | 4,567 | 933 |
| 29-YA2-R2 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 3,900 | 4,567 | 667 |
| 29-YA2-R3 | Yard2 | [redacted] | 12 - 18 | 3 | 140 | U | 4,300 | 4,567 | 267 |
| 29-YA2-R1 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,500 | 2,667 | 167 |
| 29-YA2-R2 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,600 | 2,667 | 67 |
| 29-YA2-R3 | Yard2 | [redacted] | 18 - 24 | 4 | 140 | U | 2,900 | 2,667 | 233 |
| 29-YA2-R1 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 8,200 | 7,500 | 700 |
| 29-YA2-R2 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 6,500 | 7,500 | 1000 |
| 29-YA2-R3 | Yard2 | [redacted] | 6 - 12 | 2 | 140 | U | 7800 | 7,500 | 300 |

CONFIDENTIAL

**Development of Decision Level for Total DDT by FIELDS - All Replicate Sample Results between 2 and 8 ppm**
**Phase 2A of Velsicol OU1 ANP RA**

St Dev 566.3347

**LCL 95% one-tailed cutoff = 4072**
z(0.05)=1.64

**LCL 97.5% one-tailed cutoff = 3891**
z(0.025)=1.96

**LCL 99% one-tailed cutoff = 3681**
z(0.01)=2.33

| | sd | | | |
|---|---|---|---|---|
| all reps | | 566 | 4072 | 95% |
| | | 566 | 3891 | |
| | | 566 | 3681 | |

Formula=5000-($Z_{alpha}$*standard deviation)

# Appendix B
# Development of Decision Level for Total DDT by USEPA Region 5 FIELDS
# Section 4—Summary of All Replicate Sample Results

**Development of Decision Level for Total DDT by FIELDS - Summary of All Replicate Sample Results**
**Phase 2A of Velsicol OU1 ANP RA**

Summary of replicate analysis

| | Yard | alpha-95% | alph-97.5% | alpha-99% |
|---|---|---|---|---|
| all replicates | | 4.0 | 3.8 | 3.5 |
| all replicates-1.0-9.99 | | 4.1 | 4.0 | 3.8 |
| all replicates-2.0-7.99 | | 4.1 | 3.9 | 3.7 |
| all replicates-3.5-6.5 | | 3.9 | 3.7 | 3.5 |
| sorted by yard--all data | ya1 | 4.4 | 4.2 | 4.0 |
| sorted by yard 1.0-9.99 | ya1 | 4.3 | 4.2 | 4.0 |
| sorted by yard-2.0-7.99 | ya1 | 4.2 | 4.1 | 3.9 |
| sorted by yard--all data | ya2 | 4.0 | 3.7 | 3.5 |
| sorted by yard 1.0-9.99 | ya2 | 3.9 | 3.7 | 3.4 |
| sorted by yard-2.0-7.99 | ya2 | 3.8 | 3.5 | 3.3 |
| sorted by yard--all data | pw | 3.7 | 3.5 | 3.1 |
| sorted by yard 1.0-9.99 | pw | 4.4 | 4.3 | 4.2 |
| sorted by yard-2.0-7.99 | pw | 4.4 | 4.3 | 4.2 |

Summary of replicate analysis

| | Yard | alpha-95% | alph-97.5% | alpha-99% |
|---|---|---|---|---|
| all replicates | | 4.0 | 3.8 | 3.5 |
| all replicates-2.0-8.0 | | 4.1 | 3.9 | 3.7 |
| sorted by yard--all data | ya1 | 4.4 | 4.2 | 4.0 |
| sorted by yard-2.0-8.0 | ya1 | 4.2 | 4.1 | 3.9 |
| sorted by yard--all data | ya2 | 4.0 | 3.7 | 3.5 |
| sorted by yard-2.0-8.0 | ya2 | 3.8 | 3.5 | 3.3 |
| sorted by yard--all data | pw | 3.7 | 3.5 | 3.1 |
| sorted by yard-2.0-8.0 | pw | 4.4 | 4.3 | 4.2 |

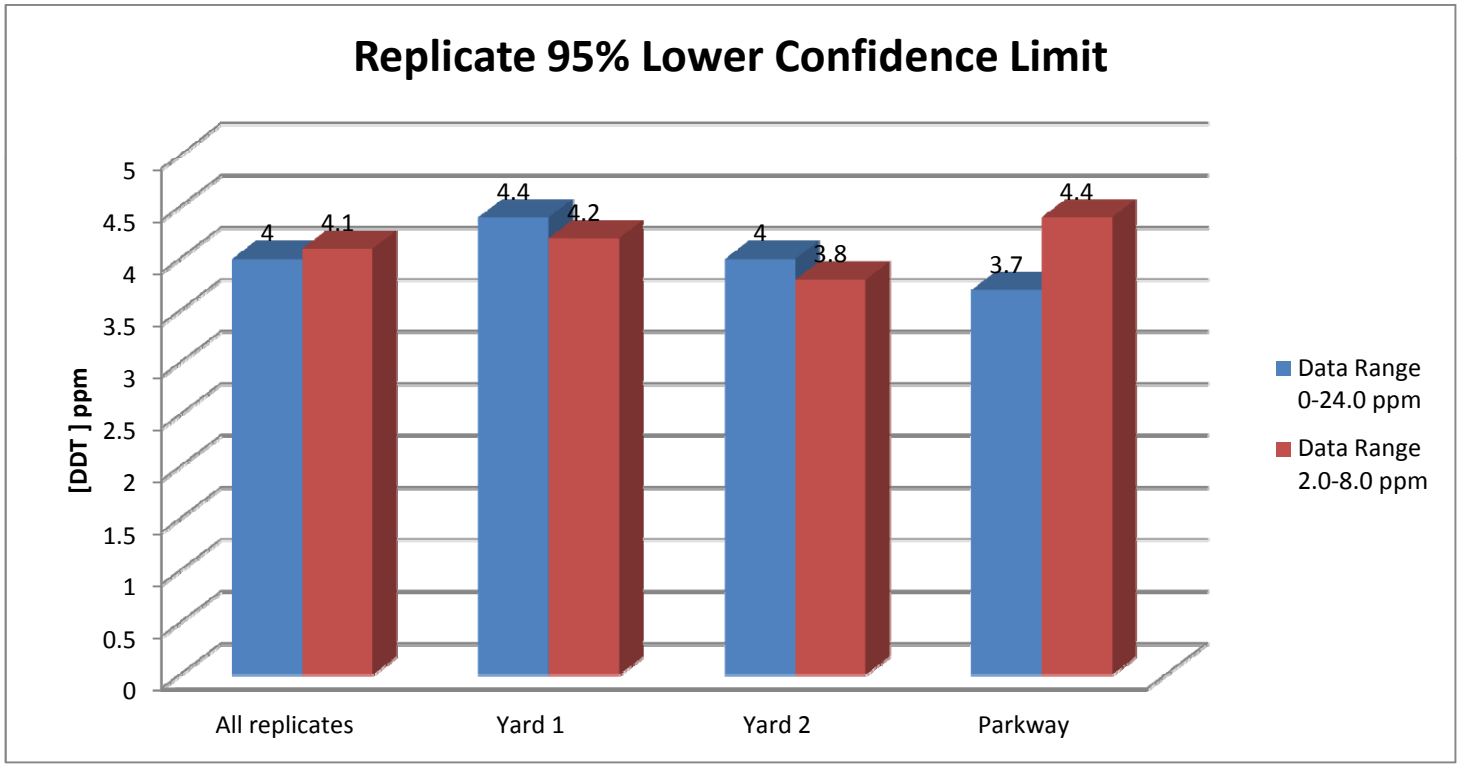
Summary of replicate analysis

| | Yard | alpha-95% |
|---|---|---|
| all replicates | | 4.0 |
| all replicates-2.0-8.0 | | 4.1 |
| sorted by yard--all data | ya1 | 4.4 |
| sorted by yard-2.0-8.0 | ya1 | 4.2 |

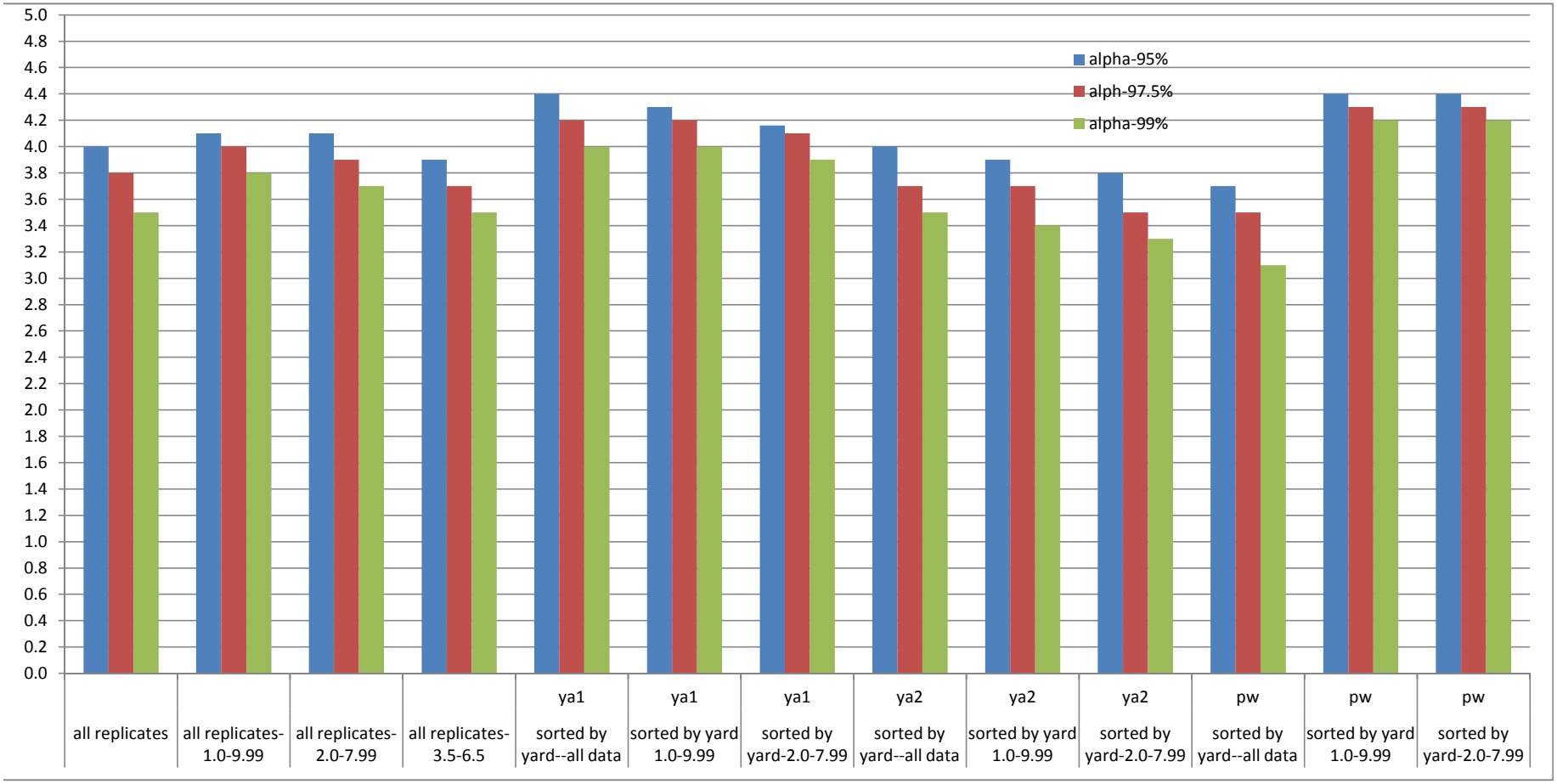
**Development of Decision Level for Total DDT by FIELDS - Summary of All Replicate Sample Results**
**Phase 2A of Velsicol OU1 ANP RA**

| | | |
|---|---|---|
| sorted by yard--all data | ya2 | 4.0 |
| sorted by yard-2.0-8.0 | ya2 | 3.8 |
| sorted by yard--all data | pw | 3.7 |
| sorted by yard-2.0-8.0 | pw | 4.4 |

| | Data Range 0-24.0 ppm | Data Range 2.0-8.0 ppm |
|---|---|---|
| All replicates | 4 | 4.1 |
| Yard 1 | 4.4 | 4.2 |
| Yard 2 | 4 | 3.8 |
| Parkway | 3.7 | 4.4 |



**Development of Decision Level for Total DDT by FIELDS - Summary of All Replicate Sample Results**
**Phase 2A of Velsicol OU1 ANP RA**



# Appendix B Development of Decision Level for Total DDT by USEPA Region 5 FIELDS Section 5—Replicate Data for Histogram

**Development of Decision Level for Total DDT by FIELDS - Replicate Sample Results for Histogram**

**Phase 2A of Velsicol OU1 ANP RA**

| StationId | Depths | PBB.ppm | DDT.ppm |
|---|---|---|---|
| 07-YA2-R1 | 4 | 88 | 713 |
| 05-YA1R1 | 4 | 88 | 767 |
| 06-PWR1 | 2 | 88 | 3,100 |
| 05-YA1R1 | 3 | 89 | 1,550 |
| 08-YA2-R1 | 4 | 89 | 1,040 |
| 11-YA2-R1 | 4 | 89 | 3,733 |
| 06-PWR1 | 3 | 89 | 1,367 |
| 07-YA2-R1 | 3 | 89 | 1,400 |
| 06-PWR1 | 4 | 89 | 627 |
| 01-YA2R1 | 4 | 89 | 777 |
| 04-YA1R1 | 4 | 89 | 392 |
| 06-YA1R1 | 4 | 89 | 1,233 |
| 11-YA2-R1 | 2 | 90 | 3,400 |
| 04-YA1R1 | 3 | 90 | 720 |
| 11-YA2-R1 | 3 | 90 | 1,800 |
| 07-YA2-R1 | 2 | 90 | 2,967 |
| 06-YA1R1 | 3 | 90 | 2,733 |
| 08-YA2-R1 | 3 | 91 | 2,400 |
| 11-PW-R1 | 4 | 91 | 907 |
| 11-YA2-R1 | 1 | 91 | 10,333 |
| 01-YA2R1 | 3 | 91 | 1,367 |
| 11-PW-R1 | 3 | 91 | 1,440 |
| 11-YA1-R1 | 4 | 92 | 983 |
| 08-YA2-R1 | 2 | 93 | 4,433 |
| 11-YA1-R1 | 2 | 93 | 4,167 |
| 11-YA1-R1 | 3 | 94 | 1,500 |
| 12-YA1-R1 | 4 | 95 | 87 |
| 12-YA1-R1 | 2 | 96 | 497 |
| 12-YA1-R1 | 3 | 96 | 153 |
| 12-YA1-R1 | 1 | 97 | 1,733 |
| 11-PW-R1 | 2 | 99 | 5,450 |
| 11-YA1-R1 | 1 | 103 | 7,933 |

| StationId | Depths | PBB.ppm | DDT.ppm |
|---|---|---|---|
| 05-YA1R1 | 1 | 104 | 8,900 |
| 06-YA1R1 | 2 | 107 | 5,300 |
| 13-YA1-R1 | 2 | 124 | 2,567 |
| 25-YA1-R1 | 3 | 130 | 360 |
| 27-YA2-R1 | 3 | 130 | 877 |
| 19-PW-R1 | 3 | 130 | 963 |
| 17-YA2-R1 | 3 | 130 | 1,100 |
| 21-PW-R1 | 3 | 130 | 2,033 |
| 28-YA2-R1 | 3 | 130 | 2,333 |
| 22-PW-R1 | 3 | 130 | 2,967 |
| 25-YA1-R1 | 4 | 130 | 188 |
| 25-PW-R1 | 4 | 130 | 317 |
| 27-YA2-R1 | 4 | 130 | 357 |
| 17-YA2-R1 | 4 | 130 | 370 |
| 19-PW-R1 | 4 | 130 | 520 |
| 28-YA2-R1 | 4 | 130 | 663 |
| 21-PW-R1 | 4 | 130 | 903 |
| 22-PW-R1 | 4 | 130 | 1,433 |
| 06-YA1R1 | 1 | 133 | 6,683 |
| 04-YA1R1 | 2 | 136 | 2,433 |
| 06-PWR1 | 1 | 137 | 3,817 |
| 25-YA1-R1 | 2 | 137 | 1,967 |
| 13-YA1-R1 | 4 | 137 | 1,118 |
| 01-YA2R1 | 2 | 139 | 3,500 |
| 13-YA1-R1 | 1 | 140 | 5,400 |
| 24-YA1-R1 | 2 | 140 | 2,583 |
| 27-YA2-R1 | 2 | 140 | 2,650 |
| 17-YA2-R1 | 2 | 140 | 2,733 |
| 14-PW-R1 | 2 | 140 | 2,750 |
| 23-YA2-R1 | 2 | 140 | 3,050 |
| 19-PW-R1 | 2 | 140 | 4,067 |
| 29-YA2-R1 | 2 | 140 | 7,500 |

**Development of Decision Level for Total DDT by FIELDS - Replicate Sample Results for Histogram**

**Phase 2A of Velsicol OU1 ANP RA**

| StationId | Depths | PBB.ppm | DDT.ppm |
|---|---|---|---|
| 22-PW-R1 | 2 | 140 | 10,700 |
| 26-PW-R1 | 3 | 140 | 937 |
| 13-YA1-R1 | 3 | 140 | 2,433 |
| 29-YA2-R1 | 3 | 140 | 4,567 |
| 26-PW-R1 | 4 | 140 | 360 |
| 14-PW-R1 | 4 | 140 | 717 |
| 24-YA1-R1 | 4 | 140 | 803 |
| 29-YA2-R1 | 4 | 140 | 2,667 |
| 14-PW-R1 | 1 | 143 | 4,133 |
| 23-YA2-R1 | 3 | 143 | 1,333 |
| 24-YA1-R1 | 3 | 143 | 1,667 |
| 23-YA2-R1 | 4 | 143 | 930 |
| 04-YA1R1 | 1 | 144 | 4,000 |
| 23-YA1-R1 | 2 | 147 | 1,600 |
| 24-YA1-R1 | 1 | 150 | 3,133 |
| 17-YA2-R1 | 1 | 150 | 3,833 |
| 29-YA2-R1 | 1 | 150 | 10,133 |
| 22-PW-R1 | 1 | 150 | 24,000 |
| 25-PW-R1 | 3 | 150 | 583 |
| 23-YA1-R1 | 3 | 150 | 1,100 |
| 23-YA1-R1 | 4 | 150 | 362 |
| 28-YA2-R1 | 2 | 153 | 5,417 |
| 23-YA1-R1 | 1 | 167 | 2,900 |
| 23-YA2-R1 | 1 | 167 | 4,567 |
| 08-YA2-R1 | 1 | 170 | 3,867 |
| 19-PW-R1 | 1 | 173 | 4,633 |
| 27-YA2-R1 | 1 | 177 | 1,867 |
| 21-PW-R1 | 2 | 177 | 3,717 |
| 07-YA2-R1 | 1 | 190 | 6,267 |
| 27-PW-R1 | 3 | 190 | 1,300 |
| 11-PW-R1 | 1 | 197 | 7,800 |
| 27-PW-R1 | 4 | 203 | 767 |

| StationId | Depths | PBB.ppm | DDT.ppm |
|---|---|---|---|
| 14-PW-R1 | 3 | 207 | 1,650 |
| 05-YA1R1 | 2 | 223 | 4,333 |
| 01-YA2R1 | 1 | 228 | 4,833 |
| 26-PW-R1 | 2 | 273 | 3,533 |
| 27-PW-R1 | 2 | 283 | 3,600 |
| 25-PW-R1 | 2 | 333 | 1,600 |
| 27-PW-R1 | 1 | 417 | 3,533 |
| 28-YA2-R1 | 1 | 420 | 10,533 |
| 21-PW-R1 | 1 | 447 | 6,067 |
| 26-PW-R1 | 1 | 623 | 4,333 |
| 25-YA1-R1 | 1 | 707 | 14,333 |
| 25-PW-R1 | 1 | 873 | 13,000 |

# Appendix B Development of Decision Level for Total DDT by USEPA Region 5 FIELDS Section 6—Replicate Data and Depth Intervals

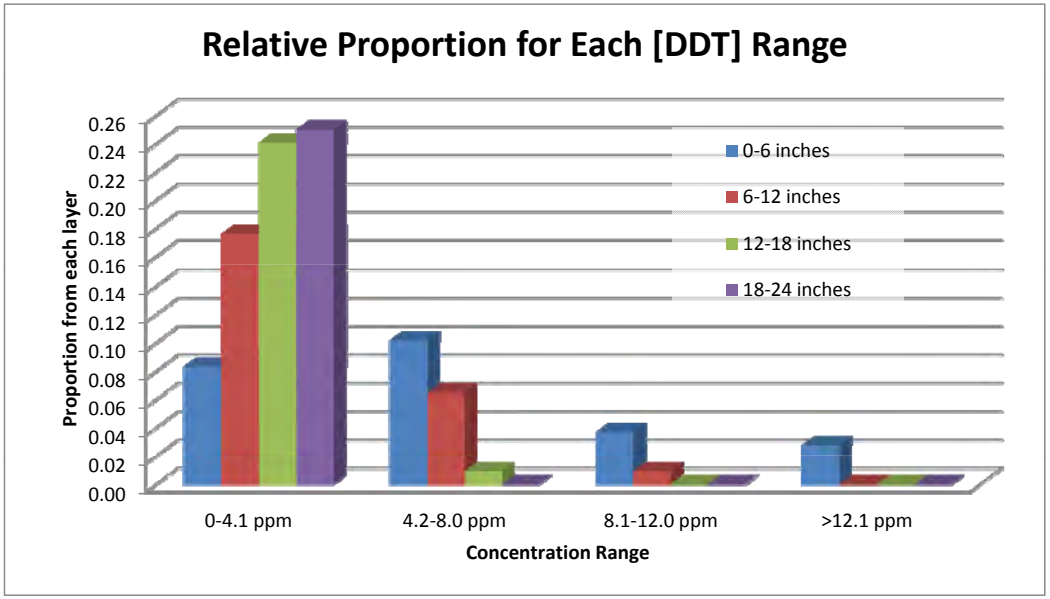
**Development of Decision Level for Total DDT by FIELDS - Replicate Samples and Depth Intervals**
**Phase 2A of Velsicol OU1 ANP RA**

| DDT | All Replicates | Parkway | Yard 1 | Yard 2 | 0-6 inches | 6-12 inches | 12-18 inches | 18-24 inches |
|---|---|---|---|---|---|---|---|---|
| 0-2.5 | 56 | 18 | 22 | 16 | 2 | 5 | 24 | 26 |
| 2.5-5.0 | 34 | 12 | 8 | 14 | 12 | 17 | 3 | 1 |
| 5.0-7.5 | 7 | 2 | 3 | 3 | 4 | 4 | 0 | 0 |
| 7.5-10 | 4 | 1 | 2 | 0 | 3 | 1 | 0 | 0 |
| 10-12.5 | 4 | 1 | 0 | 3 | 3 | 0 | 0 | 0 |
| 12.5-15 | 2 | 1 | 1 | 0 | 2 | 0 | 0 | 0 |
| >15 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |

| DDT | 0-6 inches | 6-12 inches | 12-18 inches | 18-24 inches |
|---|---|---|---|---|
| 0-4.1 | 9 | 19 | 26 | 27 |
| 4.2-8.0 | 11 | 7 | 1 | 0 |
| 8.1-12.0 | 4 | 1 | 0 | 0 |
| >12.1 | 3 | 0 | 0 | 0 |

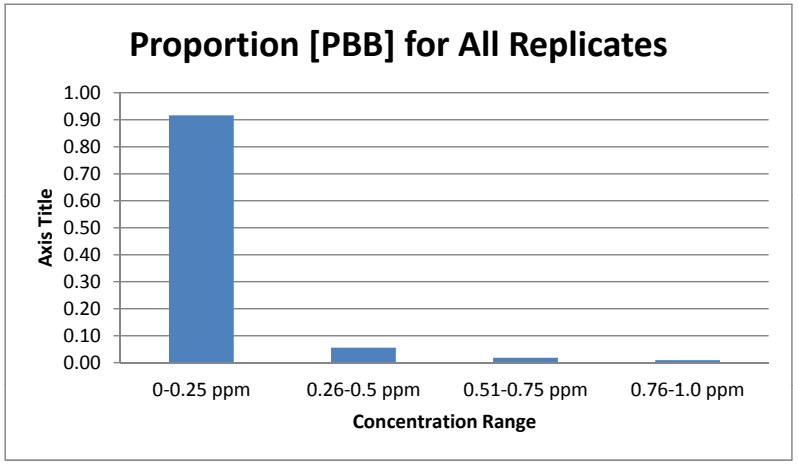
| DDT | 0-6 inches | 6-12 inches | 12-18 inches | 18-24 inches |
|---|---|---|---|---|
| 0-4.1 | 0.33 | 0.70 | 0.96 | 1.00 |
| 4.2-8.0 | 0.41 | 0.26 | 0.04 | 0.00 |
| 8.1-12.0 | 0.15 | 0.04 | 0.00 | 0.00 |
| >12.1 | 0.11 | 0.00 | 0.00 | 0.00 |

| DDT | 0-6 inches | 6-12 inches | 12-18 inches | 18-24 inches |
|---|---|---|---|---|
| 0-4.1 ppm | 0.08 | 0.18 | 0.24 | 0.25 |
| 4.2-8.0 ppm | 0.10 | 0.06 | 0.01 | 0.00 |
| 8.1-12.0 ppm | 0.04 | 0.01 | 0.00 | 0.00 |
| >12.1 ppm | 0.03 | 0.00 | 0.00 | 0.00 |




| PBB | All Replicates |
|---|---|
| 0-0.25 | 99 |
| 0.26-0.5 | 6 |
| 0.51-0.75 | 2 |
| 0.76-1.0 | 1 |

| PBB | All Replicates |
|---|---|
| 0-0.25 ppm | 0.92 |
| 0.26-0.5 ppm | 0.06 |
| 0.51-0.75 ppm | 0.02 |
| 0.76-1.0 ppm | 0.01 |



# Appendix B Development of Decision Level for Total DDT by USEPA Region 5 FIELDS Section 7—Replicate Averages per Yard

**Development of Decision Level for Total DDT by FIELDS - Replicate Sample Averages per Yard**
**Phase 2A of Velsicol OU1 ANP RA**

Subset of the replicate results for [DDT]

| | yard 1 | yard 2 | yard 3 | yard 4 | yard 5 | yard 6 | … | yard 108 |
|---|---|---|---|---|---|---|---|---|
| replicate 1 | 0.36 | 1.40 | 4.50 | 5.90 | 15.00 | 15.00 | … | … |
| replicate 2 | 0.37 | 1.30 | 4.20 | 5.90 | 11.00 | 15.00 | … | … |
| replicate 3 | 0.35 | 4.60 | 5.00 | 4.40 | 13.00 | 13.00 | … | … |
| Average | 0.36 | 2.43 | 4.57 | 5.40 | 13.00 | 14.33 | … | … |

Absolute value of the difference between the measured value and the average of the three replicates

| | yard 1 | yard 2 | yard 3 | yard 4 | yard 5 | yard 6 | … | … |
|---|---|---|---|---|---|---|---|---|
| replicate 1 | 0.00 | 1.03 | 0.67 | 0.50 | 2.00 | 0.67 | … | … |
| replicate 2 | 0.01 | 1.11 | 0.37 | 0.50 | 2.00 | 0.67 | … | … |
| replicate 3 | 0.01 | 2.17 | 0.43 | 1.00 | 0.00 | 1.33 | … | … |

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## Phase 2 Final Design Specifications

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**END OF SECTION**


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# SECTION 01 11 00
# SCOPE OF WORK

## PART 1 GENERAL

1.01 SCOPE OF WORK (SOW) or WORK: The Work includes remediation and restoration of select portions ("yard areas") of 60 residential properties with contaminated soils. The activities for satisfying the performance requirements for this project are summarized as follows:

A. Management of all Lower Tier Subcontractors and vendor activities onsite during the execution of this Work.

B. Coordination with other Subcontractors.

C. Site preparation, including preparation of storage and staging area(s). Installing temporary facilities and controls as indentified in Section 01 50 00, Temporary Facilities and Controls.

D. Coordination with the Contractor and property owner to develop a property specific plan.

E. Coordinating utility locates and installing erosion control at residential properties.

F. Excavation of approximately 20,300 cubic yards of contaminated soil with from within designated yards, as specified in Section 31 23 16, Excavation.

G. Transportation of contaminated soil from the residential properties. Excavated soil may be transported to the former plant site for temporary stockpiling prior to hauling to the disposal facility. The excavated soil shall be contained in no more than two stockpiles and neither stockpile shall exceed 1,000 tons at any point during the project.

H. Offsite transportation of contaminated soil by a licensed transporter to a licensed disposal facility as specified in Section 31 23 16, Excavation.

I. Backfill of excavated area with general backfill and topsoil as specified in Section 31 23 23, Fill and Backfill and Section 32 91 13, Topsoil Preparation, respectively. Stockpiles of imported borrow materials shall not exceed 2,000 cubic yards each.

J. Conducting post-excavation and post-backfilling surveys. Pre-excavation surveys were completed as a part of the remedial design.


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K. Restoration of excavated surfaces and Work areas.

L. Specific Tasks Not Mentioned: Specific tasks not mentioned or completely detailed in this SOW that are necessary or normally required as part of the Work described shall be performed by the Subcontractor as incidental Work without extra costs to Contractor, as if fully detailed. The expense for such Work shall be included in the applicable lump sum and unit prices for the Work described.

1.02 ROLES: Defined for Phase 2 of the Velsicol Adjacent or Nearby Properties Residential Soil Remediation.

A. Owner: U.S. Environmental Protection Agency, Region 5 (USEPA).

B. Property Owner: Property owner of individual property within the Velsicol Adjacent or Nearby Property Residential Soil Remediation Area in St. Louis, Michigan.

C. Resident: Person(s) residing at the property.

D. Contractor: CH2M HILL– Construction Management Firm that the USEPA has contracted with to complete the remedial action.

E. Earthwork Subcontractor: Responsible for completing the Work described, including but not limited to site preparation, excavation, transportation and disposal, backfill and compaction, rough and final grade, and property restoration. The Earthwork Subcontractor will be subcontracted to the Contractor.

F. Successful Bidder: The Bidder selected for Subcontract award prior to award of Subcontract.

G. Lower-Tier Subcontractor: A subcontractor retained by the Earthwork Subcontractor.

H. Laboratory Subcontractor: Responsible for analysis of samples from the borrow sources, waste characterization samples, or other samples as necessary during the work. Waste characterization or other samples will be collected and sent to the Laboratory Subcontractor by the Contractor. The Laboratory Subcontractor will be subcontracted to the Contractor.

1.03 QUALIFICATIONS

A. The Earthwork Subcontractor shall be licensed, insured, and bonded to operate in the state of Michigan and shall comply with all applicable federal,



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state, county, and local laws and regulations. In the event of conflict, the most stringent of these regulations shall apply.

1.04 SUBMITTALS PRIOR TO AWARD

A. Prior to Subcontract award, Successful Bidder will be required to submit a certificate of insurance naming U.S. Environmental Protection Agency 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, shall 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 shall be duly licensed and qualified to do business in the State of Michigan.

B. Prior to Subcontract award, the Earthwork Subcontractor will be required to submit the following:

1. Completed certification of compliant drug policy.
2. Earthwork Subcontractor's site-specific health and safety plan and Activity Hazard Analysis (AHA) worksheets.
3. Proof of training and medical monitoring programs.
4. Material safety data sheets (MSDSs).
5. Copies of Earthwork Subcontractor's business licenses as required by state and local statutes.
6. Completed Waste Subcontractor Qualification Form.
7. Transporter's valid U.S. DOT Number.
8. Transporter's valid EPA ID# (for hazardous waste transport)
9. Transporter's Certificate of Insurance
10. For waste disposal facilities, written evidence of a valid EPA CERCLA OSR approval (40 CFR 300.440); written evidence of a valid EPA/State Permit-to-Operate (40 CFR 264.11 & 265.11); and a summary of violations (formal and informal) and how they were resolved in the last 5 years.
11. A schedule for completing the work should be submitted as part of the bid proposal and should be updated prior to Subcontract award, if necessary.

1.05 SUBMITTALS AFTER AWARD

A. The Earthwork Subcontractor shall 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.


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2. Project Schedule and schedule narrative of Earthwork Subcontractor's approach in performing the Work. The narrative will identify equipment, labor resources, crews and lower-tier subcontracts. The narrative will also discuss project coordination.
3. Subcontractor Quality Control Plan.
4. Work Plan.
5. Soil Erosion and Sedimentation Control Plan (update of plan drafted by Contractor). Earthwork Subcontractor shall also provide proof of Michigan certification for its designated soil erosion and sedimentation control inspector.
6. Transportation and Disposal Plan (update of Contractor's existing plan) and including:
    a. Pre-disposal: The Subcontractor will prepare all disposal paperwork, 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), proof of Offsite Rule Approval for the disposal facility, and any other document required for transportation or disposal. The Generator of this waste is United States Environmental Protection Agency (USEPA) Region 5. The waste profile and waste will be signed by Contractor on behalf of USEPA. Once the waste profile is signed, the Contractor will provide the profile to the Subcontractor for submittal to the disposal facility.
    b. Disposal: The Subcontractor will provide a copy of the approved profile or letter of approval for each waste stream. The Contractor will coordinate with the Subcontractor for the transport and disposal of wastes.
    c. Manifesting: A manifest for each load of waste will be created before leaving the site. 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.



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d. Post-disposal: The Subcontractor will provide 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. Original facility-signed manifests will not be attached to invoices**.** All original hazardous waste manifests must be returned to the Contractor within 25 days.

e. Provide the following submittals during execution of the Work:

7. Daily reports (Subcontractor production report, Subcontractor quality control report, AHAs, and soil excavation/transportation log, waste disposal log, weight tickets, haul tickets) during the field operations period.
8. Driver's vehicle registration and driver's license required for intrastate commerce in each state of operation.
9. Summary of remedial actions completed at each property, including any deviations from the specified SOW.
10. Bi-weekly updated schedule of values.
11. Progress schedule and narrative report.
12. As-built redline drawings of all excavation areas with lateral and vertical limits of excavation. Beginning and ending elevation of excavation areas confirmed and documented by survey.
13. A table documenting information on wastes managed, including quantities generated at each location and disposition of wastes.
14. Fully completed manifests or delivery tickets for all waste streams documenting ultimate disposal.
15. Additional action and informational submittals required by the technical specifications.

## 1.06 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. ASTM International (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.
7. Occupational Safety and Health Act.
8. Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120.


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9. Underwriter's Laboratory (UL).
10. Michigan Statutes, including:
    a. Air Pollution Control Rules (Mich. Admin. Code R 336.1301-1374 and R 336.1901-1950);
    b. Water Resources Protection—Part 21, Wastewater Discharge Permits (R 323.2101‑323.2197) (R 323.2190);
    c. Part 91 (Soil Erosion and Sedimentation Control) of NREPA 1994 P.A. 451, as amended (MCL 324.9101-324.9123a);
    d. Hazardous Waste Management Rules (Mich. Admin. Code R 299.9101-11107);
    e. Transportation Standards and Recordkeeping (Mich. Admin. Code R 299.9608-9609);
    f. Part 115 (Solid Waste Management) of NREPA 1994 P.A. 451, as amended (MCL 324.11501-11550);
    g. Part 121 (Liquid Industrial Waste) of NREPA 1994 P.A. 451, as amended (MCL 324.11501-11550).
11. Michigan Department of Transportation (MDOT).
12. Michigan Department of Environmental Quality (MDEQ).
13. United States Environmental Protection Agency (USEPA), including:
    a. All regulations implementing the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986 and;
    b. Regulations implementing the National Oil and Hazardous Substances Pollution Contingency Plan.
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. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA projects are generally exempt from requirements to obtain environmental permits for on-site work; however, compliance with all substantive requirements is required. Non-environmental permits and permits related to off-site activities must be obtained.
2. A Soil Erosion and Sedimentation Control Plan will be required for this Work and will be drafted by the Contractor and discussed with Gratiot County. The Earthwork Subcontractor will provide information on best management practices for controlling erosion and will finalize the Soil Erosion and Sedimentation Control Plan.



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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. For compliance with Michigan Air Pollution Control Rules (Mich. Admin. Code R 336.1301-1374 and R 336.1901- 1950), and to avoid the nuisance rule, best management practices (i.e., periodic wetting of the area) shall be identified in the Soil Erosion and Sediment Control Plan and implemented by the Earthwork Subcontractor during the completion of the soil excavation activities.

## 1.07 HEALTH AND SAFETY

A. A copy of Contractor's health and safety plan (HASP) will be supplied to the awarded Earthwork Subcontractor for reference. The Earthwork Subcontractor shall provide its own Site-specific HASP for the performance of the Earthwork Subcontractor's activities. The primary chemicals of concern for this project are total dichlorodiphenyl trichloroethane (DDT), polybrominated biphenyl (PBB), and tris (2,3-dibromopropyl) phosphate (TRIS) which are contained within the soil that will be excavated during this project. The Earthwork 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 Subcontractors' personnel, all health and safety equipment required to comply with the Earthwork 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 Earthwork Subcontractor's HASP, as determined by Contractor's representative, shall be considered grounds for a Stop Work Order. The Earthwork Subcontractor shall remedy failure of compliance, as directed and approved by Contractor, before resuming Work. The Earthwork 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 Earthwork Subcontractor 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.


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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. Guidelines:

1. Personal Protective Equipment:
   a. General Requirements:
      1) Responsibilities (29 CFR 1910.132):
         a) Employees must use personal protective equipment (PPE) that maintains their exposure within acceptable limits as defined in the HASP.
         b) Employers shall ensure that employees receive training in and have knowledge of the use and maintenance of PPE that is to be used onsite.
      2) Employees shall be physically able and medically determined as qualified to use the PPE and safety equipment that may be required in their job duties.
      3) PPE and safety equipment shall be tested, inspected, and maintained in serviceable and sanitary condition.
         a) Defective equipment shall not be used.
         b) Records of any tests or inspection shall be available for inspection by Contractor.
      4) For hazardous waste operations, the Earthwork Subcontractor shall 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:
      1) 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 shall be in compliance.
      2) All signs and tags shall be in compliance with 29 CFR 1910.145.
      3) Fencing will be required around excavations (29 CFR 1926.501).



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2. Outline for the Subcontractor's Site-specific Health and Safety Plan:
   a. Activity Hazard Analysis:
      1) 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 of equipment to be used onsite, inspection requirements, and training requirements for operation of equipment shall 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.
      2) 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.
   c. Personal Protective Equipment: A specific list of PPE to be used by Earthwork 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.
   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:

g. Written procedures will be developed and implemented before and during site activities based upon actual site conditions. Decontamination will be described in the HASP and the Transportation and Disposal Plan.

h. Spill Control:

1) Onsite spills: Requirements for spill containment procedures are described in the Contractor's Health and Safety Plan; these shall be followed when developing the Earthwork Subcontractor's procedures.

2) 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 Earthwork Subcontractor's Health and Safety Plan.

3) All personnel leaving the exclusion area will perform the required decontamination. The Earthwork Subcontractor DSC will observe these operations and ensure proper decontamination procedures are being followed. These procedures follow every time personnel leave the site for breaks, food, and at the end of the Work period.

4) All equipment leaving the site and solvents used for decontamination shall be decontaminated or disposed of in a method specified in the Earthwork Subcontractor's Transportation and Disposal Plan and HASP.

5) PPE will be cleaned or disposed of in a method specified in the Earthwork Subcontractor's HASP.

i. Emergency response plan shall include the following:

1) 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.

2) Site emergency equipment including first aid kits, 15-minute eyewash, 20-pound fire extinguishers, blood borne 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.


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j. 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.

k. Spill Containment Program:
   1) Written spill containment program that is targeted at the quantities and types of material brought to the site by the Earthwork 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.

l. Activity Hazard Analyses:
   1) The Earthwork Subcontractor shall prepare AHAs to review the hazards posed and required hazard control procedures for activities planned during the Work.
   2) During the daily safety meeting, the Earthwork Subcontractor's supervisor shall 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 HILL Health and Safety Program Plan.
   b. OSHA 29 CFR 1910, General Industry Standards.
   c. OSHA 29 CFR 1926, Construction Industry Standards.

## 1.08 SUBCONTRACT TIME

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

B. Substantial Completion:

1. The Work is to be performed in 2014, with site restoration being performed at each property within 2 days of backfill and topsoil completion at the property.
2. Substantial Completion for each property shall occur after site restoration Work has been completed and the Residential Post-Construction Meeting is conducted with the property owners, Contractor and USEPA.


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3. Project Substantial Completion shall occur when remediation and restoration is complete for all properties, include maintenance, watering and punch list work complete and property owners have signed off on work.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**




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# SECTION 01 26 00
# SUBCONTRACT MODIFICATION PROCEDURES

## PART 1 GENERAL

### 1.01 PROPOSAL REQUESTS

A. Contractor may, in anticipation of ordering an addition, deletion, or revision to the Work, request Earthwork Subcontractor to prepare a detailed proposal of cost and times to perform contemplated change.

B. Proposal request will include reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and as may be required for Earthwork Subcontractor to accurately estimate cost and time impact on Project.

C. Proposal request is for information only. Earthwork Subcontractor is neither authorized to execute proposed change nor to stop Work in progress as result of such request.

D. Earthwork Subcontractor's written proposal shall be transmitted to Contractor promptly, but not later than 14 days after Earthwork Subcontractor's receipt of Contractor's written request. Proposal shall remain firm for a maximum period of 45 days after receipt by Contractor.

E. A request for proposal or Earthwork Subcontractor's failure to submit such proposal within the required time period will not justify a Claim for an adjustment in Subcontract Price or Subcontract Times (or Milestones).

### 1.02 CLAIMS

A. Include, at a Minimum:

1. Specific references including (i) Drawing numbers, (ii) Specification section and article/paragraph number, and (iii) Submittal type, Submittal number, date reviewed, Contractor's comment, as applicable, with appropriate attachments.
2. Stipulated facts and pertinent documents, including photographs and statements.
3. Interpretations relied upon.


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4. Description of (i) nature and extent of Claim, (ii) who or what caused the situation, (iii) impact to the Work and Work of others, and (iv) discussion of claimant's justification for requesting a change to price or times or both.
5. Estimated adjustment in price claimant believes it is entitled to with full documentation and justification.
6. Requested Change in Subcontract Times: Include at least (i) Progress Schedule documentation showing logic diagram for request, (ii) documentation that float times available for Work have been used, and (iii) revised activity logic with durations including sub-network logic revisions, duration changes, and other interrelated schedule impacts, as appropriate.
7. Documentation as may be necessary as set forth below for Work Change Directive, and as Contractor may otherwise require.

1.03 WORK CHANGE DIRECTIVES

A. Procedures:

1. Contractor will:
   a. Initiate, including a description of the Work involved and any attachments.
   b. Affix signature, demonstrating Contractor's recommendation.
   c. Transmit five copies to Owner for authorization.
2. Owner will:
   a. Affix signature, demonstrating approval of the changes involved.
   b. Return four copies to Contractor, who will retain one copy, send one copy to the Resident Project Representative or other field representative, and forward two copies to Earthwork Subcontractor.
3. Upon completion of Work covered by the Work Change Directive or when final Subcontract Times and Subcontract Price are determined, Earthwork Subcontractor shall submit documentation for inclusion in a Change Order.
4. Earthwork Subcontractor's documentation shall include but not be limited to:
   a. Appropriately detailed records of Work performed to enable determination of value of the Work.
   b. Full information required to substantiate resulting change in Subcontract Times and Subcontract Price for Work. On request of Contractor, provide additional data necessary to support documentation.


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c. Support data for Work performed on a unit price or Cost of the Work basis with additional information such as:
   1) Dates Work was performed, and by whom.
   2) Time records, wage rates paid, and equipment rental rates.
   3) Invoices and receipts for materials, equipment, and subcontracts, all similarly documented.

B. Effective Date of Work Change Directive: Date of signature by Owner, unless otherwise indicated thereon.

1.04 CHANGE ORDERS

A. Procedure:

1. Contractor will prepare electronic files of proposed Change Order and transmit such with Contractor's written recommendation and request to Earthwork Subcontractor for signature.
2. Earthwork Subcontractor shall, upon receipt, either: (i) promptly sign and retain file, and return an electronic copy to the Contractor for Owner's signature, or (ii) return unsigned copy with written justification for not executing Change Order.
3. Contractor will, upon receipt of Earthwork Subcontractor signed electronic copy, promptly forward Contractor's written recommendation and partially executed files for Owner's signature, or if Earthwork Subcontractor fails to execute the Change Order, Contractor will promptly so notify Owner and transmit Earthwork Subcontractor's justification to Owner.
4. Upon receipt of Earthwork Subcontractor-executed Change Order, Owner will promptly either:
   a. Execute Change Order, returning electronic files to the Contractor; or
   b. Return to Contractor unsigned files with written justification for not executing Change Order.
5. Upon receipt of Owner-executed Change Order, Contractor will distribute electronic files to the Earthwork Subcontractor, Resident Project Representative or other field representative, or if Owner fails to execute the Change Order, Contractor will promptly so notify Earthwork Subcontractor and transmit Owner's justification to Earthwork Subcontractor.
6. Upon receipt of Owner-executed Change Order, Earthwork Subcontractor shall:
   a. Perform Work covered by Change Order.
   b. Revise Schedule of Values to adjust Subcontract Price and submit with next Application for Payment.


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c. Revise Progress Schedule to reflect changes in Subcontract Times, if any, and to adjust times for other items of Work affected by change.
d. Enter changes in Project record documents after completion of change related Work.

B. In signing a Change Order, Owner and Earthwork Subcontractor acknowledge and agree that:

1. Stipulated compensation (Subcontract Price or Subcontract Times, or both) set forth includes payment for (i) the Cost of the Work covered by the Change Order, (ii) Earthwork Subcontractor's fee for overhead and profit, (iii) interruption of Progress Schedule, (iv) delay and impact, including cumulative impact, on other Work under the Subcontract Documents, and (v) extended overheads.
2. Change Order constitutes full mutual accord and satisfaction for the change to the Work.
3. Unless otherwise stated in the Change Order, all requirements of the original Subcontract Documents apply to the Work covered by the Change Order.

1.05 COST OF THE WORK

A. Rental of construction equipment and machinery and the parts thereof having a replacement value in excess of $1,000, whether owned by Earthwork Subcontractor or rented or leased from others, shall meet the following requirements:

1. Full rental costs for leased equipment shall not exceed rates listed in the Rental Rate Blue Book published by Equipment Watch, San Jose, California, as adjusted to the regional area of the Project and as most favorable rate to the client. Owned equipment costs shall not exceed the single shift rates established in the Cost Reference Guide (CRG) also published by Equipment Watch. The most recent published edition in effect at commencement of actual equipment use shall be used.
2. Rates shall apply to equipment in good Working condition. Equipment not in good condition, or larger than required, may be rejected by Contractor or accepted at reduced rates.
3. Leased Equipment: For equipment leased or rented in arm's length transactions from outside vendors, maximum rates shall be determined by the following actual usage/Blue Book Payment Category:
   a. Less than 8 hours: Hourly Rate.
   b. Eight (8) or more hours but less than or equal to 5 work days: Daily Rate.


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c. Six (6) or more work days but less than or equal to 15 work days: Weekly Rate.
d. Sixteen (16) work days or more: Monthly Rate.

4. Arm's length rental and lease transactions are those in which the firm involved in the rental or lease of equipment is not associated with, owned by, have common management, directorship, facilities and/or stockholders with the firm renting the equipment.
5. Leased Equipment in Use: Actual equipment use time documented by Contractor shall be the basis that equipment was on and utilized at the Project Site. In addition to the leasing rate above, equipment operational costs shall be paid at the estimated hourly operating cost rate set forth in the Blue Book if not already included in the lease rate. Hours of operation shall be based upon actual equipment usage to the nearest quarter hour, as recorded by Contractor.
6. Leased Equipment, When Idle (Standby): Idle or standby equipment is equipment onsite or in transit to and from the Work Site and necessary to perform the Work under the modification, but not in actual use. Idle equipment time, as documented by Contractor, shall be paid at the leasing rate determined above, excluding operational costs.
7. Owned and Other Equipment in Use: Equipment rates for owned equipment or equipment provided in other than arm's length transaction shall not exceed the single shift total hourly costs rate developed in accordance with the CRG and as modified herein for multiple shifts. This total hourly rate will be paid for each hour the equipment actually performs Work. Hours of operation shall be based upon actual equipment usage as recorded by Contractor. This rate shall represent payment in full for Earthwork Subcontractor's direct costs.
8. Owned and Other Equipment, When Idle (Standby): Equipment necessary to be onsite to perform the Work on single shift operations, but not utilized, shall be paid for at the ownership hourly expense rate developed in accordance with the CRG, provided its presence and necessity onsite has been documented by Contractor. Payment for idle time of portions of a normal workday, in conjunction with original contract Work, will not be allowed. In no event shall idle time claimed in a day for a particular piece of equipment exceed the normal Work or shift schedule established for the Project. It is agreed that this rate shall represent payment in full for Earthwork Subcontractor's direct costs. When Contractor determines that the equipment is not needed to continuously remain at the Work Site, payment will be limited to actual hours in use.
9. Owned and Other Equipment, Multiple Shifts: For multiple shift operations, the CRG single shift total hourly costs rate shall apply to the operating equipment during the first shift. For subsequent shifts, up to 2 in a 24-hour day, operating rate shall be the sum of the total hourly


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CRG operating cost and 60 percent of the CRG ownership and overhaul expense. Payment for idle or standby time for second and third shifts shall be 20 percent of the CRG ownership and overhaul expense.

10. When necessary to obtain owned equipment from sources beyond the Project limits, the actual cost to transfer equipment to the Work Site and return it to its original location will be allowed as an additional item of expense. Move-in and move-out allowances will not be made for equipment brought to the Project if the equipment is also used on original Subcontract or related Work.
11. If the move-out destination is not to the original location, payment for move-out will not exceed payment for move-in.
12. If move is made by common carrier, the allowance will be the amount paid for the freight. If equipment is hauled with Earthwork Subcontractor's own forces, rental will be allowed for the hauling unit plus the hauling unit operator's wage. If equipment is transferred under its own power, the rental will be 75 percent of the appropriate total hourly costs for the equipment, without attachments, plus the equipment operator's wage.
13. Charges for time utilized in servicing equipment to ready it for use prior to moving and similar charges will not be allowed.
14. When a breakdown occurs on any piece of owned equipment, payment shall cease for that equipment and any other owned equipment idled by the breakdown.
15. If any part of the Work is shut down by Owner, standby time will be paid during non-operating hours if diversion of equipment to other Work is not practicable. Contractor reserves the right to cease standby time payment when an extended shutdown is anticipated.
16. If a rate has not been established in the CRG for owned equipment, Earthwork Subcontractor may:
    a. If approved by Contractor, use the rate of the most similar model found, considering such characteristics as manufacturer, capacity, horsepower, age, and fuel type, or
    b. Request Equipment Watch to furnish a written response for a rate on the equipment, which shall be presented to Contractor for approval; or
    c. Request Contractor to establish a rate.

## 1.06 FIELD ORDER

A. Contractor will issue Field Orders to the Earthwork Subcontractor.

B. Effective date of the Field Order shall be the date of signature by Contractor, unless otherwise indicated thereon.


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C. Earthwork Subcontractor shall acknowledge receipt by signing and returning one copy to Contractor.

D. Field Orders will be incorporated into subsequent Change Orders, as a no-cost change to the Subcontract.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**


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# SECTION 01 29 00
# PAYMENT PROCEDURES

## PART 1 GENERAL

### 1.01 SUBMITTALS

A. Informational Submittals:

1. Schedule of Values: Submit on form approved by Contractor.
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 bi-weekly basis, update and provide documentation to support the accuracy of the Schedule of Values.

B. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.

C. Lump Sum Work:

1. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, project coordination and contract closeout separately.
2. Provide adequate breakdown of lump sum work specified in sections “Scope of Work” and “Temporary Facilities and Controls,” distributed for payment over the construction duration.

D. An unbalanced or front-end loaded schedule will not be acceptable.

E. 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.


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1.04 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach Summary Form with each detailed Application for Payment and include Request for Payment of Materials on Hand as applicable. Execute certification by authorized officer of Earthwork Subcontractor.

B. Use detailed Application for Payment Form suitable to Contractor.

C. Preparation:

1. Round values to nearest dollar.
2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form and such supporting data as may be requested by Contractor.

1.05 MEASUREMENT—GENERAL

A. Whenever pay quantities of material are determined by weight, weight or load slip shall be obtained from weigher and delivered to Contractor's representative at point of delivery of material.

B. 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.

C. Excavation and backfill quantities will be based on ground elevations. Field surveys will be made by Earthwork Subcontractor to confirm accuracy of actual elevations.

D. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

| Item | Method of Measurement |
|---|---|
| CY | Cubic Yard—Field Measure by survey within limits specified or shown |
| EA | Each—Field Count by Contractor |
| LS | Lump Sum |
| SF | Square Foot |
| TON | Ton—Weight Measure by Scale (2,000 pounds) |



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1.06 PAYMENT

A. Payment for all Lump Sum Work shown or specified in Subcontract Documents is included in the Subcontract Price. Payment will be based on a percentage complete basis for each line item of the accepted Schedule of Values.

1.07 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Rejected loads of material, including material rejected after it has been placed by reason of failure of Earthwork Subcontractor to conform to provisions of Subcontract Documents.
3. Material not unloaded from transporting vehicle.
4. Defective Work not accepted by Contractor.
5. Material remaining on hand after completion of Work.

1.08 PARTIAL PAYMENT FOR STORED MATERIALS

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

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**


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# SECTION 01 31 13
# PROJECT COORDINATION

## PART 1 GENERAL

### 1.01 SUBMITTALS

A. Informational:

1. Utility locate tickets:
   a. Documentation of completed utility locates for both MISS DIG and 3rd party.
   b. Submit one copy, within 2 days prior to beginning excavation activities.

B. Action:

1. Property Drawing showing Existing Conditions: Submit (2) 8-1/2x11 or 11x17 drawings within three (3) days after the Initial Residential Preconstruction Meeting.
2. Survey Documentation:
   a. Survey No. 2–Post-Excavation Survey: Submit drawing and coordinates with elevations and calculated excavation volume.
   b. Backfill Grade Control Measurements (following placement and compaction of general backfill): Submit, at a minimum, drawing from Pre-Excavation Survey with spot elevations over footprint of backfill area.
   c. Survey No. 3–Post-Construction Survey (following placement of topsoil): Submit drawing and coordinates with post-construction grade and calculated backfill and topsoil volume. Survey is to be performed prior to placement of sod.

### 1.02 UTILITY NOTIFICATION AND COORDINATION

A. The Earthwork Subcontractor will coordinate utility clearance through the local one-call system (MISS DIG). The Earthwork Subcontractor shall verify that utilities have been identified and marked prior to beginning excavation on each property and protect the utilities from damage during construction.

B. The Earthwork Subcontractor shall notify applicable utilities prior to commencing Work and if damage occurs, or if conflicts or emergencies arise during Work.


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1.03 PROPERTY ACCESS AND SERVICES

A. The Contractor will obtain property owner-signed access agreements and verify current property ownership.

B. Do not proceed with Work at project site prior to the preconstruction meeting and obtaining Owner's and Contractor's advance approval of the SOW, conditions, and duration of such Work.

C. During construction, it is expected that relocation of objects, materials, and trash will be necessary. Interfering objects that will require removal, storage or disposal will be identified and documented in the preconstruction meeting with the Property Owner, Earthwork Subcontractor, Contractor, and Resident as appropriate.

D. Two points of continuous access for Residents and Property Owners will be maintained when possible with one point of continuous access at all times. Schedule and conduct activities to enable access and egress to homes by Residents and Property Owners.

E. Openings in fences, created by the Earthwork Subcontractor for construction access or other purposes, shall be secured at the end of each day.

F. Perform Work continuously and as required to prevent interruption of services to residential homes (U.S. Postal deliveries, visitors, and others).

G. Plan and coordinate Work in and around the street and alleys to allow city services such as street cleaning and garbage pickup.

H. Coordinate street parking for excavation and backfill equipment.

I. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems without authorization from Utility and Contractor.

J. When necessary, provide various temporary services, utilities, connections, access, and similar items to maintain continuous operations for Property Owners and Residents.

1.04 RESIDENTIAL PRECONSTRUCTION MEETINGS

A. Residential Preconstruction Meeting: The Contractor and Earthwork Subcontractor will attend Residential Preconstruction Meetings with the Property Owner and Resident, as appropriate, onsite at the property where



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Work will be performed. During the meetings, information will be gathered to clearly define the limits of excavation and schedule.

1. During the initial meeting, the Contractor will take video records and photographs of the physical site, structures, fencing, poles, trees, shrubs, concrete sidewalks and slabs showing their condition prior to start of the Work.
2. The Contractor and Earthwork Subcontractor will make notations by hand on the property drawing during the initial meeting and will include additional notes, concerns and understandings discussed with the Property Owner. The Contractor will update the property drawing for each property during the meeting.
3. If significant changes to the design (significance of a change will be determined by the Contractor) are discussed during the Residential Preconstruction Meeting, the proposed changes will be documented by the Contractor and submitted to the Owner (EPA) for approval. Once Owner has provided approval, Earthwork Subcontractor shall proceed with incorporation of changes.
4. The Earthwork Subcontractor will incorporate the hand notations on the drawing into an electronic format. The Contractor, Earthwork Subcontractor and Property Owner will review the finalized drawing, notes, and inventories for the property, and sign the drawing and Property Owner Agreement during a second meeting indicating concurrence and approval to proceed.

B. Examination:

1. Complete a thorough examination of pre-existing conditions including existing buildings, structures, fences and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations or limit access for equipment. Request Resident or Property Owner demonstrate function of existing facilities that could be damaged by operations.
2. Schedule of Work.
3. Access.
4. Removals.
5. Restoration.
6. Security.
7. Other Conditions.

C. Documentation:

1. Contractor will complete Residential Survey Form/Checklist.


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2. Property Owner Agreement describes the property and Work to be performed and will be signed by the Property Owner, Earthwork Subcontractor and Contractor.
3. A drawing, to scale, of site features and extents of excavation for each property will be provided to the Earthwork Subcontractor by Contractor at the time of subcontract award. After the Initial Residential Preconstruction Meeting, the Earthwork Subcontractor will be required to revise and submit for approval a minimum of (2) 8-1/2 x 11 or 11x17 drawings for each property showing, at a minimum, the following information:
   a. Drawing #1 – Existing Conditions:
      1) Site features.
      2) Excavation area(s) and proposed access to the area(s).
      3) Location of benchmark and beginning elevation of excavation area(s).
      4) Location of utilities and other site hazards.
      5) Proposed fence removal (length and type).
      6) Tree, shrub, garden and/or other vegetation removal or protection.
   b. Drawing #2 – Restoration:
      1) Proposed restoration and replacement of fencing in-kind and pre-selected landscape features.
      2) Restoration and Replacement Notes.
   c. Each drawing will be reviewed and approved by Contractor prior to authorization for beginning Work at the individual property.
4. Documentation (e.g., photographs, videos, drawings) shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Earthwork Subcontractor's operations, and is for the protection of Property Owners, adjacent property owners, Earthwork Subcontractor, Contractor, and Owner.

## 1.05 REFERENCE POINTS AND SURVEYS

A. The Post-Excavation and Post-Construction surveys (Survey Nos. 2 and 3) shall be completed under the direct supervision of a Professional Land Surveyor subcontracted to the Earthwork Subcontractor and who is licensed and in good standing with the State of Michigan. Grade control monitoring measurements performed during construction can be completed by the Earthwork Subcontractor.



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B. Surveying Control and Tolerances:

1. Horizontal Control work shall be performed using either standard surveying techniques or Global Positioning System (GPS) techniques meeting the specification requirements outlined in this scope.
   a. If standard surveying techniques are used, all horizontal control work shall comply with Third Order – Class II standard of accuracy for geodetic control as established by the FGDC Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, Construction (A/E/C), and Facility Management.
   b. If GPS is used, the relative horizontal accuracy shall conform to the FGDC Geospatial Positioning Accuracy Standards, Part 2: National Standard for Spatial Data Accuracy. If GPS is used, horizontal measurements shall be repeatable to the nearest 3 cm for control work and GPS cannot be used for elevations on control points.
2. Horizontal control shall be based on the NAD 83 Michigan State Plane South – Intl ft. Vertical control shall be based on the North American Vertical Datum 1988 (NAVD 88).
3. Vertical Control work shall be Third Order, as outlined in the FGDC Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management.
4. The units of measurement shall be in US Survey Feet. Surveyed elevations for the topographic survey shall be accurate to within 0.05 feet on natural ground.

C. Services provided by Contractor:

1. Established horizontal reference points with temporary bench marks and reference points for Earthwork Subcontractor's use as necessary to lay out and record Work.
2. Survey No. 1: Horizontal and vertical control of site, structures, fences, and limits of excavation prior to starting work. Property boundaries will be identified as necessary as determined by posts or markers identifying property corners or legal property description. Survey No. 1 data will be provided to the Earthwork Subcontractor in AutoCAD 2007 format, or approved equivalent.


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D. Services provided by Earthwork Subcontractor:

1. Furnish all labor, equipment, and materials required to perform Work. Work shall be completed in compliance with current Federal, State, and Local regulations and in accordance with standard industry practices.
2. Locate established bench marks to tie into and document elevations during and after construction.
3. Survey No. 2: Record actual bottom of excavation points and horizontal limits prior to beginning fill and backfill operations. Calculate excavated volumes of work performed.
4. Backfill Grade Control: Provide spot elevations over footprint of backfilled area to show general backfill has been placed and compacted to within tolerances specified in Section 31 23 23, Fill and Backfill.
5. Survey No. 3: Provide spot elevations to show physical features, breaks, and grade (as determined by the Contractor) following backfill and topsoil placement. Both vertical and horizontal control of structures shall be included. Calculate backfilled volumes of work performed.

E. Earthwork Subcontractor's Responsibilities:

1. Provide competent employee(s), tools, stakes, and other equipment and materials required to:
   a. Provide survey and measurements required to determine excavation and backfilling activities have been completed.
   b. Maintain complete accurate log of survey as it progresses.
   c. Obtain measurements of excavation for removed volume purposes.
   d. Provide survey and measurements required to document positive drainage following site restoration.
   e. Calculate excavation and backfill volume based on measurements for quality checks with calculated volumes.
2. Submit survey documentation, volume calculations and drawings upon completion of work for each property, within seven days of the survey.
   a. After completion of the surveys, a coordinate printout of all survey information for each property shall be submitted in Excel format with all X, Y, and Z coordinates listed to the nearest 0.01 foot. The field information shall be provided in both Excel, and ASCII format; and shall contain the station ID, the horizontal and vertical coordinate information, and feature codes. All information shall be tied to the Michigan State Plane coordinate system and a project adjustment factor shall be provided and the final coordinate system shall be converted to ground.



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b. Within 3 days of each survey, an updated electronic property drawing in AutoCAD 2007 (or approved equivalent) format shall be submitted with the survey points, elevations and feature codes. The location and elevation of the control points and benchmarks shall be identified on the figure.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

3.01 SUPPLEMENT

A. The supplements listed below, following "End of Section," are part of this Specification.

1. Form: Residential Survey Form/Checklist.
2. Form: Property Owner Agreement.

**END OF SECTION**


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Property Address _____ Date / Time _____

Owner(s) Present _____ USEPA Rep _____

_____ CH2M HILL _____

Other Attendees _____ Subcontractor _____

_____ _____

## Property Information

1. Type of Property ☐ Residential—Single Family ☐Residential—Multi-Family ☐Vacant Lot
2. Owner Occupied ☐Yes ☐No
3. Rental Property ☐Yes ☐No
   a. If Yes, are the currently any Tenants Renting at Property ☐Yes ☐No
   b. If Yes, has the Tenant been notified of the cleanup ☐Yes ☐No
4. Areas Requiring Remediation ☐Parkway ☐Yard Area 1 ☐Yard Area 2 ☐Yard Area 3
5. Does the property owner have any knowledge of any drainage problems on the property (i.e. ponding water during rain, surface water runoff onto property, surface water runoff flooding neighboring property, water in basement)? ☐Yes ☐No

Location_____Description_____

Location_____Description_____

Location_____Description_____

6. Will the property owner allow us to inspect and take photos of the basement for structural or drainage issues? ☐Yes ☐No
7. Is there a dog at the property? ☐Yes ☐No
   a. Arrangements should be made for the dog to remain indoors during the work at the property.
   b. The dog should be kept out of the area after it is restored for several weeks to allow the grass to establish.
8. Property Owner/Tenant Special Requests:

_____

_____

_____

_____

_____

_____

_____

_____

_____

## Landscaping

1. Areas requiring landscaping after remediation is complete:

   ☐Parkway ☐Yard Area 1 ☐Yard Area 2 ☐Yard Area 3

2. Are there plants to be removed within the excavation area(s)? ☐Yes ☐No

   a. If Yes, identify areas with plants on property sketch for landscaper to inventory. Notify landscaper to complete inventory prior to 2nd Preconstruction Meeting.

3. Are there plants that the property owner will transplant? ☐Yes ☐No

   Location_____Description_____

   Location_____Description_____

   Location_____Description_____

4. Are there perennials present in the excavation area that are not in bloom? ☐Yes ☐No

   Location_____Description_____

   Location_____Description_____

   Location_____Description_____

5. Will plants be removed that the property owner does not want replaced? ☐Yes ☐No

   Location_____Description_____

   Location_____Description_____

   Location_____Description_____

6. Are there plants that will remain within the excavation area (other than mature trees)? ☐Yes ☐No

   Location_____Description_____

   Location_____Description_____

   Location_____Description_____

7. Describe special landscaping features (mulch, borders, or other):

_____

_____

_____

Landscaping Comments

_____

_____

_____

_____

_____

## General

1. Is the property owner able to confirm the property boundaries? ☐Yes ☐No
2. Is the Surveyor needed to locate property corners? ☐Yes ☐No

Comments

_____

_____

_____

_____

_____

_____

_____

_____

## Parkway

1. Require remediation? ☐Yes ☐No
2. Will be used to access other areas requiring remediation? ☐Yes ☐No ☐N/A
3. Parkway Permanent Structures ☐Driveway ☐Sidewalks ☐Concrete Slabs ☐ Pavers
   ☐Retaining Wall ☐Gravel Parking Area ☐Other

   Other / Comments:_____
4. Features identifying property boundary
   ☐Survey marker ☐Fence ☐Structure ☐Pavement ☐Landscaping ☐Ground covers

   ☐Other _____
5. Overhead utilities or obstructions? ☐Yes (show on sketch) ☐No
   ☐Electrical ☐Telephone ☐Cable ☐Other_____
6. Evidence of Underground Utilities (visible conduit, remote outlet, shutoff)? ☐Yes (show on sketch) ☐No
   ☐Gas ☐Electrical ☐Water ☐Sewer ☐Other _____

   Comments: _____
7. Does the property owner have knowledge or are there indications of underground items (USTs, sprinkler systems, wells, former pets, etc) ☐Yes (show on sketch) ☐No

   Comments: _____

**Yard Area 1**

1. Require remediation? ☐Yes ☐No

2. Will be used to access other areas requiring remediation? ☐Yes ☐No ☐N/A

3. Yard Area Permanent Structures ☐Driveway ☐Sidewalks ☐Concrete Slabs ☐Patio
   ☐Brick/concrete pavers ☐Gravel Driveway / Parking Area ☐A/C Unit ☐Other

   Comments_____

4. Structures Present ☐ Residence ☐Garage ☐Dog House/Kennel ☐Prefabricated storage shed
   ☐Constructed storage shed ☐Deck ☐Stairs ☐Other_____

   Comments_____

5. Alley Access ☐Yes ☐No

   Comments:_____

6. Any Obstructions Present in Yard Area? ☐Yes ☐No
   ☐Fence ☐Playsets ☐Stairs (number)_____ ☐Up ☐Down ☐Landscaping
   ☐Retaining Wall Material _____Height_____ ☐Vehicles (mobile or immobile)

   Comments_____

7. Fence Type, if present ☐Chain Link ☐Wood ☐ Wrought iron ☐Other _____

   ☐Gate Present Width_____inches Height_____Inches

   Comments:_____

   Location:_____

8. Fence Anchored to Building ? ☐Yes ☐Property ☐Neighboring ☐No

9. Property boundary markers observed

   ☐Fence ☐Structure ☐Survey marker ☐Landscaping ☐Pavement
   ☐Ground covers ☐Owner's knowledge

10. Overhead utilities or obstructions? ☐Yes (show on sketch) ☐No
    ☐Electrical ☐Telephone ☐Cable ☐Other_____

11. Evidence of Underground Utilities (visible conduit, remote outlet, shutoff)? ☐Yes (show on sketch) ☐No
    ☐Gas ☐Electrical ☐Water ☐Sewer ☐Other _____

    Other / Comments:_____

12. Does the property owner have knowledge or are there indications of underground items (USTs, sprinkler systems, wells, former pets, etc) ☐Yes (show on sketch) ☐No

    Location_____Description_____

    Location_____Description_____

    Location_____Description_____

13. Description of pools, gazebos, sheds, flag poles or other:

    Location_____Description_____

    Location_____Description_____

    Location_____Description_____

**Yard Area 2**

1. Require remediation? ☐Yes ☐No

2. Will be used to access other areas requiring remediation? ☐Yes ☐No ☐N/A

3. Yard Area Permanent Structures ☐Driveway ☐Sidewalks ☐Concrete Slabs ☐Patio
   ☐Brick/concrete pavers ☐Gravel Driveway / Parking Area ☐A/C Unit ☐Other

   Comments_____

4. Structures Present ☐ Residence ☐Garage ☐Dog House/Kennel ☐Prefabricated storage shed
   ☐Constructed storage shed ☐Deck ☐Stairs ☐Other_____

   Comments_____

5. Alley Access ☐Yes ☐No

   Comments:_____

6. Any Obstructions Present in Yard Area? ☐Yes ☐No
   ☐Fence ☐Playsets ☐Stairs (number)_____ ☐Up ☐Down ☐Landscaping
   ☐Retaining Wall Material _____Height_____ ☐Vehicles (mobile or immobile)

   Comments_____

7. Fence Type, if present ☐Chain Link ☐Wood ☐ Wrought iron ☐Other _____

   ☐Gate Present Width_____inches Height_____Inches

   Comments:_____

   Location:_____

8. Fence Anchored to Building ? ☐Yes ☐Property ☐Neighboring ☐No

9. Property boundary markers observed

   ☐Fence ☐Structure ☐Survey marker ☐Landscaping ☐Pavement
   ☐Ground covers ☐Owner's knowledge

10. Overhead utilities or obstructions? ☐Yes (show on sketch) ☐No
    ☐Electrical ☐Telephone ☐Cable ☐Other_____

11. Evidence of Underground Utilities (visible conduit, remote outlet, shutoff)? ☐Yes (show on sketch) ☐No
    ☐Gas ☐Electrical ☐Water ☐Sewer ☐Other _____

    Other / Comments:_____

12. Does the property owner have knowledge or are there indications of underground items (USTs, sprinkler systems, wells, former pets, etc) ☐Yes (show on sketch) ☐No

    Location_____Description_____

    Location_____Description_____

    Location_____Description_____

13. Description of pools, gazebos, sheds, flag poles or other:

    Location_____Description_____

    Location_____Description_____

    Location_____Description_____

**Yard Area 3**

1. Require remediation? ☐Yes ☐No

2. Will be used to access other areas requiring remediation? ☐Yes ☐No ☐N/A

3. Yard Area Permanent Structures ☐Driveway ☐Sidewalks ☐Concrete Slabs ☐Patio
☐Brick/concrete pavers ☐Gravel Driveway / Parking Area ☐A/C Unit ☐Other

Comments_____

4. Structures Present ☐ Residence ☐Garage ☐Dog House/Kennel ☐Prefabricated storage shed
☐Constructed storage shed ☐Deck ☐Stairs ☐Other_____

Comments_____

5. Alley Access ☐Yes ☐No

Comments:_____

6. Any Obstructions Present in Yard Area? ☐Yes ☐No
☐Fence ☐Playsets ☐Stairs (number)_____ ☐Up ☐Down ☐Landscaping
☐Retaining Wall Material _____Height_____ ☐Vehicles (mobile or immobile)

Comments_____

7. Fence Type, if present ☐Chain Link ☐Wood ☐ Wrought iron ☐Other _____

☐Gate Present Width_____inches Height_____Inches

Comments:_____

Location:_____

8. Fence Anchored to Building ? ☐Yes ☐Property ☐Neighboring ☐No

9. Property boundary markers observed

☐Fence ☐Structure ☐Survey marker ☐Landscaping ☐Pavement
☐Ground covers ☐Owner's knowledge

10. Overhead utilities or obstructions? ☐Yes (show on sketch) ☐No
☐Electrical ☐Telephone ☐Cable ☐Other_____

11. Evidence of Underground Utilities (visible conduit, remote outlet, shutoff)? ☐Yes (show on sketch) ☐No
☐Gas ☐Electrical ☐Water ☐Sewer ☐Other _____

Other / Comments:_____

12. Does the property owner have knowledge or are there indications of underground items (USTs, sprinkler systems, wells, former pets, etc) ☐Yes (show on sketch) ☐No

Location_____Description_____

Location_____Description_____

Location_____Description_____

13. Description of pools, gazebos, sheds, flag poles or other:

Location_____Description_____

Location_____Description_____

Location_____Description_____

## Property Inventory

Address_____Date_____

| Item No | Description | Location | Relocate Onsite | Store Offsite | Dispose | Responsibility of Subcontractor | Responsibility of Owner |
|---|---|---|---|---|---|---|---|
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PROPERTY OWNER AGREEMENT - RESIDENTIAL PRECONSTRUCTION MEETING
VELSICOL PHASE 2 ANP - ST. LOUIS, MICHIGAN

Property Owner(s):_____

Address:_____

Date of Meeting:_____Time of Meeting:_____

Initial Residential Preconstruction Documentation provided to Owner, including:

| | |
|---|---|
| Photo Disk (CD) or Actual Photo(s) | Owner Initials Confirming Receipt _____ |
| Photo Log | Owner Initials Confirming Receipt _____ |
| Property Inventory Log | Owner Initials Confirming Receipt _____ |
| Revised Construction Drawing | Owner Initials Confirming Receipt _____ |

Estimated Duration for Construction _____ Days (weather dependent)

Description of Property Access during Construction_____

_____

_____

_____

_____

Restoration Activities Planned: *Place and compact clean backfill and topsoil in excavated area. Topsoil will be placed in the upper 6-inches in yard areas and 18-inches in landscaping beds/garden areas. Reinstall any borders, fencing and/or temporary features removed during the course of construction. Plant sod and replacement plants in remediated areas*.

Contractor will excavate the following areas as shown on the final site drawing:

☐ Parkway ☐ Yard Area-1 ☐ Yard Area-2 ☐ Yard Area-3

Description of Other Areas_____

_____

_____

List of Trees/Plants **Not to be Removed** from Excavation Area(s) that Will Be Protected during Construction

Location_____Description_____

Location_____Description_____

Location_____Description_____

List of Trees/Perennial Plants **To be Removed** and Replaced from Excavation Area(s)

Location_____Description_____Number_____

Location_____Description_____Number_____

Location_____Description_____Number_____

List of Trees/Perennial Plants **To be Removed** and Replaced from Excavation Area(s) (continued)

Location_____Description_____Number_____

Location_____Description_____Number_____

Location_____Description_____Number_____

Location_____Description_____Number_____

List of buried items identified on the property.

Location_____Description_____

Location_____Description_____

The following existing drainage problems were identified on the property prior to work.

Location_____Description_____

Location_____Description_____

Specific Requests from the Property Owner:

_____

_____

_____

_____

_____

_____

_____

Following restoration of the property, the Contractor will maintain trees, sod and plants as follows:

*Subcontractor will perform watering twice per week for a period of 4 weeks for establishment of new grass, replacement trees, shrubs and perennials, and recovery of trees where shallow roots may have been disturbed during remedial actions. Watering frequency may be modified depending on weather conditions and sod moisture. Following this watering period, a post-construction meeting will be held with the property owner(s) to review acceptability of completed work to document substantial-completion and to develop punch list items as required. After substantial-completion, the property owner is responsible for the watering and standard care.*

**Property Owner Agreement Signatures:**

| | | |
|---|---|---|
| _____ | _____ | _____ |
| Property Owner Signature | Print Name | Date |
| _____ | _____ | _____ |
| Subcontractor Representative Signature | Print Name | Date |
| _____ | _____ | _____ |

CH2M HILL Representative Signature Print Name Date

# SECTION 01 31 19
# PROJECT MEETINGS

## PART 1 GENERAL

### 1.01 GENERAL

A. Earthwork Subcontractor shall participate in specified project meetings as required herein. The meetings include the following:

1. Pre-construction conference.
2. Scheduling meetings.
3. Residential pre-construction meetings.
4. Residential post-construction meetings.
5. Daily tailgate meetings.
6. Weekly progress meetings.
7. Final post-construction meeting.
8. 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. Earthwork Subcontractor shall 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. A health and safety charter will be performed with Contractor and Earthwork Subcontractor staff. Earthwork Subcontractor shall 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.
7. Status of permits, license or required approvals.


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8. Status of submittals.
9. Maintaining required records.
10. Activity Hazard Analyses.
11. Earthwork Subcontractor Key Personnel Information and Points of Contact for 24 hours per day, 7 days per week.
12. Earthwork Subcontractor Quality Control Plan.

B. Attendees will include:

1. Owner's representatives.
2. Earthwork Subcontractor's project manager.
3. Earthwork Subcontractor's resident superintendent.
4. Earthwork Subcontractor's quality control representative.
5. Earthwork Subcontractor's site health and safety representative.
6. Earthwork Subcontractors' representatives whom Earthwork Subcontractor may desire or Contractor may request to attend.
7. Contractor's representatives.
8. Others as appropriate.

## 1.03 PRELIMINARY SCHEDULE REVIEW MEETING

A. Schedule: A preliminary schedule review meeting will be conducted at the time of the Preconstruction Conference. The overall goal of the project is to complete excavation, backfill and site restoration activities of the select yard areas at the 60 designated properties by October 31, 2014. The Earthwork Subcontractor shall immediately notify Contractor of any changes to required work hours to achieve the milestones for performing each activity. Extended work hours or different work hours shall be coordinated with and approved by Contractor.

## 1.04 RESIDENTIAL PRECONSTRUCTION MEETINGS

A. An initial Residential Preconstruction meeting will be conducted with the Property Owners several weeks before mobilization to the property to discuss schedule, access, remediation, removals, restoration, and security. During the preconstruction meeting, a copy of the construction drawings will be provided. Contractor will coordinate and lead the meetings with the Property Owners and Earthwork Subcontractor and if necessary, the Residents. Meetings may be scheduled outside of normal working hours and on weekends to accommodate the Property Owners' schedules. All parties will be required at all meetings until details are concluded. Details will include video/photo documentation of preconstruction conditions, identification of Property Owner-installed or Resident-installed facilities that could be impacted by remedial activities, and mark-up of construction drawings for current property features.


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B. A second Pre-construction Meeting shall be performed within approximately 1 week of mobilization to the property. The Contractor and Earthwork Subcontractor will meet with the Property Owner and Resident, if necessary, at the property to confirm the drawing, made during the initial Pre-construction Meeting. The property inventory list will also be confirmed and the current Property Owner will be given a copy of the photo documentation taken during the initial Preconstruction Meeting. At the conclusion of the second Residential Preconstruction Meeting, the Property Owner, the Contractor, and the Earthwork Subcontractor will all sign the Property Owner Agreement and the final drawing authorizing the Work to be performed at that property.

1.05 DAILY TAILGATE MEETINGS

A. Daily tailgate meetings shall be conducted every workday morning at 7 a.m. Eastern time with Contractor. Generally, attendees for this meeting will include all Earthwork Subcontractor personnel who will be working that day. Documentation of the meeting shall be provided to Contractor by 10 a.m. that same day.

B. Daily tailgate meetings shall 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. Earthwork Subcontractor shall attend regular progress meetings at the site, conducted weekly to review construction progress, progress schedule, sample collection and submissions schedule, contract modifications, and other matters that require discussion and resolution.

1.07 RESIDENTIAL POST CONSTRUCTION MEETING

A. Residential Post-Construction meetings will be conducted with Property Owners and if necessary, the Residents 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 showing information gathered during the Residential Preconstruction Meetings. Contractor will coordinate and lead the meetings with the Property Owner and Earthwork Subcontractor in


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attendance at the property address. Meetings may be scheduled outside of normal Working hours and on weekends to accommodate the Property Owner and Resident's schedule.

B. The Earthwork Subcontractor will correct the items on each punch list within 7 work days of receipt of the punch list. After the completion of the punch list items, an EPA representative and the Contractor will meet with the Property Owner to perform a final inspection. The restored Work will be documented by the Contractor using photographs and video. Upon acceptance of the Work, all parties will provide their signature to the Property Owner Agreement signing off that the work is complete. If the Property Owner is unwilling to sign off at this time, they will be asked to sign off at the end of the 1-year warranty period. If the Property Owner still refuses to sign, and all of the punch list items have been completed, the project will be considered closed.

1.08 PROJECT POST-CONSTRUCTION MEETING

A. Earthwork Subcontractor shall attend a mandatory post-construction meeting for the project, which will be scheduled after completion of field activities but prior to Earthwork 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 COMMUNITY RELATIONS MEETINGS

A. One public meeting will occur before mobilization begins. Public meetings will be held at St. Louis City Hall if possible. Earthwork Subcontractor shall have a representative attend the public meeting.

1.10 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**




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# SECTION 01 32 00
# CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 GENERAL

### 1.01 SUBMITTALS

A. Informational Submittals:

1. A Preliminary Progress Schedule shall be submitted with the Earthwork Subcontractor's proposal.
2. Detailed Progress Schedule:
   a. Submit prior to pre-construction conference.
   b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
   a. Disk file compatible with Microsoft Office Project 2007, unless otherwise approved by Contractor.
   b. Progress Schedule: 3 legible copies.
   c. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
4. 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 Earthwork 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, remediation at each property and other activities 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.


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5. Residential Pre-construction Meetings.
6. Specified Work Sequences and Construction Constraints.
7. Subcontract Milestone and Completion Dates.
8. Residential Post-construction Meetings.
9. Project Close-out Summary.
10. Demobilization Summary.

C. The Preliminary Progress Schedule shall show Work approach, sequences and constraints. This schedule data will be used by the Earthwork Subcontractor in preparation of the Detailed Progress Schedule.

D. Format: In accordance with Article Progress Schedule—Critical Path Network.

1.04 DETAILED PROGRESS SCHEDULE

A. Prior to the Pre-construction Conference, submit Detailed Progress Schedule 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 Earthwork 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—Critical Path Network.

1.05 PROGRESS SCHEDULE—CRITICAL PATH NETWORK

A. General: Comprehensive computer-generated schedule using CPM, generally as outlined in Associated General Subcontractors 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. 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.
3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.


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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. Residential Pre-construction, Residential Post-construction, and Project Post-construction meetings.
   d. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
   e. Remediation activities.
   f. Landscape Work and plantings.
   g. Maintenance.
   h. Project closeout and cleanup.
   i. Demobilization.
7. No activity duration, exclusive of those for permitting, mobilization, maintenance and demobilization, shall be more than 7 days, unless otherwise approved.

C. Network Graphical Display:

1. Color print on 11x17 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.

D. Schedule Report:

1. On 8-1/2-inch by 11-inch white paper, unless otherwise approved.


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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 follows: 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.

1.07 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.

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 Earthwork Subcontractor, and major milestones achieved.


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3. Earthwork 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 Earthwork Subcontractor-caused delays.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**


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# SECTION 01 33 00
# SUBMITTAL PROCEDURES

## PART 1 GENERAL

### 1.01 DEFINITIONS

A. Action Submittal: Written and graphic information submitted by Earthwork Subcontractor that requires Contractor's approval.

B. Informational Submittal: Information submitted by Earthwork Subcontractor that does not require Contractor's approval.

### 1.02 PROCEDURES

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

1. To be determined and provided during the pre-construction meeting.

B. Transmittal of Submittal:

1. Earthwork Subcontractor shall:
   a. Review each submittal and check for compliance with Subcontract Documents.
   b. Stamp each submittal with uniform approval stamp before submitting to Contractor.
      1) Stamp to include Project name, submittal number, Specification number, Earthwork Subcontractor's reviewer name, date of Earthwork Subcontractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Subcontract Documents.
      2) Contractor will not review submittals that do not bear Earthwork Subcontractor's approval stamp and will return them without action.
2. Complete, sign, and transmit with each submittal package, one Transmittal of Earthwork 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.


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b. Specification section and paragraph to which submittal applies.
c. Date of transmittal.
d. Names of Contractor, Earthwork Subcontractor or Supplier, and manufacturer as appropriate.

4. Identify and describe each deviation or variation from Subcontract Documents.

C. Resubmittals: Clearly identify each correction or change made.

D. Incomplete Submittals: Contractor will return entire submittal for Earthwork Subcontractor's revision if preliminary review deems it incomplete.

1.03 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Copies: 1 hardcopy unless requested otherwise by the Contractor, and one reproducible electronic copy on CD, except copyrighted documents.
2. Identify and Indicate:
   a. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
   b. Project-specific information drawn accurately to scale.
3. Product Data: Provide as specified in individual Specifications.

C. Samples:

1. Copies: One, 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.

D. Action Submittal Dispositions: Contractor will review, mark, and stamp as appropriate, and distribute marked-up copies as noted:

1. Approved:
   a. Earthwork Subcontractor may incorporate product(s) or implement Work covered by submittal.



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b. Distribution:
   1) One copy retained in Contractor's file.
   2) Remaining copies returned to Earthwork Subcontractor appropriately annotated.

2. Approved as Noted:
   a. Earthwork Subcontractor may incorporate product(s) or implement Work covered by submittal, in accordance with Contractor's notations.
   b. Distribution:
      1) One copy retained in Contractor's file.
      2) Remaining copies returned to Earthwork Subcontractor appropriately annotated.
3. Partial Approval, Resubmit as Noted:
   a. Make corrections or obtain missing portions, and resubmit.
   b. Except for portions indicated, Earthwork 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) Remaining copies returned to Earthwork Subcontractor appropriately annotated.
4. Revise and Resubmit:
   a. Earthwork Subcontractor may not incorporate product(s) or implement Work covered by submittal.
   b. Distribution:
      1) One copy retained in Contractor's file.
      2) Remaining copies returned to Earthwork 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 Subcontract, Contractor will forward copies to appropriate parties. If Contractor determines submittal does not meet conditions of the Subcontract and is therefore considered unacceptable, Contractor will retain one copy and return remaining copies with review comments to Earthwork Subcontractor, and require that submittal be corrected and resubmitted.


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B. Application for Payment: In accordance with Section 01 29 00, Payment Procedures.

C. 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 that installer complies with requirements as specified in individual Specification sections.
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.

D. Contract Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures by the Earthwork Subcontractor.

E. Contractor-Design Data:

1. List of assumptions.
2. List of performance and design criteria.
3. Calculations.
4. List of applicable codes and regulations.
5. 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 sections.

G. Operation and Maintenance Data: As required in Section 32 92 00, Turf and Grasses.

H. Schedules:

1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00, Construction Progress Documentation. Show for each, at a minimum, the following:
   a. Specification section number.



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b. Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
c. Estimated date of submission to Contractor, including reviewing and processing time.

2. Schedule of Values: In accordance with Section 01 29 00, Payment Procedures.
3. Schedule of Estimated Progress Payments: In accordance with Section 01 29 00, Payment Procedures.
4. Progress Schedules: In accordance with Section 01 32 00, Construction Progress Documentation.

I. Special Warranty: Supplier's written warranty as required in individual Specification sections.

J. Submittals Required by Laws, Regulations, and Governing Agencies:

1. 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 for their records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

K. Test and Inspection Reports:

1. General: Shall contain signature of person responsible for test or report.
2. Field: As a minimum, include the following:
   a. Project title and number.
   b. Date and time.
   c. Record of temperature and weather conditions.
   d. Identification of product and Specification section.
   e. Type and location of test, Sample, or inspection, including referenced standard or code.
   f. Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
   g. If test or inspection deems material or equipment not in compliance with Subcontract Documents, identify corrective action necessary to bring into compliance.
   h. Provide interpretation of test results, when requested by Contractor.
   i. Other items as identified in individual Specification sections.

L. Training Data: In accordance with Section 01 11 00, Scope of Work.


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1.05 SUPPLEMENTS

A. The supplements listed below, following "End of Section", are part of this Specification.

1. Forms: Transmittal of Earthwork Subcontractor's Submittal.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**




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# TRANSMITTAL OF EARTHWORK SUBCONTRACTOR'S SUBMITTAL

(ATTACH TO EACH SUBMITTAL)

DATE: _____

**TO**:_____

_____

_____

_____

_____

**FROM**:_____
Subcontractor

_____

_____

_____

Submittal No.:_____

☐ New Submittal ☐ Resubmittal

Project:_____

Project No.:_____

Specification Section No.:_____
**(Cover only one section with each transmittal)**

Schedule Date of Submittal:

_____

**SUBMITTAL TYPE:** ☐ Shop Drawing ☐ Sample ☐ Informational

## The following items are hereby submitted:

| Number of Copies | Description of Item Submitted (Type, Size, Model Number, Etc.) | Spec. and Para. No. | Drawing or Brochure Number | Contains Variation to Subcontract | |
|---|---|---|---|---|---|
| | | | | No | Yes |
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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. 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 shall meet requirements or surpass minimum standards of quality for materials and workmanship established by designated standard or specification.

B. Where so specified, products or workmanship shall 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.

C. Where two or more standards are specified to establish quality, product and workmanship shall meet or exceed requirements of most stringent.

D. Where both a standard and a brand name are specified for a product in Subcontract Documents, proprietary product named shall meet or exceed requirements of specified reference standard.

E. 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 Earthwork 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 Earthwork Subcontractor's personnel, lower-tier 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 Subcontract Documents, with abbreviations used.

| | | |
|---|---|---|
| 1. | AA | Aluminum Association |
| 2. | AABC | Associated Air Balance Council |


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| | | |
|---|---|---|
| 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 |
| 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 |


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| | | |
|---|---|---|
| 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 America |
| 68. | IFI | Industrial Fasteners Institute |
| 69. | IGMA | Insulating Glass Manufacturer's Alliance |
| 70. | IMC | International Mechanical Code |
| 71. | INDA | Association of the Nonwoven Fabrics Industry |
| 72. | IPC | International Plumbing Code |
| 73. | ISA | Instrumentation, Systems, and Automation Society |
| 74. | ISO | International Organization for Standardization |
| 75. | ITL | Independent Testing Laboratory |
| 76. | JIC | Joint Industry Conferences of Hydraulic Manufacturers |
| 77. | MIA | Marble Institute of America |
| 78. | MIL | Military Specifications |
| 79. | MMA | Monorail Manufacturers' Association |


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| | | |
|---|---|---|
| 80. | MSS | Manufacturer's Standardization Society |
| 81. | NAAMM | National Association of Architectural Metal Manufacturers |
| 82. | NACE | NACE International |
| 83. | NBGQA | National Building Granite Quarries Association |
| 84. | NEBB | National Environmental Balancing Bureau |
| 85. | NEC | National Electrical Code |
| 86. | NECA | National Electrical Contractor's Association |
| 87. | NEMA | National Electrical Manufacturers' Association |
| 88. | NESC | National Electrical Safety Code |
| 89. | NETA | InterNational Electrical Testing Association |
| 90. | NFPA | National Fire Protection Association |
| 91. | NHLA | National Hardwood Lumber Association |
| 92. | NICET | National Institute for Certification in Engineering Technologies |
| 93. | NIST | National Institute of Standards and Technology |
| 94. | NRCA | National Roofing Contractors Association |
| 95. | NRTL | Nationally Recognized Testing Laboratories |
| 96. | NSF | NSF International |
| 97. | NSPE | National Society of Professional Engineers |
| 98. | NTMA | National Terrazzo and Mosaic Association |
| 99. | NWWDA | National Wood Window and Door Association |
| 100. | OSHA | Occupational Safety and Health Act (both Federal and State) |
| 101. | PCI | Precast/Prestressed Concrete Institute |
| 102. | PEI | Porcelain Enamel Institute |
| 103. | PPI | Plastic Pipe Institute |
| 104. | PS | Product Standards Section-U.S. Department of Commerce |
| 105. | RMA | Rubber Manufacturers' Association |
| 106. | RUS | Rural Utilities Service |
| 107. | SAE | Society of Automotive Engineers |
| 108. | SDI | Steel Deck Institute |
| 109. | SDI | Steel Door Institute |
| 110. | SJI | Steel Joist Institute |
| 111. | SMACNA | Sheet Metal and Air Conditioning Contractors National Association |
| 112. | SPI | Society of the Plastics Industry |
| 113. | SSPC | The Society for Protective Coatings |
| 114. | STI/SPFA | Steel Tank Institute/Steel Plate Fabricators Association |
| 115. | SWI | Steel Window Institute |
| 116. | TEMA | Tubular Exchanger Manufacturers' Association |
| 117. | TCA | Tile Council of North America |


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|---|---|---|
| 118. | TIA | Telecommunications Industry Association |
| 119. | UBC | Uniform Building Code |
| 120. | UFC | Uniform Fire Code |
| 121. | UL | Underwriters Laboratories Inc. |
| 122. | UMC | Uniform Mechanical Code |
| 123. | USBR | U.S. Bureau of Reclamation |
| 124. | WCLIB | West Coast Lumber Inspection Bureau |
| 125. | WI | Wood Institute |
| 126. | WWPA | Western Wood Products Association |

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**


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# 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, Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
   b. E329, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

### 1.02 DEFINITIONS

A. Subcontractor Quality Control (SQC): The means by which Earthwork Subcontractor ensures that the construction complies with the requirements of the Subcontract.

### 1.03 SUBMITTALS

A. Informational Submittals:

1. SQC Report Format.
2. SQC Plan: Submit, not later than 14 days after receipt of Notice to Proceed.
3. SQC Report: Submit a daily signed electronic document within 24 hours.

### 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 Earthwork Subcontractor of responsibility for providing adequate quality control measures;
2. Relieve Earthwork Subcontractor of responsibility for damage to or loss of the material before acceptance;


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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 Earthwork 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 Earthwork Subcontractor for any additional cost of inspection or test when Work is not ready at the time specified by Earthwork 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. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Subcontract Documents. The system shall cover all excavation and restoration, operations, both onsite and offsite, including Work by lower-tier subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

### 3.02 COORDINATION MEETING

A. After the Pre-construction 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.


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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 Earthwork Subcontractor.

3.03 QUALITY CONTROL ORGANIZATION

A. SQC System Manager:

1. Designate an individual within Earthwork Subcontractor's organization who will be responsible for overall management of SQC and have the authority to act in SQC matters for the Earthwork Subcontractor.
2. SQC System Manager may perform other duties on the Project.
3. SQC System Manager shall be an experienced construction person, with a minimum of 3 years construction experience on similar type Work.
4. SQC System Manager shall report to the Earthwork Subcontractor's project manager or someone higher in the organization. Project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
5. SQC System Manager shall 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 shall be subject to acceptance by Contractor.
2. SQC staff shall 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.


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C. Organizational Changes: Obtain Contractor's acceptance before replacing any member of the SQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.

3.04 QUALITY CONTROL PHASING

A. SQC shall 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 Contractor at least 48 hours in advance of beginning any of the required action of the preparatory phase.
   b. This phase shall 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 shall instruct applicable SQC staff as to the acceptable level of workmanship required in order to meet Subcontract requirements.
   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.


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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 Contract requirements.
         c) Verify required control inspection and testing.
         d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards.
         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.
      3) Separate minutes of this phase shall be prepared by the SQC System Manager and attached to the QC report. Exact location of initial phase shall 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 shall be made a matter of record in the SQC documentation and shall 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.


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## 3.05 EARTHWORK SUBCONTRACTOR QUALITY CONTROL PLAN

A. General:

1. Plan shall 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 shall cover the intended SQC organization for the entire Subcontract and shall 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 Section 3.04 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 shall 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 Owner.
   d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of lower-tier 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.


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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 Earthwork 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 Earthwork Subcontractor to make changes in the SQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

D. Notification of Changes: After acceptance of the SQC plan, Earthwork Subcontractor shall notify Contractor, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Contractor.

## 3.06 EARTHWORK SUBCONTRACTOR QUALITY CONTROL REPORT

A. Prepare a SQC report daily for each day on site. Account for all days throughout the life of the Subcontract. Reports shall 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 subcontractors and suppliers.

C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including, but not limited to, the following:

1. Lower-tier subcontractors and their areas of responsibility.
2. Operating equipment with hours worked, idle, or down for repair.
3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
4. 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.
5. Material received with statement as to its acceptability and storage.


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6. Identify submittals reviewed, with Subcontract reference, by whom, and action taken.
7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts in Drawings and/or Specifications.
10. Earthwork Subcontractor's verification statement.
11. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Subcontract.

## 3.07 SUBMITTAL QUALITY CONTROL

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

## 3.08 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.


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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 shall be signed by an engineer registered in the state where the tests are performed as applicable.
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 shall meet criteria detailed in ASTM D3740 and ASTM E329, 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 State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.09 COMPLETION INSPECTION

A. SQC System Manager shall 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. Punch List:

1. SQC System Manager shall develop a punch list of items which do not conform to the Contract requirements.
2. Include punch list in the SQC report, indicating the estimated date by which the deficiencies will be corrected.
3. SQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.
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**


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# SECTION 01 50 00
# TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.01 SUBMITTALS

A. Submittals by Earthwork Subcontractor:

1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
2. Temporary Construction Submittals:
   a. Staging area plans.
   b. Fencing and protective barrier locations and details.
3. Temporary Control Submittals (where relevant, include controls both at residences and at the staging area on the former plant site):
   a. Soil Erosion and Sedimentation Control Plan: As described in Subpart 1.04 B of this section.
   b. 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.
   c. Fugitive Dust Control Plan: Submit information for the management of stockpiles and transport of bulk materials to minimize fugitive dust emissions.
   d. Air Monitoring Plan: Earthwork Subcontractor shall revise the draft Air Monitoring Plan developed by the Contractor; revised plan shall include the following details regarding Earthwork Subcontractor's real-time air monitoring for particulate matter on a continuous basis at residences and staging area on former plant site:
      1) Data shall be recorded to data logger once per minute.
      2) Air monitoring equipment shall be placed in locations to verify effectiveness of engineering controls in minimizing dust generation that may potentially leave the exclusion zone.
      3) Dust monitors will be placed upwind and downwind of earthwork activities at a property to determine the impact of the construction activities on air quality.
      4) Dust monitoring data will be evaluated against the USEPA National Ambient Air Quality Standards (NAAQS) for PM10 of 150 micrograms per cubic meter.


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5) During work hours, an alarm shall be set at 500 micrograms per cubic meter to observe activities and determine the cause for elevated particulate concentrations and evaluate potential mitigation measures Sustained exceedances of 500 micrograms per cubic meter during work hours will be mitigated with measures such as application of water, covering stockpiles except when loading or unloading or stop work to maintain the 24-hour average concentration below the criteria.
6) Exceedances of the dust monitoring criteria of 1.5 milligrams per cubic meter (determined by the Contractor based on the maximum PBB and total DDT concentrations detected at samples for Phase 2 properties) shall require dust abatement measures, typically application of water, or stop work and further evaluation.
7) Earthwork Subcontractor personnel working within or in close proximity to the excavation shall wear personal sampling pumps and have samples collected for laboratory analysis to determine personal exposure to DDT.

e. Transportation and Disposal Plan will describe the sampling, transportation, and disposal of wastes and restoration materials and stockpiling of excavated soils and construction debris. Earthwork Subcontractor shall revise the draft Transportation and Disposal Plan developed by the Contractor; revised plan shall include the following:
1) Sequences of construction affecting use of roadways, time required for each phase of the Work, and phasing of operations to provide necessary access for pedestrians and vehicles.
2) The sequence of moving, handling and loading of trucks.
3) Describe signage and protective measures for pedestrian traffic on sidewalks and vehicular traffic on streets.
4) Information for intended haul routes to and from the staging area and approved disposal facility. Routes to and from the residential properties shall generally be shortest route available.
5) Sampling and handling requirements for stormwater.
6) Provisions for sampling and disposing of decontamination liquids and also disposal of used personal protective equipment or other remediation-derived wastes generated.
7) Plans for transporting and disposing of contaminated soil at the approved disposal facility and importing materials from approved borrow sources.



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8) 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
9) Provisions for street cleaning and equipment decontamination.
10) Manifesting and other shipping documentation requirements for transportation of contaminated soils.
11) Identification of all waste streams.
12) Waste and container management, storage, labeling, and marking.
13) Spill response and reporting (for potential spills related to transportation of materials).
14) Records and reporting.

4. Water supply source.
5. Air monitoring results:
   a. PM10 results:
      1) Microsoft Excel 2007 compatible electronic file with results recorded in 1 minute intervals.
      2) File names denoting address being sampled, sample meter location (i.e., upwind or downwind), and sample date.
      3) Submitted daily.
   b. DDT results from personal sampling pumps:
      1) Laboratory analytical report in Adobe Acrobat 9.0 or compatible version.
      2) Electronic data deliverable in Microsoft Excel 2007 compatible electronic file.
      3) Report sample collection interval, volume, and address where personal sample was collected.
      4) Employee names may be redacted.
      5) Submitted monthly.

## 1.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic, unless special arrangements have been made and approved by the Contractor.


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3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered a long line of the Work, unless other arrangements satisfactory to the Contractor and to owners of said utilities have been made.
4. 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.
5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
7. In areas where Earthwork Subcontractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Earthwork Subcontractor.
8. Notify property owners and utility offices that may be affected by construction operations at least 2 days in advance. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Earthwork Subcontractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. 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.
10. The Earthwork Subcontractor is responsible for repair or replacement of damage caused as a result of construction activities. This responsibility also includes secondary damage caused by the event.
11. Unless approved by Contractor, the Earthwork Subcontractor shall maintain original Site drainage.

## 1.03 VEHICULAR TRAFFIC

A. Traffic Control: Earthwork Subcontractor personnel shall adhere to traffic control in approved Transportation and Disposal Plan. Changes to traffic control shall be made only by written approval of appropriate public authority and the Contractor. Earthwork Subcontractor shall secure approvals for necessary changes so as not to delay progress of the Work.


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## 1.04 TEMPORARY CONTROLS

A. Earthwork Subcontractor shall provide safety and environmental controls during remediation-related 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: Earthwork Subcontractor shall revise the draft Soil Erosion and Sedimentation Control Plan developed by the Contractor. The revised Soil Erosion and Sedimentation Control Plan shall be consistent with substantive requirements of Part 21 R 323.2190 (National Permit for Stormwater Discharge during Construction); Part 91 (Soil Erosion and Sedimentation Control) of NREPA 1994 P.A. 451, as amended; and Gratiot County requirements; revised plan shall:

1. Describe the best management practices for earth disturbing activities and procedures to control soil erosion, sediment transport, and potential spills, including from stockpiles of general backfill, topsoil, and excavated soils, excavations, and at the construction site entrance and exit.
2. Describe erosion and sediment control at staging and storage areas as well as at the residential properties, including silt fence or other appropriate measures and inlet protection.
3. Describe how water entering excavations and contained on top of liners will be discharged as clean stormwater and other stormwater management activities.
4. Address preplanning for spill control and spill control measures, including potential spills of decontamination rinsate, contaminated soils, vehicle fuel, and hydraulic oil.
5. Address fire control materials and equipment.
6. Address drum, container, and tank handling and moving procedures.
7. Address protection against stockpile runoff at residential properties and at the former plant site.
8. Describe inspection and maintenance procedures.

C. Earthwork Subcontractor shall 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, to prevent erosion during earthwork activities at residential properties. The work shall include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified.

1. Erosion control shall be performed in accordance with the Soil Erosion and Sedimentation Control Plan.


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2. Soil erosion stabilization and sedimentation control may consist of construction, inspection, maintenance and recordkeeping of temporary erosion control such as inlet protection, silt fences, erosion bales, etc.
   a. Inlet protection shall be installed at the nearest downgradient storm sewer inlet.
   b. Silt fence shall be installed at excavation areas where slope is present greater than 1V:5H.
3. Temporary soil erosion and sediment control measures at or near residential properties shall be removed by the Earthwork Subcontractor after final street cleaning is performed subsequent to the completion of restoration activities specified in Section 32 10 01, Site Restoration.

D. Earthwork Subcontractor shall install, inspect, maintain, and remove temporary erosion and sediment control measures to prevent erosion at the staging area.

1. Soil erosion stabilization and sedimentation control shall consist of the following elements:
   a. Construction, inspection, maintenance, and record keeping of temporary erosion and sediment control such as silt fences, erosion bales, etc. where runoff will occur onto unpaved surfaces.
   b. Temporary Stockpile Covering: Placement and maintenance of reinforced black plastic covering over stockpiles during non-working hours or inclement weather to reduce fugitive dust emissions from stockpiles and protect from precipitation and erosion.

## PART 2 PRODUCTS

### 2.01 TEMPORARY STOCKPILE COVERING

A. Material shall 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.

### 2.02 EXCAVATED SOIL STOCKPILE LINER

A. Material shall be 10-to 20-mil polyethylene liner.

B. Material shall be of sufficient width to cover the base and three side berms to create a waterproof liner. If material is not of sufficient width, two or more sections shall be welded together and demonstrated to provide an air and water-tight seal.



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2.03 SILT FENCE (MINIMUM REQUIREMENTS)

A. Fabric shall be minimum 15 mils thick, with a tensile strength of 120 pounds, and with an equivalent opening size of 170 (U.S. Standard Sieve).

B. Silt fence must have at least two permanent markings or affixed labels per assembled roll (100 feet) which positively identifies the fabricator.

C. Silt fence fabric shall be attached to machine pointed No. 2 common grade hardwood posts using at least five staples through wood lath a minimum of 3/8 inch thick and 2.0 feet long.

D. Silt fence posts must have cross-sectional area of at least 2.25 square inches and must be a minimum of 36 inches in length.

2.04 STRAW MULCH/BALES

A. Threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds, or clean salt hay.

2.05 OTHER EROSION AND SEDIMENT CONTROL ITEMS

A. Products suggested by the Earthwork Subcontractor and approved by the Contractor to prevent erosion and control sediment.

2.06 HIGH-VISIBILITY FENCE

A. As specified in Section 31 10 00, Site Preparation.

2.07 BARRICADES AND LIGHTS

A. As required to perform Work.

2.08 SIGNS AND EQUIPMENT

A. As specified in Section 3.03 C and/or recommended by Earthwork 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 contents and/or contamination will not be loaded and turned away with the costs borne by the Subcontractor, at the sole discretion of CH2M HILL.


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## PART 3 EXECUTION

### 3.01 MOBILIZATION

A. This task will consist of mobilizing Earthwork Subcontractor personnel, equipment, any lower-tier Subcontractors, and materials to the project site. The Earthwork Subcontractor will be responsible for coordinating and making arrangements for storage and laydown areas for construction equipment, temporary storage of Property Owners' and Residents' objects and materials.

B. The Earthwork Subcontractor shall 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. The soil storage area shall include a bermed liner if the Earthwork Subcontractor intends to stockpile excavated soil. Liner shall be a continuous or watertight seamed sheet to prevent erosion of excavated soils.

1. Coordination and scheduling of mobilization activities will be discussed with Contractor in detail during the pre-construction meeting.

C. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required approvals and permits.
2. Mobilizing Earthwork Subcontractor's field office, if desired, and equipment required for operations onto Site.
3. Secure facilities to store and protect Property Owners' and Residents' moved objects and materials during construction.
4. Installing temporary construction power, wiring, and lighting facilities.
5. Providing onsite communication facilities if desired by Earthwork Subcontractor.
6. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
7. Arranging for Earthwork Subcontractor's storage yard.
8. Posting OSHA required notices and establishing safety programs and procedures.
9. Having Earthwork Subcontractor's superintendent at the Site full time.

### 3.02 TEMPORARY UTILITIES

A. Power:

1. No electric power is available for Earthwork Subcontractor use at the residential sites.


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2. Earthwork Subcontractor shall provide portable generators for required power at the sites.
3. Earthwork Subcontractor shall arrange for electrical hook-ups at the field office and staging areas, if desired. Cost of electric power will be borne by Earthwork Subcontractor.

B. Water: Earthwork Subcontractor is not allowed to use water from the residence. Earthwork Subcontractor shall make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.

C. Sanitary and Personnel Facilities: Earthwork Subcontractor shall provide and maintain facilities for Contractor and Earthwork Subcontractor's employees and lower-tier subcontractors. Service, clean, and maintain facilities and enclosures.

D. Telephone Service: Earthwork Subcontractor shall arrange and provide onsite telephone service for Earthwork Subcontractor, if needed, for use during construction. Earthwork Subcontractor shall pay costs of installation, removal and monthly bills.

3.03 PROTECTION OF WORK AND PROPERTY

A. Earthwork Staging Area Security:

1. Earthwork Subcontractor shall provide temporary storage enclosures for tools, materials, supplies or equipment at the Former Plant Site.
2. The Owner and Contractor are not responsible for theft, damages or losses incurred during the performance of this Work.

B. Barricades and Lights:

1. Provide as required by the Vehicle Code and in sufficient quantity to safeguard public and the Work.
2. 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 Earthwork Subcontractor's employees, other employer's employees, and others who may be affected by the Work.
3. Provide to protect existing and adjacent properties from potential damage.
4. Locate to enable access by Property Owners and Residents.
5. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.


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6. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section in accordance with governing requirements.
7. Illuminate barricades and obstructions with warning lights from sunset to sunrise.

C. Signs and Equipment:

1. Conform to applicable federal, state or local requirements.
2. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movements.
3. High-Level Warning Flag Units: Provide two in advance of traffic approaching the Work, each displaying three flags mounted at a height of 9 feet.
4. DETOUR Signs: Provide two, right arrow or left arrow, placed as approved by Contractor.
5. RIGHT or LEFT LANE CLOSED AHEAD Signs: Provide two, place in advance of lane to be closed.
6. Provide at obstructions, such as material piles and equipment.
7. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

D. Existing Structures:

1. Where Earthwork Subcontractor contemplates removal of small structures such as mailboxes, signposts, and other objects/structures that interfere with Earthwork Subcontractor's operations, obtain approval of Property Owner and Contractor. Survey the location of the structure prior to its removal.
2. Move mailboxes to temporary locations accessible to postal service.
3. Replace items removed in their original location and elevation and a condition equal to or better than original.

E. Waterways: Keep ditches, culverts, and natural drainages continuously free of soil, sediment, construction materials and debris.

F. Dewatering: Construct, maintain, and operate sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Manage all water from the work in accordance with the SESC Plan and Transportation and Disposal Plan. Maintain foundations and parts of the Work free from water.


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G. Archaeological Finds: Should finds of an archaeological or paleontological nature be made within the limits of the Site, immediately notify Owner and Contractor. Continue the Work in other areas without interruption.

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.
3. Conduct earthwork and trucking operations to minimize dust. Strictly adhere to applicable environmental regulations for dust prevention.

B. Noise Control:

1. 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.
2. Standard hours for operation of construction equipment are Monday through Friday from 7 a.m. to 6 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 procedures outlined in U.S. Environmental Protection Agency manuals entitled, “Guidelines for Erosion and Sedimentation Control Planning” and “Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity,” and other applicable guidance documents or regulations.” Comply with Earthwork Subcontractor’s approved Soil Erosion and Sedimentation Control Plan.
2. Do not dispose of wastewater, stormwater, decontamination fluids or volatile wastes in storm or sanitary drains. Disposal of wastewater, stormwater, or wastes into streams or waterways without Contractor approval is prohibited. Provide acceptable containers for collection and disposal of stormwater, waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control:

1. Provide, inspect, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.


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2. To reduce erosion, and control stormwater run-on and runoff during construction activities, the following structural and nonstructural best management practices shall be included in the Soil Erosion and Sedimentation Control Plan and be implemented:
   a. Minimize the area of bare soil exposed at one time (that is, phased excavation).
   b. Minimize the amount of time an excavation is open.
   c. Stabilizing cut-and-fill slopes.
   d. Perimeter controls (such as drainage diversions).
   e. Sediment basins and traps.
   f. Silt fences at excavations.
   g. Site restoration (for example, regrading, mulching, and seeding, or repaving with asphalt or concrete).
3. Prepare site only after adequate erosion and sediment controls are in place as discussed during the pre-construction meeting. Earthwork Subcontractor will identify anticipated duration excavation will remain open and what will be required.

E. Dust Control:

1. The Earthwork Subcontractor shall comply with the fugitive dust control program and meet the applicable requirements of Air Pollution Control Rules (Mich. Admin. Code R 336.1301 – 1374 and 336.1901-1950).
2. The Earthwork Subcontractor shall be responsible for controlling the dust and airborne dirt generated by construction activities. Water or other suppression means shall be used as needed to control dust.
3. The Earthwork Subcontractor shall perform street cleaning daily from the time earthwork is initiated until backfilling of excavations is complete. Additional street cleaning shall be performed by the Earthwork Subcontractor if directed by the Contractor. Final street cleaning shall be conducted prior to the removal of the temporary erosion control measures, such as inlet protection. Street cleaning shall be performed with equipment that will capture debris after sweeping, using either mechanical methods or vacuum, to minimize fugitive dust emissions.
4. Sidewalks, driveways or similar surfaces adjacent to the excavation areas shall be covered daily with 6 mil polyethylene (or equivalent) as possible from the start of excavation through completion of backfill. Manual cleaning shall be performed daily if spillage occurs onto these surfaces.



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5. All excavation activities shall 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 Earthwork Subcontractor shall prepare a fugitive dust control plan that will address the management of stockpiles and transport of bulk materials.
6. The Earthwork Subcontractor shall perform air monitoring at the staging area and residential properties in accordance with the Air Monitoring Plan.

## 3.05 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Assure 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 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 each Property Owner so affected and Contractor 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed with Contractor approval.

E. 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.

F. Notify fire department and police department at least 48 hours before closing the 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 Contractor’s night emergency telephone numbers to police department.


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G. Coordinate traffic routing with that of others working in same or adjacent areas.

3.06 SURFACE WATER CONTROL IN EXCAVATIONS

A. Install temporary liners in excavated areas overnight, where possible, to prevent stormwater from contacting soils in open excavations. Anchor the temporary liners with sandbags or approved equivalent spaced along the perimeter of or within the excavation to prevent the liner from becoming displaced. Stormwater contained on top of the liner will be discharged as clean stormwater in accordance with the approved Soil Erosion and Sedimentation Control plan.

B. If an excavation is unable to be covered and standing water is present in the excavation when backfill must occur, and water cannot be allowed to infiltrate due to schedule or other constraints, Earthwork Subcontractor shall remove, containerize and store water at staging area in accordance with the approved Transportation and Disposal Plan. The Contractor will sample the water for disposal at an appropriate treatment facility. The treatment facility is subject to the approval of USEPA.

C. Remove surface runoff controls when no longer needed.

D. 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.

3.07 DISPOSAL OF IMPACTED EXCAVATION WATER

A. The Contractor will characterize excavation water that has contacted impacted soils as required by applicable laws and regulations.

B. The Earthwork Subcontractor shall dispose of impacted excavation water at a treatment facility approved by the Contractor.

3.08 CLEANING DURING CONSTRUCTION

A. Unless otherwise directed by the Contractor, the Earthwork Subcontractor shall use street-sweeping equipment to sweep roadways, alleys, or other areas affected by the Work on a daily basis from the onset of excavation and continue until the removal of the temporary erosion control measures, such as inlet protection. Street sweeping equipment shall contain debris after sweeping, through either mechanical means or with a vacuum, to minimize fugitive dust emissions.



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## 3.09 DECONTAMINATION OF EQUIPMENT AND PERSONNEL

A. Field equipment that has come into contact with any potentially contaminated material shall be decontaminated using a dry method of cleaning. The equipment shall be visually inspected for signs of contamination, and the cleaning procedure shall be repeated until the equipment is visually clean. After dry decontamination, the Earthwork Subcontractor shall perform wet decontamination on a decon pad at the staging area. All contaminated equipment shall be cleaned before leaving the site. All equipment decontamination shall be documented in the field logbooks.

B. Field equipment that has been used for excavation activities shall have dry decontamination performed prior to leaving a residential property. Wet decontamination shall be performed on the decon pad at the staging area prior to use for backfill activities if dedicated excavation and backfill equipment are not used.

## 3.10 DEMOBILIZATION

A. Upon completion of Work each construction season, all field equipment, temporary facilities, and other miscellaneous items (for example, barricades, caution tapes, and signs) resulting from or used during field operations shall be removed.

B. All wastes and general construction debris generated by construction activities shall be properly disposed of offsite prior to demobilization.

**END OF SECTION**


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# SECTION 01 77 00
# CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR

## 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. Special bonds, Guarantees, and Service Agreements.
   c. Consent of Surety to Final Payment: As required in General Terms and Conditions.
   d. Releases or Waivers of Liens and Claims: As required in General Terms and Conditions.
   e. Releases from Agreements.
   f. Final Application for Payment: Submit in accordance with General Terms and Conditions.

1.02 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
2. Accuracy of Records:
   a. Record changes within Construction Drawings, 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.
3. Make entries as Work progresses.
4. Prior to submitting each request for progress payment, request 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 Earthwork Subcontractor's Application for Payment, either partial for final.


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## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

A. General:

1. Following award of the Work, Contractor will provide electronic drawing files of the residential sites and a database of property addresses.
2. Record information concurrently with construction progress.
3. Redline markups of approved construction documents will be accepted as Record Drawings.

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.

**END OF SECTION**




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# SECTION 31 10 00
# SITE PREPARATION

## PART 1 GENERAL

### 1.01 DEFINITIONS

A. Interfering or Objectionable Material: Trash, rubbish and junk; vegetation and other organic matter, whether alive, dead or decaying.

B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface, including trees, stumps, roots and shrubs.

C. Obstructions: Swing sets, benches, landscaping features, ground cover materials and borders, and other movable encumbrances to soil excavation.

D. Excavation Limits: Areas, as shown or specified, within which Work is to be performed.

E. Permanent Structures: Buildings, decks, stairs, sheds, telephone poles, pavements, and similar structures.

### 1.02 SUBMITTALS

A. Action Submittals:

1. Utility locate completion documentation.
2. Revised property sketches documenting utility locations.

### 1.03 SCHEDULING AND SEQUENCING

A. The excavation area surveys provided to the Earthwork Subcontractor shall be reviewed in the field to locate pre-construction control points and existing elevations. The Earthwork Subcontractor shall mark excavation areas in a manner to allow identification and inspection during execution of the work.

B. Prepare Site only after adequate security, safety, and erosion and sediment controls are in place as discussed during the Residential Pre-construction Meeting and specified in other sections.

C. Prior to removal of any trees, shrubs or obstructions, inspect for bird nests if the clearing is to be performed between April 1 and September 15. The inspection shall be performed during the Residential Pre-construction Meeting and again within 24-hours prior to clearing in consultation with the Contractor. If bird nests are in trees or shrubs designated for removal or


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obstructions that will be temporarily relocated and stored, the nests shall be inspected for the presence of eggs or hatchlings. Written documentation of the inspection shall be provided to the Contractor. If present, do not disturb the nest; halt the clearing and consult with the Contractor and the US Fish and Wildlife Service and other appropriate agencies to assurance compliance with the Migratory Bird Treaty Act.

## PART 2 PRODUCTS

### 2.01 HIGH-VISIBILITY FENCE

A. Orange high density polyethylene.

B. Thirty-six inches in height.

## PART 3 EXECUTION

### 3.01 GENERAL

A. Site preparation shall include removal or protection of trees, shrubs, vegetation and encumbrances to soil excavation.

B. The excavation areas shall be marked by the Earthwork Subcontractor in a manner to allow identification and inspection during execution of the Work.

C. Orange plastic construction barrier fence, minimum 36-inch height, shall be installed around the excavation and work areas using steel “T” post spaced at 6-foot centers to separate pedestrian traffic from the work. The fence will be secured around open excavations before the end of each work day.

D. Take necessary measures to protect existing buildings, utilities, fencing and trees or other vegetation on or adjacent to the site from construction activities.

E. This work includes removing sections of fencing and gates as necessary to allow access for the soil removal and restoration areas for each property. Fencing will remain in place where possible. Where necessary, fencing shall be removed in a manner to protect it for reinstallation and reuse. Actual reuse will be based on site-specific evaluation of conditions. Fence openings made for access shall be secured at the end of each work day to provide an equivalent level of security during non-working hours. All fencing not reused shall be disposed of and replaced in-kind by the Earthwork Subcontractor during restoration.

F. Obstructions, including outdoor play equipment, benches, and other encumbrances to soil excavation, shall be tagged and removed from the property or relocated to an area of property unaffected by Work. The


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Earthwork Subcontractor shall provide secure temporary storage at the Former Plant Site during construction. Obstructions removed from the property shall be securely stored and returned upon completion of restoration.

G. Obstructions including landscaping features and borders are to be removed and stored for reuse or replaced as part of the restoration work, with like kind materials during restoration.

H. Tree stumps and roots required to be removed are considered contaminated and shall be mulched and disposed of with the soil. Trees, shrubs and other aboveground vegetation required to be removed shall be disposed of at a disposal facility approved by the Contractor. Surface debris, such as bricks, concrete pieces and other materials that will not be stored and reused, shall be segregated, cleaned of soil and vegetation and disposed of as non-contaminated waste. The scope of this Work shall be included in the unit price per ton provided in the Bid Form and validated by weight tickets.

I. Ensure that stormwater runoff control is installed and erosion and sediment controls are in place according to the Soil Erosion and Sedimentation Control Plan and best management practices prior to excavation. Stormwater runoff controls shall, at a minimum, prevent migration to storm sewers, street gutters, streets, sidewalks, and driveways.

J. Plywood with a thickness of 3/4-inch, or approved equivalent, shall be placed on the ground surface if small equipment will travel through the tree drip-line to access the excavation area. The plywood shall be secured to the ground to prevent its movement.

## 3.02 UTILITY NOTIFICATION AND COORDINATION

A. The Contractor will interview the property owner (and tenant, if applicable) during a pre-construction meeting to determine if there are any undocumented or private utilities, such as irrigation systems, underground electrical or gas, or drain tile in the area of work.

B. The Earthwork Subcontractor shall contact MISS DIG and use a third-party utility locating service to identify utilities before work begins at each property. The Earthwork Subcontractor shall verify the completion of the locates and submit documentation to Contractor a minimum of 3 days prior to beginning any invasive activities at each property. The Earthwork Subcontractor shall record the location of the utilities on the property sketch for permanent documentation.


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C. Coordinate the Work with various utilities within Project limits. Notify applicable utilities if damage occurs or if conflicts or emergencies arise during Work.

1. Utility Locator: MISS DIG.
   a. Telephone: 800-482-7171.
2. St. Louis Public Utilities (Electric, Water and Public Works).
   a. Telephone (8:00 AM – 5:00 PM): 989-681-4377.
   b. After Hours Telephone: 989-875-7505.

3.03 LIMITS

A. Clearing and excavation is not to extend beyond excavation limits established during design investigation and finalized during the Residential Pre-construction Meetings.

3.04 REMOVAL OF INTERFERING OR OBJECTIONABLE MATERIALS

A. Remove rubbish, trash and junk from work area as agreed during the Residential Pre-construction Meeting.

B. Temporary relation of large items, such as vehicles, shall be coordinated with the Property Owner.

3.05 REMOVAL OF INTERFERING PLANTINGS

A. Remove shrubs and trees that are designated for removal or interfere with construction activities.

B. Record sufficient information to uniquely identify each plant removed for accurate replacement.

3.06 CLEARING

A. Clear areas within excavation limits shown or specified.

B. Cut off designated shrubs, brush, weeds and grasses to within 1-inch of ground surface, including within planting beds.

C. Trees slated for removal shall be measured to determine their diameter at breast height per Section 32 93 00 Trees, Shrubs and Perennials.

D. Trees equal to or larger than 4 inches in diameter at breast height shall be systematically cut up and removed in pieces from the top down by a licensed and bonded tree service.



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E. Stumps shall be ground out or otherwise removed to a minimum depth of 12 inches below ground surface or at least as deeply as the target excavation depth.

3.07 DISPOSAL

A. Dispose of debris offsite, which may consist of above ground plant materials, rubbish, trash materials and junk. Large items, such as vehicles, will not be disposed of and only temporarily relocated after coordination with the Property Owner.

B. Wood debris and root mass may be chipped. Chips will be mixed with soil and disposed.

**END OF SECTION**


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# SECTION 31 23 16
# EXCAVATION

## PART 1 GENERAL

1.01 DEFINITIONS

A. Permanent Structures: Buildings, sheds, decks, stairs, telephone poles and similar structures.

1.02 SUBMITTALS

A. Draft filled-in non-hazardous waste manifest prior to the start of excavation.

B. Haul tickets submitted daily.

C. Completed non-hazardous waste manifests submitted daily.

1.03 QUALITY ASSURANCE

A. Provide adequate control to avoid unauthorized over excavation.

1.04 WEATHER LIMITATIONS

A. Excavation shall not be performed during inclement weather.

1.05 SEQUENCING

A. Complete applicable work requirements of Section 01 11 00, Scope of Work, Section 01 50 00, Temporary Facilities and Controls, and Section 31 10 00, Site Preparation, prior to excavation.

B. Earthwork Subcontractor shall sequence work to minimize the time that excavations remain open.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

3.01 GENERAL

A. Means and methods of access to soil excavation areas will be determined on a property-specific basis. The scope may include use of mechanical equipment and/or manual excavation, depending on site conditions. Earthwork Subcontractor shall determine the method(s) to access and excavate the properties in accordance with the specifications.


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B. Boundaries of the Work estimated for each property are shown on the property sketches. Excavation boundaries are defined by the design investigation and will be confirmed during Residential Pre-construction Meetings with concurrence from the Property Owner.

C. Depth of the Work for each site is shown on the property sketches. Over-excavation tolerance is plus 0.1 foot, and under-excavation tolerance is minus 0.0 foot. Contractor may limit the depth of excavation if it is believed that further excavation may result in damage to structures or safety hazards.

D. Do not over excavate without written authorization of Contractor.

E. Remove or protect obstructions as shown and as specified in Section 01 50 00, Temporary Facilities and Controls, Article Protection of Work and Property.

F. Hand dig within 60 inches of either side of the approximate underground utility markings to verify actual location of the utility, and make provisions to support and protect utilities during excavation and backfill.

G. Hand dig around fire hydrants, monitoring wells, sign posts and similar features to prevent damage from heavy equipment.

H. Limits of construction for soil excavation are as follows (not inclusive of all limits):

1. One (1) foot away from permanent structures and fences and sloping away from the structure at a maximum slope of 1 horizontal to 1 vertical.
2. One (1) foot away from property lines unless the excavation continues onto the neighboring property and the adjacent Property Owner has provided access. Excavation may proceed across a property line into a right-of-way if it serves as part of that yard.
3. When the Earthwork Subcontractor is satisfied that an excavation is to the specified lines and grades, with confirmation from the Post-Excavation survey, the Contractor will perform an inspection. After inspection and approval, Contractor will authorize the Earthwork Subcontractor to proceed with backfilling of the excavation.

I. Immediately notify Contractor if latent differing site conditions are encountered during construction. Such conditions include french drains, drain tile, unknown electrical and plumbing lines, and other similar conditions.




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## 3.02 EXCAVATION AT OR ADJACENT TO PROTECTED TREES AND SHRUBS

A. Manual excavation shall be performed around tree roots as specified below:

1. Excavation within an 8-feet radius of the tree trunk (unless otherwise indicated on the Drawings) shall be limited to manual excavation to a depth of 6-inches.
2. Manual excavation shall expose woody roots 1 inch in diameter or greater to preserve the roots.
3. Manual excavation shall follow the roots 1 inch in diameter or greater to the horizontal extent of the excavation to expose the roots. Outside the manual excavation radius indicated on the Drawings, mechanical excavation shall be allowed to the required depth using a mini excavator, or approved equivalent, and spotter to remove soils between 1 inch diameter or larger roots previously exposed by manual excavation.
4. If roots are damaged, Earthwork Subcontractor shall perform corrective pruning to create a clean cut and promote quick wound closure and regeneration.

B. Protect from damage and preserve trees, shrubs, and other plants outside excavation limits.

1. Provide and maintain temporary barricades around trees.
2. Employ manual excavation as specified to minimize tree injury.
3. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.
4. Water vegetation, as necessary, to maintain health.
5. Do not stockpile materials or permit unprotected traffic within drip lines of trees.

C. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning and other accepted horticultural and tree surgery practices.

## 3.03 REMOVAL OF EXCAVATED MATERIAL

A. This task includes transporting the excavated material from the property. Properties may be adjacent to a city sidewalk, boulevard, and/or city street in the front. Earthwork Subcontractor shall determine the best method to load the excavated soil for transporting to the Former Plant Site for staging prior to disposal.

B. The Earthwork Subcontractor shall perform work as outlined and approved in the Transportation and Disposal Plan.


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C. Earthwork Subcontractor shall provide means and methods to remove and transport excavated material for disposal.

3.04 STOCKPILING EXCAVATED MATERIAL

A. Excavated materials shall not be allowed to be stockpiled overnight except at the Former Plant Site with proper controls in place. Excavated material may be staged for disposal and stockpiled at the Former Plant Site within approved areas.

B. Post signs identifying material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable.

C. Excavated soil may be temporarily stockpiled within the extent of the excavation prior to loading the soil for transport to the Former Plant Site or for offsite disposal. Temporary stockpiles shall be removed before the end of construction activities each day.

D. Do not stockpile excavated materials near or over existing utilities, facilities, adjacent property, or completed Work, or within the tree drip line.

E. Protection against stockpile runoff shall be implemented in accordance with the approved Soil Erosion and Sedimentation Control Plan.

3.05 LOADING OF EXCAVATED MATERIAL

A. This task includes all moving, handling and loading of excavated material for transportation. Sequencing of moving, handling and loading of trucks is to be done in accordance with the Earthwork Subcontractor's Transportation and Disposal Plan.

B. Trucks shall be fully loaded, within allowable hauling weight limits, prior to transporting the excavated materials to the Former Plant Site for staging or the approved licensed disposal facility.

C. A temporary ground covering, 6 mil polyethylene or equivalent, shall extend a minimum of 2 feet under trucks to minimize the potential for soil to spill into roadways or other areas not requiring remediation.

3.06 TRANSPORTATION AND DISPOSAL

A. The exterior of each transportation vehicle and load of waste shall be visually inspected and all loose soil/material removed and collected before leaving the site.


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B. Each truckload shall be covered with a fully functioning tarp system that satisfies local, county, state and federal regulations prior to transporting the excavated materials to the Former Plant Site for staging or from the Former Plant Site to the approved licensed disposal facility.

C. Transportation of nonhazardous wastes shall be completed by a transporter licensed for commercial transportation in the State of Michigan. The transporter shall adhere by and be in compliance with all regulatory requirements under 49 Code of Federal Regulations (CFR).

D. Transporters will be required to abide by the health and safety plan, including PPE requirements when outside the vehicle. The Contractor shall not be responsible for any demurrage or other costs as a result of turning away a driver who does not comply with project health and safety requirements.

E. Each driver shall maintain proof of insurance for their truck and valid commercial driver's license in their truck.

F. Vehicle fueling, lubrication, and maintenance will not be performed on site.

G. Soil waste removed from the site shall be transported and disposed of at a licensed facility approved by USEPA. Disposal facilities will be required to provide proof of USEPA approval under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Offsite Rule, set forth in the National Contingency Plan, at 40 Code of Federal Regulations 300.440 and shall be approved by the Contractor.

H. Non-hazardous waste manifests will be prepared by the Earthwork Subcontractor and signed by the Contractor on behalf of USEPA. A completed draft manifest will be provided to Contractor prior to beginning excavation work. A manifest will accompany each load from the Former Plant Site.

I. Waste characterization samples will be collected from excavated soil in accordance with the approval requirements of the approved disposal facility if additional waste characterization is required. The Contractor will provide the results of analysis to the Earthwork Subcontractor.

J. The quantities of waste shall be recorded by documented weighing at the approved disposal facility. For each load of material, weight measurements will be obtained for each full and empty container or dump truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container or dump truck. Copies of haul tickets shall be signed and provided to Contractor on a daily basis.


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K. The following procedures also will be observed when transporting wastes offsite:

1. The Subcontractor will coordinate waste pickup with the Contractor once all analytical, profiles and manifests are in order.
2. Waste material transportation shall comply with federal, state and local regulations.
3. Impacts to general public traffic will be minimized.
4. If road damage is caused by construction and/or hauling traffic, the damage will be repaired.
5. Material spilled during the work or in transit will be reported to the Contractor immediately and cleaned up in accordance with the Transportation and Disposal Plan.
6. Safety and spill response procedures will be followed.
7. Sealed trucks will be used to transport liquids or wet materials.
8. No materials from other projects shall be combined with materials from this site.
9. The approved Transportation and Disposal Plan will be followed.

**END OF SECTION**


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# SECTION 31 23 23
# FILL AND BACKFILL

## 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. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
   b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
   c. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft$^3$ (600 kN-m/m$^3$)).
   d. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   e. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   f. D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
   g. D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.
2. Michigan Department of Transportation (MDOT):
   a. MTM 108, Michigan Test Method for Materials Finer than No. 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
   b. MTM 109, Michigan Test Method for Sieve Analysis of Fine, Dense Graded, Open Graded and Coarse Aggregates in the Field

### 1.02 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Contractor.


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B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Relative Density: Calculated in accordance with ASTM D4254 based on maximum index density and minimum index density determined in accordance with ASTM D4253 and ASTM D4254, respectively.

D. Completed Course: A course or layer that is ready for next layer or next phase of Work.

E. Lift: Loose (uncompacted) layer of material.

F. Well-Graded:

1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

G. Influence Area: Area within planes sloped downward and outward at 45-degree angle from horizontal measured from:

1. 1 foot outside outermost edge at base of foundations or slabs.
2. 1 foot outside outermost edge at surface of roadways, shoulder or sidewalk.
3. 2 foot outside exterior at spring line of pipes or culverts.

H. Borrow soils utilized for this project are described in three classifications and are as follows:

1. General Backfill (-6 inches to maximum -4 feet): CL or ML Classification (ASTM D2487).
2. Granular Fill (adjacent to, beneath, or within influence area of structures): as defined in this section.
3. Topsoil (-6 inches to surface finish grade in yards and -18 inches to surface finish grade in gardens and landscaping areas): as defined in Section 32 91 13, Topsoil Preparation.



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I. Imported Material: Materials obtained from sources offsite, suitable for specific use.

J. Fill: Materials obtained from approved sources offsite, suitable for specified use.

K. Standard Specifications: When referenced in this section, shall mean Michigan Department of Transportation Standard Specifications for Construction, latest edition.

1.03 SUBMITTALS

A. Action Submittals:

1. Earthwork Subcontractor shall identify borrow source(s) for materials described in this section for sampling and approval by Contractor. Samples collected by the Contractor will be analyzed for the following:
   a. Chemical analyses of source materials (contaminants).
   b. Gradation analyses of source materials.
2. Earthwork Subcontractor compaction test results.

B. Informational Submittals: Manufacturer's data sheets for compaction equipment.

1.04 QUALITY ASSURANCE

A. Notify Contractor when:

1. Whenever subgrade is ready for backfilling or when backfilling operations are resumed after a period of inactivity.
2. Soft or loose subgrade materials are encountered.
3. Fill material appears to be deviating from Specifications.

B. Earthwork Subcontractor shall perform 2 compaction tests in place per lift per yard area. Locations of compaction tests shall be spread out over the footprint of the area being backfilled. Contractor may direct Earthwork Subcontractor to perform additional compaction testing for quality assurance on a random basis in a manner to minimize interruption to backfill and compaction operations . The compaction tests shall be performed in accordance with ASTM D6938.


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1.05 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Section 31 10 00, Site Clearing, and Section 31 23 16, Excavation, prior to placing materials described in this section.

B. Perform Survey No 2 in accordance with Section 01 31 13, Project Coordination prior to performing Work specified under this section.

C. Complete Work specified in this Section after receiving authorization from Contractor upon inspection of final excavation depth.

D. Complete Work specified in this section within 7 days of the completion of excavation at a property.

**PART 2 PRODUCTS**

2.01 SOURCE QUALITY CONTROL

A. Earthwork Subcontractor shall coordinate with Contractor to ensure samples collected by Contractor at material source are representative of materials transported to the site.

B. The Contractor will collect samples for target compound list (TCL) organics and target analyte list (TAL) metals when identifying borrow source(s) to be used for General Backfill and Granular Fill. Earthwork Subcontractor shall develop a site drawing identifying the location of the samples with respect to the specific borrow area at the borrow source. The materials will meet the Michigan Part 201 Residential Soil criteria to be determined to be “clean.”

C. The Contractor will collect one TCL organics and TAL metals sample per 1,000 $yd^3$ of fill material or more often as determined by Contractor, if variation in material is occurring, or if material appears to depart from Specifications.

D. Gradation: Contractor will collect one sample for gradation analysis per 1,000 $yd^3$ of General Backfill and Granular Fill materials or more often as determined by Contractor, if variation in gradation is occurring, or if material appears to depart from Specifications.

2.02 GENERAL BACKFILL

A. General Backfill shall consist of natural soils that include fine or coarse grained soils, clay, clayey sand, and other natural-approved material. The material shall be suitably graded. The use of an essentially one-size material will not be permitted unless approved.



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B. General Backfill material shall be free from rocks larger than 3 inches, from roots, peat and other organic matter, ashes, cinders, trash, debris, and other deleterious materials.

C. General Backfill shall not contain more than 10 percent gravel, stones, or shale particles.

2.03 GRANULAR FILL (IF REQUIRED)

A. Class 1 material in accordance with Michigan Department of Transportation 2012 Standard Specifications for Construction, Section 902.07, Granular Materials for Fill and Subbase.

2.04 WATER FOR MOISTURE CONDITIONING

A. Free of hazardous or toxic contaminants, or contaminants deleterious to proper compaction.

B. The Earthwork Subcontractor must supply water for moisture conditioning. Water may not be used from the residence.

**PART 3 EXECUTION**

3.01 GENERAL

A. Keep placement surfaces free of water, debris and foreign materials during placement and compaction of backfill materials.

B. This work includes transportation and installation of all material to the project site.

C. Stockpile and manage General Backfill, Granular Fill, and Topsoil as follows:

1. These materials shall not be allowed to be stockpiled overnight except at the Former Plant Site with proper controls in place. These materials may be staged and stockpiled at the Former Plant Site within approved areas.
2. Post signs identifying material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable.
3. Materials for backfilling may be temporarily stockpiled within the extent of the excavation prior to placement. Temporary stockpiles shall be spread out or otherwise removed before the end of construction activities each day.
4. Do not stockpile materials near or over existing utilities, facilities, adjacent property, or completed Work, or within the tree drip line.


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5. Protection against stockpile runoff shall be implemented in accordance with the approved Soil Erosion and Sedimentation Control Plan.

D. General Backfill material will be placed at various depth intervals up to the depth of topsoil specified in Section 32 91 13, Topsoil Preparation. General Backfill will be compacted to 85 percent maximum dry density as determined by ASTM D698 (Standard Proctor) in no greater than 6-inch lifts. Compaction shall not exceed 90 percent maximum dry density. The backfilled areas shall be compacted in a manner that prevents differential settlement, sink holes, subsidence, etc., and shall warrant against same for 1 year. All work associated with repairing backfilled areas shall be the responsibility of the Earthwork Subcontractor.

E. General Backfill shall not be placed in excavations with standing water or unstable subgrade conditions. General Backfill shall be placed in a manner that does not disturb or damage surrounding structures or utilities. The backfilled areas shall be graded away from structures to suit the elevation of the surrounding area and such that there will be no ponding of water.

F. Place and spread backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.

G. During backfilling, keep level of backfill around each structure even.

H. Do not place backfill, if material is frozen, or if surface upon which backfill is to be placed is frozen.

I. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.

J. Maintain prepared ground surface in finished condition until next course is placed.

K. Tolerances:

1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
2. Grade to establish and maintain slopes and drainage as shown.

L. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping and other facilities, caused by settlement of backfill material, including during maintenance period.



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3.02 ADJACENT TO ROADS, DRIVEWAYS, FOUNDATIONS AND SIDEWALKS, FACILITIES

A. Within influence area adjacent to or beneath structures, sidewalks, slabs, pavements, curbs, piping, conduits, and other facilities, backfill with Granular Fill material approved by Contractor.

B. Place fill in lifts of 6-inch maximum thickness and compact each lift to minimum of 90 percent relative compaction as determined in accordance with ASTM D698.

3.03 SITE TESTING

A. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.

B. Remove material placed in Work that does not meet Specification requirements.

3.04 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by Contractor with same material as specified for overlying fill or backfill.

**END OF SECTION**


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# SECTION 32 10 01
# SITE RESTORATION

## PART 1 GENERAL

1.01 SUBMITTALS

A. Action Submittals: Inspection or testing results for existing systems.

B. Informational Submittals:

1. Manufacturer's Instructions or data sheets for replacement materials.
2. Samples.

1.02 SEQUENCING AND SCHEDULING

A. The Work of this Specification shall not commence until the Contractor has approved materials and methods proposed for restoration.

B. Include the Work of this Specification in the progress schedule, as specified in Section 01 32 00, Construction Progress Documentation.

C. Site restoration shall be performed after the completion of activities described in Section 32 91 13, Topsoil Preparation.

D. Site restoration shall be performed after the completion of Survey No. 3 as specified in Section 01 31 13, Project Coordination.

1.03 TESTING

A. Sprinkler systems, electrical, piping, and plumbing located within or near the limits of excavation will be inspected and tested as appropriate to determine if damage occurred during the remediation.

B. Testing may include verifying the system is functional or other appropriate means.

C. Testing shall be coordinated with and observed by the Contractor.

## PART 2 PRODUCTS

2.01 REPLACEMENT MATERIALS

A. Products to match the material and finishes as the item being repaired or replaced.


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## PART 3 EXECUTION

### 3.01 GENERAL

A. Site restoration shall include reinstallation of removed obstructions, repairs to permanent structures, and repair or replacement of property disturbed or damaged during or as a result of the Earthwork Subcontractor's construction activities.

B. Site restoration shall also include the removal of temporary controls.

### 3.02 RESTORATION

A. The Earthwork Subcontractor shall reinstall landscaping features or other obstructions removed from the area. Materials will be reinstalled to an equivalent or better condition. Any materials that are damaged and cannot be reinstalled shall be replaced with new materials of like-kind with matching finishes as possible.

B. The Earthwork Subcontractor will return items to the property from storage area after reinstallation of removed fencing sections. Any items damaged by the Earthwork Subcontractor shall be repaired or replaced as directed by Contractor. The condition of equipment and materials prior to removal from the property will be based on photographic and video documentation.

### 3.03 REPAIRS

A. Residential Property:

1. Damage to private property, including but not limited to, fencing, private utilities, and permanent structures, shall be repaired by the Earthwork Subcontractor in accordance with manufacturer's instructions, local codes and ordinances, and other applicable regulations and as approved by the Contractor.
2. Repairs will be performed to an equivalent or better quality than the original. Repairs shall be made with like-kind materials with matching finishes as possible.
3. Repairs may be performed by the Earthwork Subcontractor if qualified, or the Earthwork Subcontractor shall retain a qualified party to perform the repairs.
4. Damaged items shall be replaced by the Earthwork Subcontractor with new undamaged items as approved by Contractor.



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B. City-Owned Property:

1. The Earthwork Subcontractor shall repair sidewalks, curb and gutter, trees or other City property damaged by the Earthwork Subcontractor or as a result of their construction activities. Repairs shall be performed in accordance with the MDOT Standard Specifications for Construction, City of St. Louis Municipal Code of Ordinances, or other applicable ordinances or regulations.
2. Repairs will be performed by the Earthwork Subcontractor, if qualified, or the Earthwork Subcontractor will retain a qualified party to perform the repairs.

C. Costs to repair or replace damaged items will be borne by the Earthwork Subcontractor.

3.04 CLEANUP

A. Temporary controls shall be removed from the residential property after topsoil preparation is complete, sod has been installed, and other property features have been restored.

B. Erosion and sediment control measures, such as inlet protection, shall be removed by the Earthwork Subcontractor after the final street cleaning is performed in accordance with 01 50 00, Temporary Facilities and Controls.

C. Debris, rubbish and excess materials shall be removed from the property for storage at the staging area or disposal, as appropriate. Local regulations regarding hauling and disposal shall apply.

**END OF SECTION**


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# SECTION 32 91 13
# TOPSOIL PREPARATION

## PART 1 GENERAL

### 1.01 GENERAL

A. This Work includes transportation and installation of topsoil to the project site.

### 1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
   a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
   b. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft$^3$ (600 kN-m/m$^3$)).
   c. D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
   d. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   e. D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
   f. D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.
2. Michigan Department of Transportation (MDOT):
   a. MTM 108, Michigan Test Method for Materials Finer than No. 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
   b. MTM 109, Michigan Test Method for Sieve Analysis of Fine, Dense Graded, Open Graded and Coarse Aggregates in the Field

### 1.03 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density (determined in accordance with ASTM D6938) to laboratory maximum dry density as determined in accordance with ASTM D698.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Contractor.


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B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Relative Density: Calculated in accordance with ASTM D6398 based on maximum index density and minimum index density determined in accordance with ASTM D4253 and ASTM D4254, respectively.

D. Completed Course: A course or layer that is ready for next layer or next phase of Work.

E. Topsoil: Uppermost 6 inches of soil to be placed in areas of sod and uppermost 18 inches (or maximum excavation depth if less than 18 inches) in landscaped areas, designed to favor plant establishment and growth.

F. Subsoil: All soil fill materials below the topsoil layer and in accordance with Section 31 23 23B Fill and Backfill.

G. Lift: Loose (uncompacted) layer of material.

H. Imported Material: Materials obtained from sources offsite, suitable for specific use.

## 1.04 SUBMITTALS

A. Action Submittals:

1. Earthwork Subcontractor shall identify topsoil borrow source(s) for sampling and approval by Contractor. Samples collected by the Contractor will be analyzed for the following:
   a. Chemical analyses of source materials (contaminants).
   b. Chemical analyses of source materials (basic fertility and salinity).
   c. Gradation analyses of source materials.
2. Earthwork Subcontractor compaction test results.

## 1.05 QUALITY ASSURANCE

A. Notify Contractor when:

1. Subgrade is ready for backfilling or when backfilling operations are resumed after a period of inactivity.
2. Soft or loose subgrade materials are encountered.


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3. Topsoil material appears to be deviating from Specifications.

B. Earthwork Subcontractor shall perform two (2) compaction tests in place in accordance with ASTM D6938 per lift per yard area. Locations of compaction tests shall be spread out over the footprint of the area being backfilled. Contractor may direct Earthwork Subcontractor to perform additional compaction testing for quality assurance on a random basis in a manner to minimize interruption to backfill and compaction operations.

1.06 SEQUENCING AND SCHEDULING

A. Perform Work specified in Section 31 10 00, Site Clearing; Section 31 23 16, Excavation; and Section 31 23 23, Fill and Backfill prior to performing Work specified under this section.

B. Complete Work specified in this section within 7 days of the completion of excavation at a property.

**PART 2 PRODUCTS**

2.01 SOURCE QUALITY CONTROL – BY CONTRACTOR:

A. The Contractor will collect samples for target compound list (TCL) organics and target analyte list (TAL) metals when identifying borrow source(s) to be used for topsoil. A site drawing will be submitted identifying the location of the samples with respect to the specific borrow area at the borrow source. The topsoil will meet the Michigan Part 201 Residential Soil criteria to be determined to be “clean.”

B. The Contractor will collect one TCL organics and TAL metals sample per 1,000 $yd^3$ of fill material or more often as determined by Contractor, if variation in material is occurring, or if material appears to depart from Specifications.

C. The Contractor will test general fertility/salinity parameters using the Ag Source Harris ‘Diagnotic Test’ (http://agsource.crinet.com/page2504/HarrisTurfTestPackages) or equivalent with one sample per 1,000 $yd^3$ of topsoil.

D. Gradation: Contractor will collect one sample for gradation analysis per 1,000 $yd^3$ of topsoil or more often as determined by Contractor, if variation in gradation is occurring, or if material appears to depart from Specifications.


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2.02 TOPSOIL

A. Topsoil shall be free from objects larger than 1 inch maximum dimension, and free of subsoil, roots, grass, other foreign matter, hazardous or toxic substances, and deleterious material that may be harmful to plant growth or may hinder grading, planting, or maintenance.

B. Topsoil shall consist of loam, sandy loam, silt loam or clay loam (USDA Classification System) humus-bearing soils adapted to the sustenance of plant life.

C. Topsoil Borrow: The Contractor will collect samples for gradation analysis when identifying borrow source(s) to be used for topsoil. Topsoil shall meet the requirements as described below:

1. Gravel – 5 percent by weight, maximum.
2. Sand – 10-50 percent passing No. 10 sieve.
3. Silt – 50-80 percent, 0.05-0.002 mm diameter.
4. Clay – 10-25 percent, less than 0.002 mm diameter.
5. Organic matter – 2.5 to 5 percent of dry wet as determined in accordance with ASTM D2974.

2.03 WATER FOR MOISTURE CONDITIONING

A. Free of hazardous or toxic contaminants, or contaminants deleterious to proper compaction.

B. The Earthwork Subcontractor must supply clean water for moisture conditioning. Water may not be used from the residence.

**PART 3 EXECUTION**

3.01 GENERAL

A. This work includes transportation and installation of all material to the project site.

B. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.

3.02 TOPSOIL PLACEMENT

A. The top 6 inches of soil for all backfilled excavation areas shall be topsoil, except for garden or landscaping areas which shall have a minimum of 18



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inches of topsoil (unless the excavation depth is less than 18 inches, in which case the thickness of topsoil shall be equal to the excavation depth).

B. Do not place topsoil when topsoil is frozen, excessively wet, or otherwise detrimental to the Work.

C. Topsoil shall not be placed in standing water or with unstable subgrade conditions. Topsoil shall be placed in a manner that does not disturb or damage surrounding structures or utilities.

D. Topsoil shall be placed in lifts no greater than 6 inches. Topsoil will be placed in each excavated area to -0.1 foot of final grade if sod is to be placed over the topsoil. Fine grade topsoil eliminating rough or low areas and maintaining levels, profiles, and contours of subgrade.

E. Remove stones exceeding 1 inch, roots, sticks, debris, and foreign matter during and after topsoil placement.

F. Remove surplus topsoil from property.

3.03 TOPSOIL COMPACTION

A. Topsoil compaction shall be minimized to the extent possible in all areas planned for herbaceous (e.g., lawn) or woody vegetation (trees or shrubs). All compacted areas such as wheel ruts and other high traffic areas shall be tilled with an implement designed to lift and loosen soil (e.g., rip). Compact soils to no less than 75 percent and no more than 85 percent relative compaction per ASTM D698.

3.04 PARKING AREAS

A. In areas frequently used by the Property Owner or Resident for parking, compact topsoil to between 90 and 95 percent maximum dry density as determined by ASTM D698 (Standard Proctor).

3.05 SITE TESTING

A. Amend topsoil in accordance with the reported Harris Turf Test guidelines.

B. If chemical or gradation test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.


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C. If compaction test results indicate material does not meet Specification requirements, rework as necessary and retest to meet project requirements.

D. Remove material placed in Work that does not meet Specification requirements.

**END OF SECTION**


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# SECTION 32 92 00
# TURF AND GRASSES

## PART 1 GENERAL

1.01 GENERAL

A. Items specified within this section to be completed in 2014 by the Earthwork Subcontractor.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section: Michigan Department of Transportation Standard Specifications for Construction, 2012 Version or current.

1.03 DEFINITIONS

A. Maintenance Period: Begin watering immediately after each property is sodded and continue for a period of four weeks during which the area will be watered by the Earthwork Subcontractor.

1.04 SUBMITTALS

A. Informational Submittals:

1. Product labels/data sheets.
2. Daily log of watering activities.

B. Action Submittals:

1. Certification of sod; include source and harvest date of sod, and sod seed mix.
2. Watering plan and schedule, identifying labor, equipment and materials to be used.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Sod: Deliver and lay within 24 hours of harvesting.

1.06 WEATHER RESTRICTIONS

A. Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.


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B. Sod shall not be placed when the ground is frozen.

1.07 SEQUENCING AND SCHEDULING

A. Prepare topsoil as specified in Section 32 91 13, Topsoil Preparation, before starting Work of this section.

B. Planting Season: Per grower's recommendation.

1.08 MAINTENANCE SERVICE

A. Furnish and apply water to installed sod areas during maintenance period to establish sod.

**PART 2 PRODUCTS**

2.01 WATER

A. Any water used to moisten surface soils or water vegetation shall be from a potable source or a source approved by the Contractor.

B. The Earthwork Subcontractor may not use water from the residence.

2.02 SOD

A. Sod shall be a densely rooted blend of at least two bluegrass varieties. The sod shall have a minimum 30 percent content that is tolerant of shade and drought conditions.

B. Strongly rooted pads, capable of supporting own weight and retaining size and shape when suspended vertically from a firm grasp on upper 10 percent of pad.

1. Grass Height: Maximum of 3 to 4 inches.
2. Strip Size: Uniform units approximately 1.5 by 6 feet; larger rolls can be used if machinery designed for that purpose is used.
3. Soil Thickness: Uniform; minimum 3/4 inch thick at time of cutting.
4. Condition: Healthy, green, moist; free of diseases, nematode and insects, and of undesirable grassy and broadleaf weeds. Yellow sod, or broken pads, or torn and uneven ends will not be accepted.



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## PART 3 EXECUTION

### 3.01 PREPARATION

A. Grade areas to smooth, even surface with loose, uniformly fine texture.

1. Just before laying sod, harrow the topsoil a minimum of 3 inches deep with a disk, spring tooth drag, spike tooth drag or other equipment designed to condition the soil. A rake can be used for smaller areas.
2. Thoroughly water the earth bed with a minimum of 3.5 gallons per square yard before laying the sod.
3. Limit such Work to areas to be planted immediately.
4. Remove debris, and stones larger than 1-1/2-inch diameter, and other objects that may interfere with planting and maintenance operations.

### 3.02 SODDING

A. Do not plant dormant sod or when ground is frozen.

B. Lay sod within 24 hours after cutting and properly protect until placed.

C. Do not handle sod with pitch forks nor dump from vehicles.

D. Lay sod to form solid mass with tightly fitted joints; butt ends and sides and do not overlap.

1. Stagger strips to offset joints in adjacent courses.
2. Work from boards to avoid damage to subgrade or sod.
3. Tamp or roll lightly to ensure contact with subgrade; work sifted soil into minor cracks between pieces of sod, remove excess to avoid smothering adjacent grass.
4. Complete sod surface true to finished grade, even and firm.

E. Sod which has been allowed to dry out at any time will be rejected.

### 3.03 WATERING

A. Thoroughly water the earth bed with a minimum of 3.5 gallons per square yard before laying the sod.

B. Within eight hours after the sod has been placed, spray 6 gallons of water per square yard.

C. Apply 3.5 gallons per square yard twice per week for a period of four weeks after sod installation. Watering frequency may be modified by the Contractor due to weather conditions and sod moisture.


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D. Contractor may require additional applications based on the season and weather conditions.

E. Provide Contractor with daily log of watering activities. Include date and weather conditions, and for each property indicate times for start and end of watering and approximate volume of water delivered to property.

3.04 FIELD QUALITY CONTROL

A. At the end of the Maintenance Period watering and on written notice from Earthwork Subcontractor, Contractor will inspect the sodded areas. At the direction of Contractor, any defective or unacceptable sod shall be removed, replaced and watered by the Earthwork Subcontractor at the Earthwork Subcontractor's expense. Payment will be made for acceptable sod and the Property Owner will assume responsibility for further maintenance watering.

**END OF SECTION**




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# SECTION 32 93 00
# TREES, SHRUBS, AND PERENNIALS

## PART 1 GENERAL

### 1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of Nurserymen (AAN): Z60.1, Nursery Stock.
2. Hortus Third, Liberty Hyde Bailey, Hortorium, 1976.
3. Federal Housing Administration (FHA), Section 1103-103.

### 1.02 DEFINITIONS

A. Measurement:

1. In size grading Balled and Burlapped (B & B), caliper takes precedence over height.
2. Measure trunk caliper 6 inches above the ground level (up to and including 1-inch caliper size).
3. Measure size of container-grown stock by height and width of plant.
4. Measure herbaceous perennials pot size, not top growth.

### 1.03 SUBMITTALS

A. Action Submittals:

1. Pre-Selected Plant materials source list: Subcontractor shall develop and submit a list of trees, shrubs and perennials that are readily available at local nurseries and appropriate for the region with the recommended available sizes.
2. Product data on manufactured products specified.

B. Informational Submittals:

1. Maintenance Data: Instructions for storage, planting, fertilizing, care, and maintenance of each type of plant for 1-year period in climate and location of the Project.
2. Special Warranty.


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1.04 DELIVERY, STORAGE, AND HANDLING

A. Cover plants during shipment with a tarpaulin or other suitable covering to minimize drying or ship in box van.

B. B & B Plants: Wrap each ball firmly with burlap and securely bind with twine, cord, or wire for shipment and handling. Drum-lace balls with a diameter of 30 inches or more.

C. As specified herein for transplanting.

1.05 SPECIAL WARRANTY

A. Provide special warranty, with Property Owner named as beneficiary, in writing, that provides for replacement with new plants those found defective or to be dead or not in a vigorous, thriving condition during a period of 1 year after the date of post-construction property review for each property.

B. Replace defective plants with new plants free of dead or dying branches and branch tips, and bearing foliage of a normal density, size, and color. Closely match new plants to adjacent specimens of the same species and meet requirements of this Specification.

C. Plant replacement plants that die during a season unfavorable for planting during the first month of the next favorable season.

D. Plants damaged or lost due to vandalism or acts of neglect by others are not subject to this special warranty.

1.06 MAINTENANCE

A. Commence watering to maintain plant life immediately after planting and maintain for the period specified for “Maintenance Period” in Section 32 92 00, Turf and Grasses.

B. In accordance with accepted Submittal on care and maintenance of plants and as follows:

1. Maintain by watering, pruning, cultivating, and weeding as required for healthy growth.
2. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required.
3. Maintenance and fertilizer requirements as specified in Informational Submittal.


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4. Restore or replace damaged wrappings.
5. Maintenance includes temporary protection fences, barriers, and signs as required for protection.
6. Coordinate watering to provide deep root watering to newly installed trees.

1.07 SCHEDULING AND SEQUENCING

A. Planting Season: Per manufacturer's recommendation.

B. Plant trees, shrubs, and perennials after final topsoil grades are established and before placement of sod.

**PART 2 PRODUCTS**

2.01 PLANT MATERIALS

A. Provide size, genus, species, and variety of trees, shrubs, and perennials to comply with applicable requirements of AAN Z60.1 to develop the Pre-selected Species (Supplement 1) that are readily available at local nurseries.

B. Nomenclature (Names of Plants): In accordance with "Hortus Third".

C. Quality and Size:

1. Nursery-grown, habit of growth normal for species.
2. Sound, healthy, vigorous, and free from insects, diseases, and injuries.
3. Equal to or exceeding measurements specified in plant list. Measure plants before pruning with branches in normal position.
4. Perform necessary pruning at time of planting.
5. Sizes: Dimensional relationship requirements of AAN Z60.1 for kind and type of plants required.
6. B & B Plants: Firm, intact ball of earth encompassing enough of the fibrous and feeding root system to enable full plant recovery.
   a. Ball Size: AAN Z60.1.
7. Container-Grown Plants: Self-established root systems, sufficient to hold earth together after removal from container, without being root bound.
   a. Stock: Grown in delivery containers for at least 6 months but not over 2 years.
8. Label one tree and shrub of each variety with securely attached waterproof tag bearing legible designation of botanical and common name.


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D. Replacement Trees, Shrubs, and Perennials: Same species and quantity as specified for plant being replaced except:

1. Species that are at risk due to current or anticipated diseases or infestations in the foreseeable future (i.e., Dutch Elm disease or Emerald Ash tree borer).
2. Replace existing trees larger than 4-inch caliper with 2-inch caliper trees.
3. Exotic species not readily available at local nurseries will be managed on property-specific basis with the property owner.

2.02 ANTIDESICCANT

A. Provide transpiration retarding material to be used where any plant material is moved during the growing season.

B. Products (or approved equivalent):

1. Foliguard©.
2. Wiltpruf©.

2.03 STAKING, AND WRAPPING MATERIALS

A. Wood Stake: 2 inches by 2 inches by 8 feet.

B. Guy Wires: Galvanized, 12-gauge, ductile steel.

C. Hose: Two-ply, reinforced rubber garden hose, not less than 1/2-inch diameter, new or used.

D. Tree Ties: No. 4 chain lock tree ties as manufactured by Green Brothers, Ltd.

E. Wrapping Material: Heavy crepe paper.

1. Burlap: Of first quality, minimum 8 ounces in weight, not less than 6 inches nor more than 10 inches in width.

2.04 MULCH

A. Recycled hardwood (chipped or shredded), free from noxious weed seed and foreign material harmful to plant growth.

B. Depth: 3 inches.


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2.05 PEAT MOSS

A. Composition: Natural residue formed by decomposition of reeds, sedges, or mosses in a freshwater environment, free from lumps, roots, and stones.

1. Organic Matter: Not less than 90 percent on a dry weight basis.

B. Moisture Content: Maximum 65 percent by weight at time of delivery.

2.06 HERBICIDE

A. Selective, pre-emergent, surface-applied at manufacturer's recommended rate.

B. Manufacturers and Products (or approved equivalent):

1. Eli Lilly and Co.; Surflan.
2. Thompson-Hayward Chemical Co.; Casoron.

2.07 PLANTING SOIL MIX

A. Proportion by Weight: 3/4 approved Topsoil with 1/4 approved organic matter (peat moss).

2.08 FERTILIZER

A. Commercial, complete, of neutral character; in granular, packet, or pellet form, 35 to 80 percent of nitrogen slow release.

1. Minimum: 10 percent available nitrogen, 3 percent to 5 percent phosphoric acid, and 3 percent to 5 percent soluble potash.

B. Organic fertilizer when requested by property owner and as directed by the Contractor.

**PART 3 EXECUTION**

3.01 LOCATION OF PLANTS

A. Locate new planting in same location as removed plant or otherwise directed by Contractor.

B. Locate no planting, except ground cover, closer than 18 inches to pavements, pedestrian pathways, and 36 inches to structures unless replacing plant that was previously located there.


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C. Request Contractor observe locations and adjust as necessary before planting begins.

D. Planting of trees and shrubs shall be as specified herein and shown on Standard Details:

1. 3293-612, Small Tree Planting.
2. 3293-630, Shrub Planting from Container.

E. Ground Cover Beds:

1. Mix amendments and fertilizer with top soil prior to placing or apply on surface of top soil and mix thoroughly before planting.
2. Scarify top soil to a depth of 4 to 6 inches.
3. Establish finish grading of soil. Rake areas to smooth and create uniform texture and fill depressions.
4. Moisten.

## 3.02 PREPARATION

A. Planting Soil: Delay mixing of amendments and fertilizer if planting will not follow preparation of planting soil within 2 days. For pit and trench type backfill, mix planting soil prior to backfilling and stockpile at Site.

B. Trees, Shrubs, and Perennials:

1. Pits, Beds, and Trenches: Excavate with vertical and scarified sides.
2. B & B Trees and Shrubs: Make excavations at least twice as wide as root ball.
3. Container-Grown Stock: Excavate as specified for B & B stock, adjusted for size of container width and depth.
4. Bare-Root Trees: Excavate pits to a width to just accommodate roots fully extended and depth to allow uppermost roots to be just below original grade.
5. Fill excavations with water and allow to percolate out prior to planting.

## 3.03 PLANTING

A. Plant trees before planting surrounding smaller plants. Adjust plants with most desirable side facing toward the prominent view (sidewalk, building, street).

B. B & B Plants: Place in pit by lifting and carrying by its ball (do not lift by branches or trunk). Lower into pit. Set straight and in pit center with tip of rootball 1 to 2 inches above adjacent finish grade.


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C. Bare-Root Plants: Spread roots and set stock on cushion of planting soil mixture. Set straight in the pit center so that roots, when fully extended, will not touch walls of the planting pit and the uppermost root is just below finish grade. Cover roots of bare-root plants to the crown.

D. Container-Grown Plants: Remove containers, slash edges of rootballs from top to bottom at least 1-inch deep. Plant as for B & B plants.

E. Ground Covers: Dig planting holes with one of the following: hand trowel, shovel, bulb planter, or hoe. Split biodegradable pots or remove nonbiodegradable pots. Root systems of all potted plants shall be split or crumbled. Plant so roots are surrounded by soil. Set potted plants so pot top is even with existing grade.

F. Transplants: The Property Owner may have removed existing plants prior to excavation and removal by the Earthwork Subcontractor. At the direction of the Contractor, the Landscaping Subcontractor shall prepare planting holes appropriate for the transplants.

3.04 BACKFILLING

A. Backfill with planting soil mix as specified in Article 2.07.

B. B & B Plants:

1. Partially backfill pit to support plant. Remove burlap and binding from sides and tops of B & B plants. Do not pull burlap from under balls.
2. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill to eliminate air pockets even if it is raining. Finish backfilling pit sides.
3. Never cover top of rootball with soil. Form a saucer above existing grade, completely around the outer rim of the plant pit.

C. Bare-Root Plants:

1. Plumb before backfilling and maintain plumb while working backfill around roots and placing layers above roots.
2. Set original soil line of plant 1 inch to 2 inches above adjacent finish landscape grades. Spread out roots without tangling or turning up to surface. Cut injured roots cleanly; do not break.
3. Carefully work backfill around roots by hand; puddle with water until backfill layers are completely saturated.


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3.05 STAKING, AND WRAPPING

A. Support trees immediately after planting to maintain plumb position.

B. Staking: Support deciduous trees 2 inches in caliper or less with stakes spaced equally about each tree.

C. Wrapping: Spirally wrap trunks of deciduous trees from ground line to height of second branches promptly after planting. Wrap neatly and snug. Hold material in place with raffia cord at top and bottom.

3.06 FERTILIZER

A. Add as top dressing depending on plant size and manufacturer's recommendation.

3.07 MULCHING

A. Cover planting beds and area of saucer around each plant with 3-inch thick layer of selected mulch within 2 days after planting. Saturate planting area with water.

3.08 WEED CONTROL

A. Maintain a weed-free condition within planting areas during maintenance period. Apply pre-emergent selective herbicide to mulched beds at manufacturer's recommended rate of application.

3.09 SUPPLEMENT

A. The supplements listed below, following "End of Section," are a part of this Specification:

1. Template: Trees, Shrubs and Perennial Listing.
2. Standard Detail 3293-612, Small Tree Planting.
3. Standard Detail 3293-630, Shrub Planting from Container.

**END OF SECTION**




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| **Tree Listing** | | | | |
|---|---|---|---|---|
| **Quantity** | **Size** | **Genus** | **Species** | **Variety** |
| *example* | *2-inch DBH* | *Birch* | *River Birch* | *Betula Nigra* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| **Shrub Listing** | | | | |
| *example* | *3-gallon pot* | *Viburnum* | *Viburnum Arrowwood* | *Viburnum dentatum* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| **Perennial Listing** | | | | |
| *example* | *4-inch pot* | *Hosta* | *H. Royal Standard* | *Royal Standard* |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

*Note: Earthwork Subcontractor shall develop listing of trees, shrubs, and perennials in the above format (or comparable) with plants that are appropriate for the region and readily available at local nurseries.*


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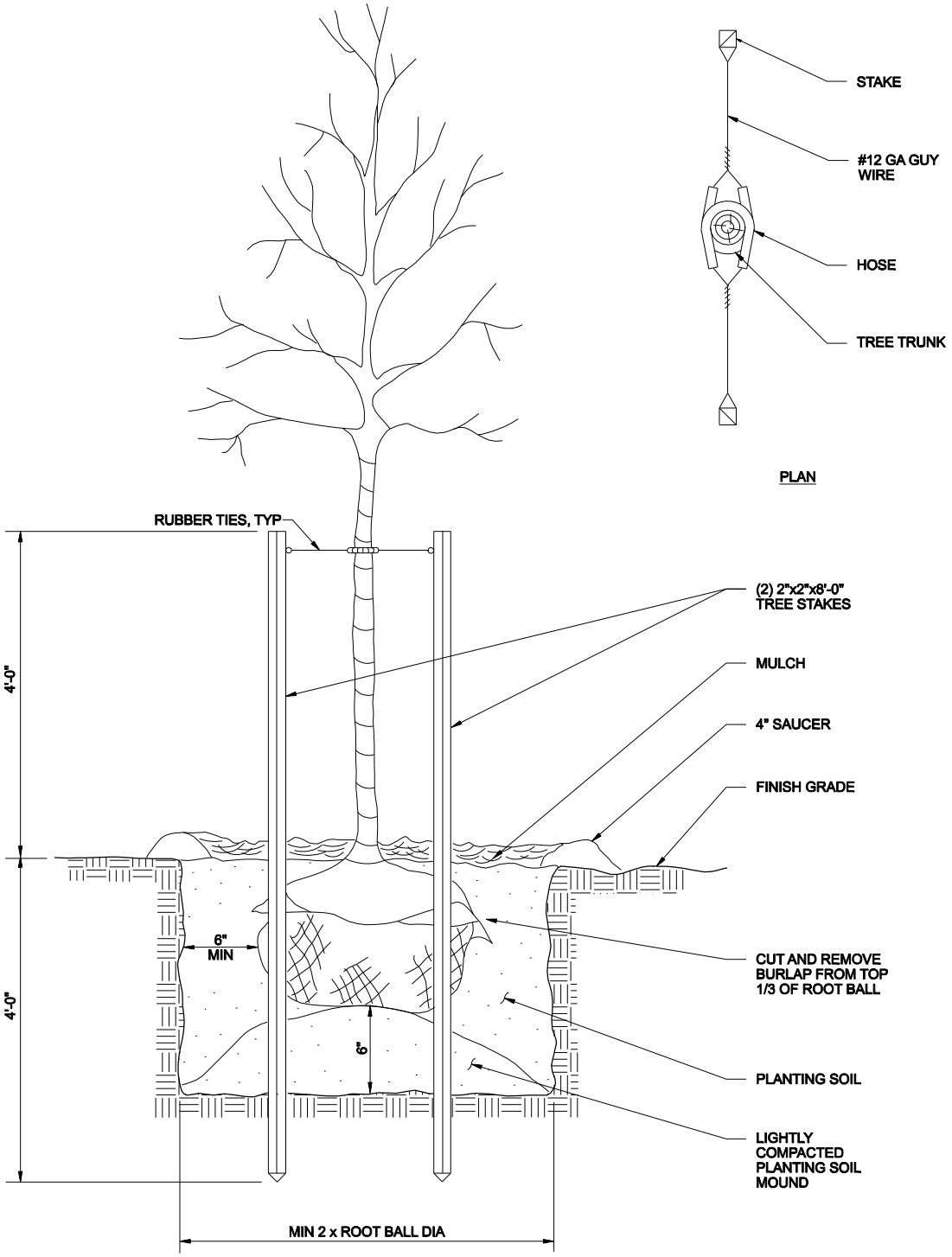


NOTE:

TREE SHALL BEAR SAME RELATION TO FINISH GRADE AS IT BORE TO PREVIOUS GRADE.

DETAIL 3293-612

## SMALL TREE PLANTING

PROPERTY IMPROVEMENTS

VELSICOL OU1 ANP REMEDIATION

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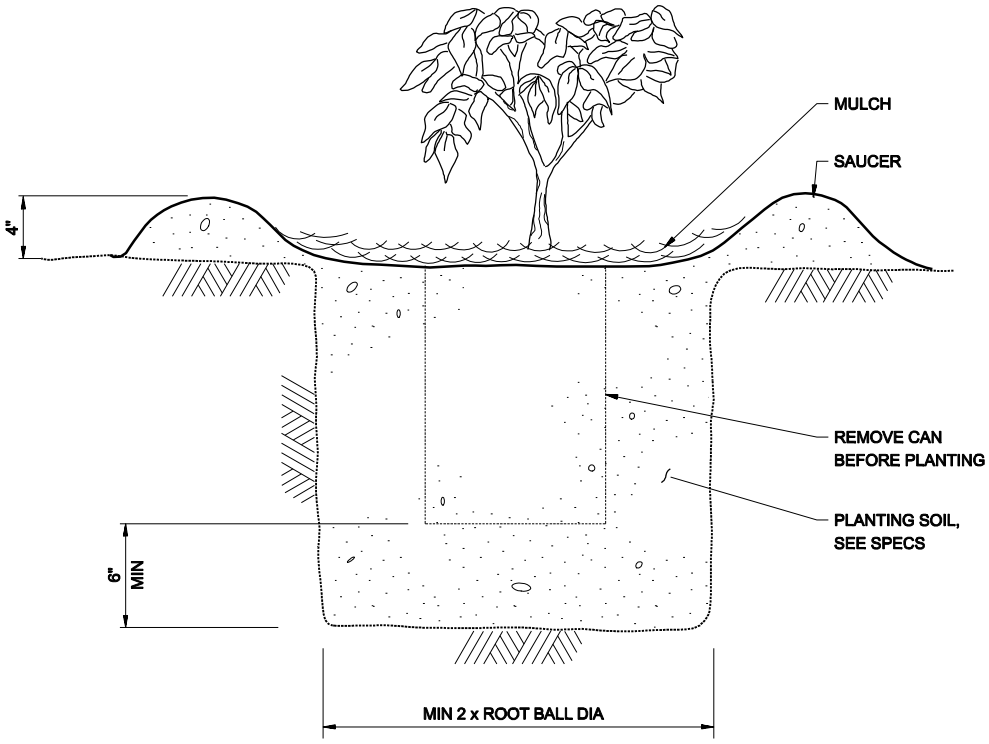


DETAIL 3293-630

## SHRUB PLANTING FROM CONTAINER

**PROPERTY IMPROVEMENTS**

VELSICOL OU1 ANP REMEDIATION

CH2MHILL

fn001g005_372256.dgn

# Appendix D
## Engineer's Estimate of Construction Cost

# Basis of Estimate for Velsicol Chemical Corporation Superfund Site Adjacent or Nearby Properties, Operable Unit 1, Phase 2 St. Louis, Michigan

PREPARED FOR: U.S. Environmental Protection Agency

DATE: March 10, 2014

## Project Description / Purpose of Estimate

The Velsicol Chemical Corporation/Pine River Superfund Site (Velsicol Superfund Site), National Superfund Database identification number MID00722439, is located in St. Louis, Michigan. The Record of Decision addresses the former plant site (FPS) and the residential properties adjacent to the FPS. Operable Unit 1 (OU1) is composed of the FPS and adjacent and nearby properties (ANP).

This remedial action (RA) will involve excavation and offsite disposal of soils exceeding 4.1 parts per million (ppm) total dichlorodiphenyl trichlorethane (DDT) and 1.2 ppm polybrominated biphenyl (PBB) in the ANP to address risk to human health and the environment. Phase 2 of the ANP RA involves removal of soils exceeding ecological health risk criteria from select portions of yards. Excavated areas will be backfilled with clean general fill and topsoil and restored.

The purpose of this estimate is to assist the U.S. Environmental Protection Agency (EPA) in preparing a budget for the remedial activities for Phase 2 of the ANP RA. This estimate will be part of the design documentation prepared by CH2M HILL.

The estimate is based on drawings of each of the properties to be remediated. The drawings have recently been updated based on surveys of each property. Quantity take-offs for disposal and for restoration are based on this information. The estimate is classified as a Class 1 Estimate (Final Design). Class 1 cost estimates are considered accurate to within minus 10 percent to plus 15 percent of actual costs.

## Site Information

OU1 was placed on the National Priority List in 2010. The ANP consist of mainly single-family residences with front and back yards. The portions of yards to be remediated in Phase 2 vary by property with single yards up to entire properties.

## Previous Cost Information

Phase 1 of the Velsicol OU1 ANP RA was performed within the past year. Additionally, a design was prepared for Phase 2A (5 properties) of the Velsicol OU1 ANP RA, which went out to bid. Two bids were received for Phase 2A, but due to contractual and scheduling issues, Phase 2A was not performed. The Phase 2A properties have been included in the scope of Phase 2. The Phase 2A pricing obtained from bidders has been incorporated into the Phase 2 cost estimate as appropriate. The scope of Phase 2 is greater in size and complexity than Phase 2A, so pricing from Phase 2A is not available for all line items. CH2M HILL performed very similar work for EPA Region 5 on the South Minneapolis Residential Soil Contamination project between 2009 and 2011. Costs from that project were used with escalation in some instances as well.

## Project Team

- Theo von Wallmenich/DET—CH2M HILL Site Manager
- Rob Stryker/MKE—CH2M HILL Design Manager
- Beth Rohde/MKE—CH2M HILL Design Quality Manager
- Louise Amundson/MKE—CH2M HILL Design Quality Control Manager
- Jason Cole/KNV—CH2M HILL Senior Technical Consultant

- Jeff Keiser/MKE—CH2M HILL Lead Technical Reviewer
- Steve Grant/ATL—CH2M HILL Cost Estimator
- Greg Mah-Hing/BAO—CH2M HILL Cost Estimating Reviewer

## Cost Estimate Methodology

**Technical Tasks**—Costs for project management and construction management were estimated on a percentage markup of construction costs. The percentage markup is based on the South Minneapolis residential soil remedial action. The administration/subcontractor oversight includes field and office management including project management, coordination with property owners/residents, oversight of multiple construction crews, sampling activities, documentation, and reporting.

**Schedule**—Estimate is based upon on a 5-month field schedule for excavation and backfilling through landscaping and restoration in 2014.

## Construction Costs

**Quantities**—Quantity take-offs for waste volumes were provided by the CH2M HILL design team with estimates on contaminated soil removal, backfill quantities, and vegetation replacement. Dimensions of excavation areas were estimated based on site surveys of properties and observations by field personnel. Depths of contaminated soil were determined during predesign investigation activities.

**Construction Cost Basis**—Craft labor costs are based on current Davis-Bacon wages, Wage Determination for St. Louis, Michigan. Heavy equipment costs are based on second-half 2013 Equipment Rental Blue Book Rates adjusted for region, model year, ownership, and operation cost. Construction costs were developed by building up crews for the activities and setting production rates based on estimator experience. Costs for materials, supplies, and transportation and disposal are based on pricing from vendors working on previous similar remediation projects. A formal procurement process has not been conducted.

## Assumptions/Exclusions

- Drawings used for this estimate were prepared by CH2M HILL.
- We have included a line item in the cost estimate for Preconstruction Activities, which includes costs associated with development of preconstruction deliverables, obtaining insurance certificates and permits, and participating in project planning meetings.
- Costs associated with assessing each property, locating utilities, erosion control, site clearance, temporary fencing during excavation, minimal traffic control, and relocating minor property items back to the original locations are included in the excavation line items.
- Portions of 60 properties will be remediated (see Table 3-3 from the Basis of Design Report for quantities per property).
- An estimated total of 20,303 cubic yards ($yd^3$) of soil will be removed and disposed (see Table 3-3 from the Basis of Design Report for quantities per property). We are using a conversion factor of 1.5 tons per $yd^3$ to estimate disposal tonnage. Quantities are estimated and actual quantities may vary.
- Disposal costs were determined based on costs for disposal from the bids for Phase 2A. The estimate includes disposal of all debris. Disposal cost assumes no hazardous waste will be encountered. Waste characterization sampling will be performed under the RD.
- CH2M HILL will determine if the general backfill and topsoil is clean by nondetection or detection of volatile organic compounds (Method 8260), semivolatile organic compounds (Method 8270), pesticides (Method 8081), herbicides (Method 8151A) polychlorinated biphenyls (Method 8082), and Resource Conservation and Recovery Act metals (Method 6010/7000) that are less than Michigan Part 201 values for soil – residential. In addition, analytical testing of the topsoil will be conducted to demonstrate suitability to support the establishment of the sod.
- Groundwater management or surface water management beyond average precipitation/stormwater management practices is not included.

- No escalation has been added as a factor within the estimate because this work will be conducted within a 1-year period. Costs have been calculated based on unit rates and U.S. dollars.
- Cost assumes CH2M HILL will procure and execute a subcontract with the remedial action subcontractor. CH2M HILL will provide project management, design, work plans, submittal reviews, and construction management services.

## General Notes

The Class 1 estimate contained in this memorandum has been produced using comparisons with similar work performed by contractors, with material and labor adjustments based on observed or perceived site conditions and/or on information provided by local contractors and/or vendors.

The purpose of this estimate is to assist in establishing funding levels for this project. Final project costs will be affected by market conditions, schedule, and public interface.

# Appendix E
## Construction Quality Assurance Plan

*Construction Quality Assurance Plan*

# Velsicol Chemical Corporation/Pine River Superfund Site Phase 2 Adjacent or Nearby Properties, Operable Unit 1 St. Louis, Michigan

## Remedial Design

## WA No. 164-RDRD-0532/Contract No. EP-S5-06-01

Prepared for

March 2014

CH2MHILL®

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# Acronyms and Abbreviations

| | |
|---|---|
| 3POC | Three Phases of Control |
| ANP | adjacent or nearby properties |
| BODR | basis of design report |
| CQAP | construction quality assurance plan |
| CQM | construction quality manager |
| COC | contaminant of concern |
| DDT | dichlorodiphenyl trichloroethane |
| DFOW | definable feature of work |
| FBA | Former Burn Area |
| FIELDS | Field Environmental Decision Support |
| FPS | Former Plant Site |
| FS | feasibility study |
| HASP | health and safety plan |
| HSM | health and safety manager |
| HSSE | Health, Safety, Security and Environment |
| MDEQ | Michigan Department of Environmental Quality |
| OU | operable unit |
| PBB | polybrominated biphenyl |
| PIs | project instructions |
| ppm | parts per million |
| QA | quality assurance |
| QC | quality control |
| RA | remedial action |
| RAO | remedial action objective |
| RFI | request for information |
| RG | remediation goal |
| ROD | Record of Decision |
| SESC | Soil Erosion and Sedimentation Control |
| SM | site manager |
| SOV | schedule of values |
| TAL | target analyte list |
| TCL | target compound list |
| TCLP | toxicity characteristics leaching procedure |
| TRIS | tris(2,3-dibromopropyl) phosphate |
| WAM | work assignment manager |
| USEPA | U.S. Environmental Protection Agency |

# Glossary

**Construction quality assurance plan (CQAP)—**Establishes the guidelines and requirements to be used for project delivery to meet client objectives and achieve the standards. The primary objective of the CQAP is to document requirements, procedures, and methodology for quality assurance and quality control during construction of this project.

**Quality assurance (QA)—**Refers to the overall quality process. It is the assurance that the construction effort is conducted in a manner consistent with the design and meets the requirements of the project objectives.

**Quality control (QC)—**Refers to a planned system for monitoring, controlling, and documenting the quality of materials, supplies, and workmanship in a manner consistent with the execution plan and the drawings and specifications. Monitoring, controlling, and documenting are the active tasks associated with quality management. This document does not specifically address QC requirements.

**Project instructions (PIs)—**Provide management instructions for construction operations, documentation, and reporting for work to be performed. The instructions provide guidance to the project team and clarify the site manager's expectations regarding personnel assignments (including level of effort, responsibilities, accountability, project goals, direction, processes, and procedures through the construction phase of the project. The project instructions define parameters for the implementation of the CQAP.

**Construction quality submittals—**Refers to submittals generated during or immediately prior to construction to demonstrate compliance with the project plans, drawings, and specifications. Construction quality submittals include daily reports, shop drawings, schedules, sample documentation, calibration records, photographs, product data, samples, field change request documentation, administrative and closeout submittals, and additional technical support data presented for review and approval.

SECTION 1

# Introduction

The purpose of the construction quality assurance plan (CQAP) is to provide the quality processes and procedures for work conducted at Operable Unit (OU) 1 of the Velsicol Chemical Corporation Superfund Site, St. Louis, Michigan. This CQAP specifically addresses construction activities aimed at the removal of impacted soil within 60 residential/commercial properties in the adjacent or nearby properties (ANP) in OU1 in accordance with Work Assignment No. 146-RDRD-0532 under Contract No. EP-S5-06-01, as directed by the U.S. Environmental Protection Agency (USEPA). The CQAP includes processes and procedures for the following activities:

- Observing construction activities
- Sampling and testing protocol
- Documenting that construction has been completed in general accordance with the plans and specifications and with quality assurance (QA) procedures outlined in this plan

## 1.1 Site Description

The Velsicol Chemical Corporation/Pine River Superfund Site (National Superfund Database ID No. MID00722439) is located in St. Louis, Michigan, and occupies a 52-acre land parcel commonly referred to as the Former Plant Site (FPS) in addition to the ANP. The ANP is an approximately 11-block residential area with a few commercial properties located south of the FPS. A chemical plant once occupied the FPS, which is located in a predominantly residential area. The Pine River flows along the western and northern boundary of the FPS into Pine River Mill Pond, where the St. Louis hydroelectric dam is located (about 0.25 mile east of the FPS). Three nearby properties are also part of the former Velsicol operations and are referred to as the Former Creamery Warehouse, Velsicol property 1, and the Former Burn Area (FBA). The FBA was proposed for the National Priorities List in the early 1980s, but was not placed on the list at that time. The FBA has recently been re-evaluated, and was placed on the National Priorities List in March 2010. Figure 1 shows the location of the FPS and the surrounding area. USEPA is the lead agency for the site.

The Velsicol Site is composed of three OUs: OU1 includes the FPS and ANP, OU2 includes the sediments and fish in the Pine River adjacent to the FPS and immediately downstream of the FPS (above the hydroelectric dam), and OU3 includes the Pine River downstream of the hydroelectric dam.

The boundary of the 52-acre FPS is fenced, and access is controlled through a main gate that remains locked at all times. The City of St. Louis distributes drinking water to the community through the operation of six drinking water wells.

## 1.2 Site History

The FPS was used for modern industrial operations beginning in the mid-1930s until the plant was closed in 1977. Historical operations at the site included a lumber mill, oil refinery, salt processing plant, and chemical manufacturing plant. In 1935, Michigan Chemical Corporation purchased the property and operated a chemical manufacturing business. In 1965, Velsicol Chemical Corporation gained a controlling interest in Michigan Chemical Corporation.

Michigan Chemical Corporation manufactured a wide variety of products at the FPS from 1936 through 1977, including various salts, magnesium oxide, rare earth chemicals, fire retardants hexabromobenzene, polybrominated biphenyl (PBB), tris (2,3-dibromopropyl) phosphate (TRIS), and pesticides dichlorodiphenyl trichloroethane (DDT) and 1,2-dibromo-3-chloropropane.

The FPS included numerous buildings that housed manufacturing, maintenance operations, administrative functions, and laboratories for product research and development. Storage facilities for raw and finished products, including warehouses and storage tanks constructed above and below ground, were also integrated throughout the FPS. Historical documents identify several lagoons that are either known or presumed to be associated with waste disposal practices.

After the plant closed in 1977, demolition and decommissioning activities began in 1978. The aboveground site buildings were razed, and some structures were buried onsite, including storage tanks and process piping. Building and tank foundations were not removed and a significant amount of debris remains buried at the site.

In November 2006, the Michigan Department of Environmental Quality (MDEQ)[1] completed the first three phases of the remedial investigation at the FPS and FBA, including a baseline risk assessment (Weston Solutions, Inc. 2006). A determination was made by MDEQ that additional site characterization was needed to fill key data gaps. From 2006 through 2008, MDEQ performed supplemental investigations at the FPS, FBA, and ANP. Supplemental findings were summarized in the January 2009 *Remedial Investigation Addendum Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan* (Weston Solutions, Inc. 2009).

The feasibility study (FS) was released in November 2011 (Weston Solutions, Inc. 2011). On February 7, 2012, USEPA released the proposed plan for the Velsicol Chemical Corporation/Pine River Superfund Site for public comment (USEPA 2012a). On June 19, 2012, USEPA issued the Record of Decision (ROD) for OU1 (USEPA 2012b). The ROD stated that existing contamination in soils in the ANP presents unacceptable risk to both human and ecological receptors.

## 1.3 Project Goals and Objectives

Phase 1 of the ANP remedial action (RA) was completed in spring 2013 and included remediation of soil within 14 fenced areas on 11 properties in the ANP. Phase 2 of the ANP RA, described in the preliminary basis of design report ([BODR]; [USEPA 2014), will include remediation of portions of 60 properties identified during predesign sampling. Additional properties are currently being identified for remediation, which will be performed in future phases.

The major components of the selected remedy applicable to Phase 2 of OU1, as presented in the ROD, include the following:

- Excavation and offsite disposal of soils exceeding remediation goals (RGs) in the ANP to address risk to human health and the environment.
- Excavated properties will be backfilled with clean earth backfill and topsoil, and restored.

Remedial action objectives (RAOs) are goals that are specific to media or operable units for protecting human health and the environment. The remedial investigation data indicate that soils at the ANP contain contaminants of concern (COCs). The RAOs developed during the FS for the ANP include the following:

- Prevent ingestion, inhalation, and direct contact of site-related COCs in soil to human and ecological receptors.
- Prevent mobilization of site-related COCs from unsaturated soils to groundwater or surface water.

The selected remedy in the June 22, 2012, ROD includes excavation of residential soils in ANP exceeding a concentration of 5 parts per million (ppm) for total DDT, 1.2 ppm for PBB, and 4.4 ppm for TRIS. The total DDT RG of 5 ppm is based on ecological risk to avian receptors, and the PBB and TRIS criteria of 1.2 and 4.4 ppm, respectively, are based on MDEQ Part 201 residential direct-contact cleanup standards. Additional details regarding the development of the RAOs and RGs are presented in the FS (Weston Solutions, Inc. 2011).

The Field Environmental Decision Support (FIELDS) Team within USEPA Region 5 calculated a decision level for total DDT of 4.1 ppm. The decision level calculation was performed to provide a level of assurance that all properties exceeding the 5-ppm cleanup level for total DDT were included in the cleanup action. An explanation of the total DDT decision level calculation is included in Appendix B of the BODR (USEPA 2014). A decision level was not calculated for PBB due, in part, to the large number of nondetects in the data set. DDT is the primary COC in the ANP. The PBB detections, when present, are collocated with DDT.

[1] Throughout the history of the site, the lead state agency or name of the agency has evolved and names variably have included Michigan Department of Natural Resources, Michigan Department of Environmental Quality, Michigan Department of Natural Resources and Environment, and the most recent name is Michigan Department of Environmental Quality. For purposes of this document, the term "MDEQ" will be used to represent the appropriate state agency at the relevant time period being discussed.

The design is based on cleanup of yard areas exceeding the 4.1-ppm decision level for total DDT or the PBB RG of 1.2 ppm. At all yard areas where an exceedance of the PBB RG is observed, there is also an exceedance of the total DDT decision level. TRIS was included in the ROD based on one small exceedance in the Resident Inspector's data. USEPA has decided not to use TRIS as the basis for cleanup in the ANP due primarily to the low frequency of exceedance of the cleanup value in the ANP. USEPA believes that excavation of soils exceeding the total DDT and PBB RGs will achieve the RAOs for ANP residential soils as contained in the ROD.

SECTION 2

# Responsibilities and Authority

Responsibilities and authority are described in the following subsections.

## 2.1 Responsibilities

An organizational chart presenting the various stakeholders and their roles and responsibilities is shown in Figure 2.

### 2.1.1 USEPA—Superfund

USEPA is responsible for the overall execution of the project. USEPA will retain independent design, QA, and construction organizations to accomplish the work, and will have the authority to hire and fire these organizations. USEPA has the authority to accept or reject QA plans, reports, and recommendations of USEPA's contractor, and the materials and workmanship of subcontractors. Thomas Alcamo is the USEPA WAM for the RA.

### 2.1.2 USEPA Contractor

CH2M HILL was contracted by USEPA to manage the tasks required to complete the work assignment and to oversee the activities of the subcontractors assisting with those tasks. The organizational structure for USEPA's contractor project staff is also shown in Figure 2.

#### 2.1.2.1 CH2M HILL Program Manager

Paul Arps, CH2M HILL's program manager, has overall responsibility for meeting USEPA's objectives and CH2M HILL's quality standards as well as technical QC and project oversight.

#### 2.1.2.2 Site Manager

The primary responsibility of the site manager (SM), Theo Von Wallmenich, is to manage the overall direction of the project. The SM is also responsible for implementation of the CQAP. The project team members will be provided with a clear description of their project roles and responsibilities and an outline of expectations for execution of communication and reporting to meet contract and project requirements. The global quality-related responsibilities of the SM may include, but are not limited to, the following:

- Organizing the project staff and assigning responsibilities.
- Understanding the requirements of the contract and scope of work for the project.
- Checking that submittals are completed and submitted, as required in the contract.
- Communicating client requirements and quality practices to the project staff.
- Identifying, documenting, and providing notification to the client and project team about changes in the scope of work, design/engineering specifications and drawings, project documentation, and activities.
- Supervising the preparation and approval of project-specific procedures, project plans, and design/engineering specifications and drawings.
- Serving as liaison for communications with the client and subcontractors.
- Serving as liaison for communications between the project staff and other internal groups.
- Serving as final reviewer prior to release of project information.
- Approving and signing outgoing correspondence.

The SM may assign some of the responsibilities to other team members who will remain onsite throughout project field activities. Note that the SM role is analogous to the project manager role on other projects.

#### 2.1.2.3 Regional/Project Quality Manager

The regional/project quality manager (Theresa Rojas) is responsible for verifying the implementation of the quality program within the region or program. The responsibility includes verification of the effectiveness of the program and project QA. The project quality manager will also conduct periodic review of activities under the guidance of this CQAP, performing periodic surveys and audits of the processes being implemented, evaluation of any recommendations made by the project team over the course of the project regarding use of the processes, and implementing continuous improvement evaluations of the quality program.

#### 2.1.2.4 Health and Safety Manager

The site health and safety manager (HSM; Steve Chumney) for the project is responsible for review and edit of the health and safety plan (HASP) to be included in the contract documents. The SM will coordinate involvement during design to check that compliance is achievable. The health and safety manager will conduct health and safety audits during the project to check that the HASP is supported by the project team.

#### 2.1.2.5 Subcontract Administrator

The subcontract administrator (Steve Eversdyk) will assist the team with subcontractual arrangements. The subcontract administrator is responsible for checking that the procurement is conducted in accordance with CH2M HILL protocol for subcontracting. The subcontract administrator will assist in evaluating payment applications from subcontractor(s) and vendors for processing. The subcontract administrator will also be involved with change order administration and management of subcontractors and vendor subcontracts and issuance of formal changes. In addition, the subcontract administrator will check that the potential subcontractor and vendor proposals contain appropriate rates and have adequate documentation.

#### 2.1.2.6 Resident Inspector

CH2M HILL's Resident Inspector (James Eluskie) is responsible for management of subcontractors performing remedial construction activities on Phase 2 ANP residential properties. The Resident Inspector performs field observation duties and directs the field technical staff. He or she operates as a liaison and is in direct communication with the subcontractors and the CH2M HILL design team. Specific responsibilities of the Resident Inspector include the following:

- Review subcontractor schedules.
- Prepare and conduct orientation sessions for project personnel.
- Review subcontract modifications and forward modifications to the SM for approval.
- Provide cost monitoring and tracking, including tracking of subcontract costs.
- Review subcontractor's payment requests and forward the requests to the SM for approval.
- Interpret the technical content of the drawings and specifications with respect to deviations from them or to request for clarifications.
- Enforces the requirements in the implementation of work according to the subcontract documents, approved subcontractor plans, design drawings, specifications, submittals, etc.
- Leads and engages project team members to comply with all project requirements, including client requirements, CH2M HILL program protocols, subcontract requirements, or external (that is, federal, state, regulatory, local) requirements
- Manages the delivery of subcontractor services including quality of workmanship, safety, schedule, and work sequencing; obtains CQM and HSM concurrence to verify compliance with QC and health and safety–related requirements
- Verifies that equipment and materials delivered to the FPS are in accordance with approved work plans and submittals; inspects all delivered equipment and verify that materials have no defects in workmanship

- Maintains proper/adequate/timely communications with the property owner(s)
- Confirms utility clearance (third party) is completed prior to performance of intrusive work
- Confirms access agreements are in place, that they are applicable to the work being performed, that surveyed property line boundaries are marked in the field, and that a copy of each access agreement is available to the field team
- Monitors the construction and condition of the access roads in accordance with plans and specifications
- Checks schedule of values (SOV)/accruals are properly documented, reviewed, approved, and submitted to the SM for review
- Checks that proper haul routes are in accordance with the City of St. Louis approval and traffic signs are installed and that roads are maintained and can accommodate construction traffic. Confirm that we have Michigan Department of Transportation permits in place for work conducted at properties bordering M-46
- Monitors delivery, handling, and storage of materials per the specifications
- Verifies site storage facilities are protective of equipment and materials and secure to prevent damage/vandalism to equipment and materials per specifications
- Reviews manufacturer material certifications
- Communicates with HSM to check that subcontractors and project team members have the required qualifications, training licenses, and certifications; verifies site personnel have received orientation to site requirements
- Checks that QC testing (that is, compaction testing) is performed in accordance with the specifications, drawings, and project plans
- Prepares a daily report using the daily report template and submits in timely manner for archiving; daily report will include accurate and complete information to be able to document what happened that day at the site
- Reviews subcontractor's daily reports for accuracy and completeness; check that the final accepted version is archived
- Checks that all subcontractor submittals are submitted to CH2M HILL on time in conjunction with the CQM and HSM
- Prepares project documentation that supports verification completion of project objectives, including field logbooks, construction daily and QC reports, photo documentation, inspections, etc.
- Coordinates the three phases of control for each definable feature of work (DFOW) for each subcontractor; no DFOW will be performed without conducting a preparatory meeting at least 2 workdays prior to starting the DFOW; all required items and form completion will be in place by the subcontractor prior to the meeting
- Check that Soil Erosion and Sedimentation Control (SESC) plan inspections are completed weekly and that inspection reports are completed
- Reviews design on a periodic basis for constructability in conjunction with the SM and design engineer
- Reviews request for proposal documents prior to Issue for Bid or during outstanding procurement activity
- Arranges and leads internal preconstruction and weekly meetings
- Conducts change management of subcontractors; check that team members whose roles and responsibilities (QC, health and safety, sampling, surveying, engineering or management, etc.) are engaged in the change—includes request for information (RFI) development/review/acceptance, purchase order modifications, engineer's estimates, field change notices

- Checks that the sample grid list information (that is, start of excavation, end of excavation, start of survey, completion of survey for each applicable confirmation grid) is updated weekly at a minimum

Multiple field technical staff will be employed during the execution of this project due to the planned soil excavation operation schedule, which will generally be limited to 7:00 a.m. to 6:00 p.m. from Monday through Friday for an estimated 5-month period.

#### 2.1.2.7 Construction Quality Manager

CH2M HILL's construction quality manager (CQM; Elizabeth Markham) is responsible for implementing and managing the site-specific QC requirements in accordance with the CQAP. The CQM will review the CQAP to gain a thorough understanding of construction and remediation methods, as well as a clear understanding of the project inspection and documentation requirements. The CQM is responsible for conducting submittal reviews, oversight, and coordination of all testing activities, certifying the appropriate aspects of QC activities, and attending and preparing minutes for the weekly status meetings and the coordination meeting. The CQM will be responsible for the quality of work on the job and verify compliance with quality requirements specified in the CQAP. The CQM will also coordinate with and assist the regional quality manager in the performance of quality audits and inspections.

The CQM has the authority to stop work on all or any project work activity due to nonconformance with the CQAP, project plans, specifications, and drawings. Onsite personnel will be encouraged to discuss concerns with the CQM and supporting technical personnel. In the event the CQM is informed of and/or detects an incident of project nonconformance, the Resident Inspector will perform an initial investigation, evaluate the course of corrective action required, document the incident, and report the incident to the SM.

The CQM's responsibilities include, but are not limited to, the following:

- Performs field verification, inspections, and observations at least once per week per property with the Resident Inspector to confirm that work is being conducted in accordance with the statement of work, plans, and specifications; provides Resident Inspector with findings for Resident Inspector follow-up and checks that the findings are addressed in a timely manner, including rework items.
- Leads and coordinates reviews of preconstruction, construction, and post-construction submittals on the project and maintain the project submittal register from each subcontract; evaluates submittals for acceptance on the project or facilitate submittal reviews by the Design Engineer or other team members. A copy of the submittal register template is provided in Appendix A.
- Leads review of project documents for accuracy, completeness, and correctness.
- Verifies with Resident Inspector that 3POC for each DFOW are followed by each subcontractor.
- Leads monthly QC meetings with all subcontractors and disseminates meeting minutes/action items.
- Checks that all QC-related items associated with operational readiness review meetings have been addressed prior to starting field activities.
- Assists with chartering new personnel in QC requirements.
- Performs QC of project tracking logs on a regular basis and follow-up with the author for any identified deficiencies to verify completion—examples include the following: daily reports, RFIs, and submittals.
- Submittal Register, sampling and testing tracking, logbooks, survey data tracking, photographs, field orders, and SOV quantities, change orders, etc.; but may delegate document review(s) or preparation to other project team members.
- Assists in completing project QC and environmental audits of the task order.
- Performs at least monthly reviews of red-lined drawings being maintained by subcontractors and supporting field notes.

- Verifies the accuracy and completeness of as-built records. Coordinates final review/acceptance of as-built records by the Design Engineer.
- Checks that project documentation supports verification and validation of completion of project objectives (for instance, excavation extent, quantities, etc.).
- Determines and initiates corrective action/preventive action when the project has been deficient in adherence to company processes/policies.
- Assists in preparation and review of final reporting documentation.
- Coordinates preparation of maps as required by project team and client.
- Checks that nonconforming items are corrected or addressed through the subcontractor, or via nonconformance or deficiency reports, if necessary.
- Performs surveillance of project activities as necessary to check the quality of service, product, and workmanship meets the requirements of the project.
- Provides support to SM, Resident Inspector, HSM, and other team members (as relates to progress maps, quantity-related documents, etc.).
- The CQM will also coordinate with and assist the SM and/or the USEPA representative in the performance of quality audits and inspections.

#### 2.1.2.8 Document Manager

The responsibilities of the document manager include the following:

- Implementing the document control processes.
- Implementing the document management processes.
- Archiving documents and records.

### 2.1.3 Subcontractors

Construction subcontractors will be selected by CH2M HILL to provide services during construction. Each subcontractor will work under the oversight of the Resident Inspector. The subcontractors are responsible to perform work in accordance with the design plans and specifications, meeting the acceptance requirements detailed in the design. The subcontractor will be responsible for construction QC CQC requirements, as appropriate.

The subcontractors are responsible for certifying that the products supplied conform to the plans and specifications. The individual subcontractors are collectively referred to as subcontractors within this CQAP.

The following type of subcontractors will be utilized to accomplish the work:

- Earthwork subcontractor
- Analytical laboratory services

### 2.1.4 Vendors, Independent Test Companies, and Third-tier Subcontractors

Vendors, independent test companies, and third-tier subcontractors are agents of the respective subcontractor by way of subcontracts, sub-subcontracts, or similar arrangements. As such, they are responsible, through the subcontractor, for maintaining QC procedures in accordance with their contractual arrangements and the subcontractor's QC plans. The agents should also provide the subcontractor with QC data and reports necessary for the agent's submittals to the SM. The following third-tier subcontractors may be used for this project:

- Borrow source provider of topsoil and general backfill (trucking)
- Utility locating service(s)
- Surveying services
- Arborist (Stump and Tree removal)

- Landscaping services (plant/tree replacement, sod replacement and lawn watering)
- Transportation and disposal services

SECTION 3

# Quality Control and Testing Requirements

Section 3 defines the reporting and documentation requirements associated with the QA procedures. The quality of materials and workmanship will be controlled by the subcontractor who furnishes the work or material involved. However, the CQM has the ultimate responsibility for subcontractor quality control.

## 3.1 Construction Quality Management

An inspection system referred to as the Three Phases of Control (3POC) will be implemented as a subcontractor construction quality management process. The 3POC is a three-step inspection process that includes the Preparatory Phase, Initial Phase, and Follow-up Phase inspections. The process is designed to discuss the project requirements prior to initiating any construction work activities, assess the quality of work early in the execution of work, and monitor the work throughout the delivery until completion. The 3POC process is intended to enhance management of construction quality and formalize documentation of the quality administrators for each DFOW for the project. A DFOW is a task that is separate and distinct from other tasks and has separate control requirements. The 3POC process will be implemented for each DFOW. The following are the DFOWs for this RA:

- Utility Locating (DFOW 1)
- Mobilization and Setup (DFOW 2)
  - Deliver equipment and construct facilities
  - Preconstruction Property Visit
- Property Remediation (DFOW 3)
  - SESC Implementation
  - Clearing, Grubbing and Tree Removal
  - Soil excavation
  - Backfilling
- Surveying – Post-excavation and Post-backfill (DFOW 4)
- Sampling/Testing (DFOW5)
  - Air monitoring
  - Borrow source sampling and testing
  - Waste characterization
  - Soil compaction testing
- Waste Management (DFOW6)
  - Stockpiling
  - Transportation
  - Disposal
- Site Restoration (DFOW7)
  - Landscaping (tree/plant replacement)
  - Sod installation
  - Watering
- Demobilization (DFOW8)

The respective inspection phases are discussed in the following subsections. The inspections associated with the DFOWs are provided in Table 1.

### 3.1.1 Preparatory Phase

The Preparatory Phase is the step in delivering the project that essentially culminates the planning and design process leading up to actual fieldwork of a specific residential property. It also serves to assure that the project delivery, QC, and safety plans have been completed and are ready to be implemented. The following events take place during the Preparatory Phase for each DFOW established by the Resident Inspector:

1. Confirm that the appropriate technical specifications are incorporated into the project work plans, construction drawings and review specifications with the Resident Inspector and other field team members.
2. Confirm that the appropriate contract drawings are incorporated into the project work plan and review drawings with the Resident Inspector and other field team members.
3. Verify with the CQM that all shop drawings and preconstruction submittals (materials, health and safety, project plans) have been approved by the proper approving authority (including factory test results, when required).
4. Confirm with the Resident Inspector and CQM that the testing plan coincides with the project plans and that adequate testing is called for to assure quality delivery.
5. Confirm definition of preliminary work required at the work site and examine the work area with the Resident Inspector.
6. Resident Inspector to confirm required preliminary work has been properly completed.
7. Confirm availability of required materials and equipment. Confirm with CQM and Resident Inspector that materials and equipment inspected and CQM to confirm compliance with approved submittals.
8. Confirm with the HSM that the site HASP and activity hazard analyses have been reviewed and approved to verify that safety concerns are adequately addressed and applicable safety requirements have been incorporated into the plan. Confirm that the appropriate safety data sheets have been identified and properly submitted.

Discuss with the Resident Inspector the construction methods to be employed during the RA. Confirm that all field team members are aware of the identified checkpoints and areas of evaluation that will allow determination that the appropriate quality of construction is being achieved.

### 3.1.2 Initial Phase

The Initial Phase occurs at the startup of remedial activities, or construction, associated with a specific DFOW. Essentially, the Initial Phase confirms that the CQAP is being effectively implemented and the desired results are being achieved. With the Initial Phase, notification of the CQM that the crews are ready to start a particular DFOW is required prior to their actual start.

Specific details associated with the Initial Phase are as follows:

1. Establish the quality of workmanship required to properly deliver the DFOW in accordance with project requirements. The CQM assures that the Resident Inspector has made the subcontractor aware of expectations associated with the construction methods established under the Preparatory Phase. This assurance is to be achieved through observation of the initial work activities, as well as through interaction with the Resident Inspector.
2. Resolve conflicts. The CQM will provide support to the Resident Inspector in resolving conflicts involving quality issues. Should conflicts arise in establishing the baseline quality for the DFOW, the responsibility to resolve the conflict falls to the CQM. Should the conflict not be resolved in a manner that satisfies the contract requirements, the CQM will elevate the conflict to the SM. Should the issue jeopardize the results of the DFOW, or put the project at risk of non-compliant performance, the SM or CQM may direct a cessation of work activity.
3. Evaluate the site HASP and AHAs against actual work conditions with the Resident Inspector to assure that the hazard analysis conducted to prepare the safety plan adequately addressed field conditions. Confirm applicable safety requirements are being implemented during construction activities.

4. Observe and evaluate the performance of testing technicians. Confirm with the CQM that testing is being performed in accordance with the testing plan and that required protocols are being observed. Review reports and documentation associated with extraction, packaging, transporting, and testing of samples. Note discrepancies and direct correction accordingly.

Upon completion of the Initial Phase activities, results are to be documented in the daily report.

### 3.1.3 Follow-up Phase

Completion of the Initial Phase of QC activity leads directly into the Follow-up Phase, which addresses the routine day-to-day activities on the project site. Inspection activities associated with each DFOW are to be addressed within the daily report. Specific concerns associated with the Follow-up Phase include the following:

1. Inspection of the work activity to assure work is in compliance with the contracted project tasks.
2. Evaluation and confirmation that the quality of workmanship is being maintained at a level no less than that established during the Initial Phase.
3. Evaluation and confirmation that required testing and surveying are being performed in accordance with procedures established during the Preparatory Phase and confirmed during the Initial Phase.

Confirmation that non-conforming work is being corrected promptly (within 24-hours) and in accordance with the direction provided by the Resident Inspector.

SECTION 4

# Project Communications and Meetings

Section 4 discusses project communications and meetings.

## 4.1 Lines of Communication

Accurate and timely communication is required to avoid construction-related conflicts and potential errors and omissions. USEPA, CH2M HILL, subcontractors, and their respective employees and staff will have an established communication network, as shown in Figure 2. Establishing open lines of communication is essential for maintaining strong working relationships and producing quality work.

Project-specific personnel and lines of communication will be discussed and established by all parties at the preconstruction meeting. The discussion will include the following topics:

- Communication procedures between supervisory and field staff.
- Direct communication procedures between key parties for specific issues and situations.
- Procedures and restrictions for secondary lines of communication within the project organization.
- Procedures for information transfer and confirmation between the various parties.
- Procedures for documentation of all communications.
- Format for meetings, reports, submittals, etc.

Communication will be documented with each party receiving a copy of such documentation (for example, telephone memorandums, meeting notes). Copies will be routed to other parties that should be informed of the situation (for example, problem, change, or agreement).

Document control procedures will be established for items such as subcontractor submittals, test results, and plan or specification revisions. The controls will include distribution and confirmation procedures to verify that documents are appropriately dispatched and incorporated into the project. Whenever possible, documents indicating revisions in plans, specifications, or procedures will be distributed immediately and explained to all parties at routine or special project meetings.

## 4.2 Project Meetings

Project meetings will be scheduled to promote communication between various personnel responsible for designing, constructing, managing, and observing the construction. The purpose of the routine project meetings is to keep all project staff members informed and to provide a forum for solving design, construction, and QA issues.

### 4.2.1 Prebid Meeting

A prebid meeting will be held before the bid submittal date to provide a forum for prequalified bidders to discuss the subcontract documents. At a minimum, the SM, Resident Inspector, and the USEPA representative should be present to meet with interested bidders. Any specific questions that are brought up will be answered in the form of an addendum to the subcontract documents.

### 4.2.2 Subcontractor HSSE Chartering Meeting

Prior to mobilization, all subcontractors and lower tier subcontractors that will be physically mobilizing to the FPS are required to attend a Health, Safety, Security and Environment (HSSE) chartering meeting with key CH2M HILL representatives (SM, HSM, CQM, and Resident Inspector). The purpose of the meeting is to discuss and agree on key HSSE requirements on the project and to emphasize and reinforce CH2M HILL's expectations for HSSE performance. The meeting may be held over the phone or in person, depending on project needs.

### 4.2.3 Preconstruction Meeting

A preconstruction meeting will be held to identify project personnel, review the project, and schedule, clarify, or resolve outstanding issues before construction startup. At a minimum, USEPA, CH2M HILL's SM, CQM and Resident Inspector,

the subcontractors, and selected sub-subcontractors should be present. The SM, CQM and Resident Inspector will be prepared to discuss the following subjects, at a minimum:

- Required schedules
- Status of bonds and insurance
- Sequencing of critical path work items
- Progress payment procedures
- Project changes and clarification procedures
- Use of site, access, office and storage areas, security, and temporary facilities
- Subcontractor's HASP and representative
- Status of permits, license, or required approvals
- Status of submittals
- Maintenance of required records
- Activity hazard analysis
- Subcontractor's key personnel information and points of contact
- Subcontractor's QA/QC plan

The following will be performed by the Resident Inspector and CQM during the preconstruction meeting:

- Provide each party with relevant construction and QA documents and supporting information. Supporting information may include construction drawings, specifications, and other applicable documents. The information transfer is not limited to documents distributed by the Resident Inspector and CQM. All parties should use the opportunity to distribute relevant documents.
- Familiarize each party with his or her specific responsibilities relative to the design criteria, construction drawings, schedules, and specifications.
- Discuss the purpose of the CQAP and the documentation structure provided by the CQAP to verify that the project will be executed efficiently and in compliance with the specified design criteria and schedule.
- Review the responsibilities of each party.
- Review lines of authority and communication for each party.
- Discuss the established procedures and protocol for observations and tests, including sampling strategies.
- Discuss the established procedures and protocol for handling construction deficiencies, repairs, and retesting.
- Discuss the established procedures and protocol for handling contract modifications such as change orders and field orders.
- Review methods for documenting and reporting inspections and test data.
- Review work area security and safety protocols.
- Discuss procedures for locating and protecting construction materials and preventing damage to the materials from inclement weather or other events.
- Conduct a site walk to review construction material and equipment storage locations.
- Discuss payment for work in-place, including method of payment and unit cost work.

The preconstruction meeting will be documented by the CQM and minutes will be provided to all parties.

### 4.2.4 Coordination Meeting/Preconstruction Client Meeting

Prior to the start of site work, the project team will meet with USEPA and stakeholders to develop a mutual understanding of the project details, including health and safety issues, communication procedures, evacuation/emergency procedures, scheduling work, security procedures, submittal reviewer/approvers, inspectors/approvers of major milestones of work performed, permits required, forms to be used, administration of

onsite and offsite work, signature authorities for changes and waste documentation, schedule, and method for transmitting submittals. Minutes of the meeting will be prepared by the SM and signed by CH2M HILL's representative, USEPA's designated representative(s), and the stakeholders (MDEQ, fire marshal, representatives of local police, utilities, and health services, etc.). Meeting minutes will be distributed to the parties involved in the meeting and placed in the project files. The meeting may be held in conjunction with other meetings (for example, the preconstruction meeting).

### 4.2.5 Project Status Meetings

After the start of site work and throughout project execution, the project team will conduct project status meetings (sometimes referred to as quality meetings) at least weekly. USEPA's representative(s) and stakeholders may attend any of the meetings. At a minimum, the following will be accomplished at each meeting:

1. Review the minutes of the previous meeting
2. Review the schedule
    a. Work or testing accomplished since last meeting
    b. Rework items identified since last meeting
    c. Rework items completed since last meeting
    d. Schedule delays and long lead time items
    e. Critical milestones
3. Review the status of submittals
    a. Submittals reviewed and approved since last meeting
    b. Request for information resolutions
    c. Submittals required in the near future
4. Review the work to be accomplished in the next 2 weeks and documentation required
    a. Completion dates for rework items
    b. Inspections required
    c. Testing required
    d. Status of offsite work or testing
    e. Documentation required
5. Discuss health and safety issues, such as near misses, incidents
6. Resolve quality issues such as nonconformance, rework, or corrective actions
7. Resolve production problems
8. Address items that may require revising the CQAP or other project plans
    a. Changes in procedures
    b. Changes in design/engineering drawings and/or specifications
    c. Changes or claims for additional compensation or time

Meetings will be recorded in project status meeting minutes, prepared by the CQM. The meetings may be held in conjunction with other meetings (such as tailgate safety meetings, progress meetings, planning meetings, etc.). Meeting minutes will be sent to all personnel attending the meeting.

### 4.2.6 Problem or Work Deficiency Meetings

A special meeting may be held if a problem or deficiency is present or likely to occur. The meeting should at least be attended by CH2M HILL's Resident Inspector and/or CQM, the subcontractor, and sub-subcontractors involved in the problem or deficiency. The purpose of the meeting is to define and resolve a problem or recurring work deficiency in the following manner:

- Define and discuss the problem or deficiency
- Review alternative solutions

- Implement a plan to resolve the problem or deficiency

The meetings will be documented by the Resident Inspector, CQM, or a designated representative. Copies of the meeting minutes will be sent to all personnel attending the meeting, the SM, and USEPA, if not present.

SECTION 5

# Document Control and Management

Section 5 discusses document control and management.

## 5.1 General

The document manager for the project is responsible for implementing the procedures described in this section. A document control and management process will be implemented so that current and correct documents are available where the work is performed and that project records are archived after the work has been completed. Obsolete copies will be appropriately marked and/or removed from the work site and destroyed. The document manager is also responsible for providing backup of field files to the central project files as required by these procedures. Hard copies of the specifications, property drawings, HASP, and signed activity hazard analyses will be kept on file at the CH2M HILL FPS trailer. Hard copies will include change order or RFI resolution attachments.

The document manager will be responsible to check that project personnel, subcontractors, lower-tier subcontractors, and customers use the correct version of project documents. In general, the document manager must receive all documents transmitted, either directly or copied in communications from other project team members. The document manager will save electronic documents in the respective subfolders at the following location: \\HERCULES\Proj\Velsicol_OU1\Residential Excavation\Phase 2\Phase 2 RA Documentation.

## 5.2 Document Transmittals

Document transmittals between the project parties provide a record of communications that is necessary to keep appropriate construction and QA personnel informed of project requirements, progress, changes, and quality of the work. Transmittals should be formally communicated with proper documentation and confirmation of submittal and receipt to prevent misunderstandings and omissions.

### 5.2.1 Subcontract Clarification/Interpretation Requests

Subcontract clarification/interpretation requests and requests for information (Appendix C, Form C.1 [270]) are submitted when an explanation of the intent of specific project requirements, as presented in the subcontract documents, is required, which are generally submitted by the subcontractor to the document manager; however, the Resident Inspector can submit clarification/interpretation requests to the subcontractor and should include the document manager on communications.

Subcontract clarification/interpretation requests shall be managed by the document manager. Interpretations of design or specifications by the design team will be issued in writing. In special cases, a design engineer may communicate a design interpretation or clarification verbally, followed by written confirmation. Responses to subcontract clarification/interpretation requests will be obtained in a timely manner to limit the impact on the project schedule. The SM is responsible for informing all parties of the design team's interpretations by distribution of documents to construction and QA personnel through the document manager, or by copying the document manager on communications, at a minimum.

### 5.2.2 Subcontract Modification Requests

A subcontract modification request is made if a change to the subcontract documents is deemed necessary for the following reasons:

- Changed site conditions
- Changed materials conditions
- Alternative design procedures proposed
- Alternative materials proposed

Subcontract modification requests (Appendix C, Form C.2 [273]) are generally prepared in response to a subcontract clarification/interpretation request submitted by the subcontractor or the document manager that has an effect on the subcontract scope, schedule, or budget. Subcontract modification requests should be submitted to the document manager for coordination with the appropriate groups. The appropriate groups will review, negotiate, and finalize all subcontract modification requests and forward modifications to the SM for approval. The Resident Inspector or CQM will prepare subcontract modifications (change orders) as necessary, including the document manager on communications for submittal to the contract administrator. Responses to subcontract modification requests will be obtained in a timely manner to limit the impact on the construction schedule. The Resident Inspector is responsible for transmitting all subcontract modifications to the appropriate organizations, before the change becomes part of the project record.

Likewise, the Resident Inspector or CQM may issue a field order (Appendix C, Form C.3 [275]) for clarification and interpretation of drawings in cases where a subcontract modification is not suitable, including the document manager on communications. For example, a field order may be issued in response to a subcontractor-initiated subcontract clarification/interpretation request when the clarification does not affect the design intent, schedule, or cost of the work.

## 5.2.3 Subcontractor Submittals

### 5.2.3.1 Technical Submittals

The subcontract documents require that the subcontractor (earthwork subcontractor, third-party utility locate services subcontractor, and analytical laboratory services) submit various technical submittals. The submittals are outlined by their respective phase of work and as presented in the Submittal Register (Appendix A). Documents shall be submitted (Appendix C, Form C.4 [295]) to the document manager according to the frequency and number specified in the subcontract documents. Lower-tiered subcontractor and vendor submittals shall be made through the subcontractor.

As submittals are received, the document manager will document their receipt on a submittal log. The document manager will assign the submittal to appropriate project team members for detailed review (Appendix C, Form C.5 [296]). Reviewers will check the submittal for general compliance with the contract documents and will note missing information or deviations (Appendix C, Form C.6 [299R]). The Resident Inspector and/or SM will oversee the review process and help resolve questions regarding compliance with subcontract documents.

Review comments on submittals will clearly state information the reviewer considers to be lacking. Notes must be written legibly with red ink on the front sheet of a submittal so that deficiencies can be clearly identified by the subcontractor. Notes will not be in the form of questions; rather, they must state what has been omitted or what is unacceptable.

Following the detailed review, the document manager will send a marked copy of the submittal and a submittal reply form to the subcontractor. The SM will indicate on the submittal reply form whether deviations from the subcontract documents were noted, and whether additional submittals or resubmittals by the subcontractor are required. Copies of the original submittal, review copies, and submittal log and reply forms will be kept in a project submittal file.

### 5.2.3.2 Field Testing, QC Submittals

Submittals are administrative and technical documents such as design drawings, shop drawings, work plans, permits, certifications, schedules, air monitoring data, reports, and other types of documents and any accompanying samples that are required for the work.

Construction QC submittals are those generated by the Resident Inspector, CQM or by the subcontractor prior to or during construction to demonstrate compliance with the project plans, specifications, and drawings. For materials and equipment procured directly by CH2M HILL, the Resident Inspector or CQM is responsible to check that the proper submittals are provided by the suppliers before accepting delivery. For materials and equipment supplied by the subcontractor, the Resident Inspector or CQM is responsible to check that the proper submittals are provided and approved prior to delivery or installation.

The subcontract documents require that the subcontractor submit a quality control plan, materials certifications, inspection and test data, etc., for review by the Resident Inspector, CQM and staff. Documents shall be submitted to the document manager, who will forward copies to the Resident Inspector, CQM and SM for conformance evaluation and incorporation into the records. Lower-tiered subcontractor vendor submittals will be made through the subcontractor. Test data and similar submittals will be submitted with a transmittal form (Appendix C, Form C.4 [295]) outlining the contents of the submittal and the date submitted.

## 5.2.4 Nonconformance Reports

### 5.2.4.1 Initiation of Reports

When materials, methods, or work elements are not in accordance with subcontract documents and immediate resolution (within 24 hours) cannot be achieved, a nonconformance report (Appendix C, Form C.7 [442]) will be prepared. Nonconformance reports initiated by the CQM will be submitted to the Resident Inspector, who will issue the nonconformance report to the subcontractor, copying the document manager, and will check that the subcontractor develops a corrective action plan.

The written nonconformance report shall be issued as soon as possible after nonconformance is detected. Each nonconformance report will be assigned a unique file number and recorded on a nonconformance report log (Appendix C, Form C.8 [444]). The log will allow the status of the nonconformance to be easily tracked.

The sole exception to this policy will be verbal notices made by the Resident Inspector or CQM to the subcontractor for procedures that can be, and are, corrected immediately upon notice. Verbal notices will be recorded in the daily reports with an explanation of corrective measures taken and the time required to bring the work into conformance.

## 5.2.5 Resolution of Nonconformance

No payment will be issued for nonconforming work until the associated nonconformance is resolved. Each nonconformance report will remain in effect until corrective actions have been taken that meet the intent of the subcontract documents and the satisfaction of onsite QA representatives. When corrective actions are acceptable, the Resident Inspector or CQM will document the corrective actions taken and results of retests, and will complete the acceptance portion of the nonconformance report. Likewise, the Resident Inspector or CQM will observe and document the corrective actions and acceptability of the results on field observation forms. Whenever possible, retests shall be performed by the same Resident Inspector or CQM who initially detected the nonconformance.

Full documentation is required for resolution of each nonconformance report. When a nonconformance is resolved, the following documentation procedures (Appendix C, Form C.9 [443]) will be followed:

- A copy of the observer’s explanation of corrective action and acceptance will be attached to the nonconformance report for review and filing.
- Daily reports, data summaries, etc., will be updated to reflect the resolved status of the original deficiency (for example, notes of corrective action in observation reports, resubmittals, and retest results). At a minimum, the nonconformance report file number, date, or test number that identifies the initial deficiency will be included.

The corrected nonconformance will be checked off the record book, initialed, and dated by the Resident Inspector or CQM, subcontractor, or designated representative.

SECTION 6

# Quality Level and Requirements

The quality of materials and workmanship will be controlled by the subcontractor or supplier who furnishes the work or material involved; however, the subcontractor has the ultimate responsibility for QC of its sub-subcontractors and vendors.

The Resident Inspector and/or CQM will observe QC testing of the construction materials, workmanship, and the subcontractor's QC activities. Specific QA requirements for observation and verification testing are detailed in the appendixes. Appendix C contains samples of forms that may be used or modified to document QA activities.

QC testing, sampling, and inspecting will be conducted by the subcontractor, the subcontractor's supplier, or subcontracted independent testing companies. The subcontractor will provide to the Resident Inspector or CQM, in a timely fashion or as specified, copies of QC inspection and testing reports if specified in the subcontract. The reports will include documentation of failed tests and corrective actions taken.

## 6.1 Observation and Verification Testing

The Resident Inspector, CQM, or other designated personnel will document observations in the 3POC daily report form (Appendix C, Form C.11) and will document verification tests in the appropriate testing forms. Documentation will be recorded in ink. To correct an error in an inspection report, a single line will be drawn through the error with the correct information entered next to the error. All corrections will be initialed and dated.

The field personnel will obtain, review, and become familiar with the applicable procedures, codes, standards, specifications, drawings, observation, and verification testing requirements, and accept or reject criteria.

Daily observation records and verification testing forms will contain at least the following:

- Item, condition, or activity observed or testing performed
- Location of observation or verification test
- Date of the observation or verification test
- Resident inspector's name and signature
- Type of observation or verification test
- Observation or verification test source criteria (for example, drawings and specifications)
- Results or acceptability
- Reference to corrective action taken in connection with nonconformance
- Relevant nonconformance report number

The Checklist for Michigan Permit-by-Rule for Construction Activities Requirements (Appendix C, Form C.16) will be reviewed when observing construction activities and when completing the daily inspector's report to verify soil erosion and sediment controls are in compliance.

## 6.2 Quality Assurance Subcontracts

The QA subcontracts include contracts for independent laboratory testing. Items or services procured for QA purposes that may affect the measurement of the quality of the construction project will meet the requirements of the contract specifications and this CQAP, as applicable.

## 6.3 Testing

Sampling and testing will be performed to verify that control measures are adequate to provide a product that conforms to project plans, specifications, and drawings. The Sampling and Testing Log (Appendix C, Form C.12) will be populated to log the sampling and testing conducted. Offsite testing will be performed by laboratories and testing companies with accreditation and certifications through industry recognized organizations and standards. Onsite

testing will be performed by individuals with documented training and experience to perform the testing as determined by their supervisor and accepted by the remedial program quality manager.

Testing services required for execution of the project will be contracted either directly by CH2M HILL or by its subcontractor(s). The testing services will be procured according to a scope of work, which will be compliant with the project requirements and specifications. The scope of work will specify specific analytical and geotechnical testing methods (for example, ASTM International or similar standards), professional services, and other measurement protocols as specified in the project plans, designs, and specifications. The scope of work will also specify the nature of the report or deliverable required of the testing laboratory, including requirements for professional certification. Scheduling of site services will be the responsibility of the Resident Inspector or CQM.

The following activities will be performed and documented during testing:

- Verify that testing procedures comply with contract requirements.
- Verify that facilities and testing equipment are available and comply with testing standards.
- Check test instrument calibration data against traceable certified standards.
- Verify that recording forms and the test identification system, including all test documentation requirements, have been prepared.
- Record results of all tests, both passing and failing tests, on the daily report for the date taken. Give section reference, location where tests were taken, and the sequential control number identifying the test. Actual test reports may be submitted later with a reference to the test number and the date taken.

The test results must be signed by the testing laboratory's representative authorized to sign certified test results. The signed reports, certifications, and other documentation will be submitted to USEPA as part of the construction completion reports.

### 6.3.1 Borrow Source Sampling

The earthwork subcontractor will identify suppliers of general backfill and topsoil as part of the preconstruction activities. CH2M HILL will collect samples of the topsoil at the source and submit them to the laboratory subcontractor for target compound list (TCL) organics, target analyte list (TAL) metals, PBB, total DDT, and particle-size distribution analyses (see Table 2 for laboratory methods). The borrow source laboratory results will be required to meet applicable MDEQ Part 201 generic residential criteria and project specifications (Specification Sections 32 23 23B Fill and Backfill and 32 91 13B Topsoil Preparation) to be approved for use.

Additional borrow samples will be collected during construction activities at a frequency of 1 sample per 1,000 cubic yards to verify continued compliance with project specifications. Additionally, a sample will be retained by CH2M HILL for visual comparison during construction activities to confirm consistency in the materials. If inconsistencies in the materials are observed, CH2M HILL may collect additional samples to determine continued compliance or nonconformance with project requirements.

### 6.3.2 Dust Monitoring and Personal and Perimeter DDT Air Sampling

The earthwork subcontractor will conduct real-time air monitoring for particulate matter continuously at each property (two monitoring points) and at the FPS where excavated soil is staged while earthwork is being performed (three monitoring points). Data will be recorded to a data logger once per minute. The air monitoring equipment will be placed in locations to verify effectiveness of engineering controls in minimizing dust generation that may potentially leave the exclusion zone. Dust monitors will be placed upwind and downwind of earthwork activities at a property and around the soil stockpiles on the FPS to determine the impact of the construction activities on air quality.

Dust-monitoring data will be evaluated against the USEPA National Ambient Air Quality Standards for $PM_{10}$ (particulate matter less than 10 micrometers in aerodynamic diameter) of 150 micrograms per cubic meter. The standards are based on a 24-hour average, but work will only be performed for approximately 8 hours per day, so no dust generation is assumed during the non-working hours. During work hours, an alarm will be set at 500 micrograms per cubic meter to

observe activities and determine the cause for elevated particulate concentrations and to evaluate potential mitigation measures to maintain the 24-hour average concentration below the criteria. A health and safety dust-monitoring action limit of 1.5 milligrams per cubic meter was determined based on the maximum PBB and total DDT concentrations detected in samples collected from the Phase 2 properties. Exceedances of the dust-monitoring criteria require dust abatement measures, typically application of water, or stop work and further evaluation. The earthwork subcontractor is responsible for submitting dust monitoring data to CH2M HILL on a daily basis.

During excavation activities, personal and perimeter air sampling for DDT will be performed daily at each property and on the FPS around the soil staging area. Personal DDT monitoring will be conducted on the earthwork subcontractor employee (one per day) working within or in close proximity to the property excavation with the greatest potential exposure. All samples will be collected and analyzed in accordance with the air monitoring plan (Appendix B). The earthwork subcontractor is responsible for submitting personal and perimeter DDT air monitoring data to CH2M HILL on a monthly basis.

Based on the results of the first week of personal air sampling, the sampling plan will be reviewed to evaluate the effectiveness of the monitoring for the remainder of the field event. Factors that will be considered include, but are not limited to, (1) results of the first round of personal air sampling, (2) level of soil contamination anticipated in future excavations based on previous soil sampling data, (3) soil conditions (wetness) anticipated, and (4) level of work activity anticipated.

### 6.3.3 Waste Characterization Sampling

Waste characterization sampling was conducted during the RD. However, if required by the disposal facility, additional waste characterization sampling will be conducted during the RA, as necessary, to support establishment of waste profiles with an approved offsite nonhazardous disposal facility. The sampling frequency and analyses will be determined by the approval requirements of the selected disposal facility. Waste profiles will be reviewed by the CH2M HILL environmental manager or waste coordinator prior to signature and submittal to the landfill. Offsite disposal of soil waste will be coordinated and arranged upon receipt waste profile approval. The subcontractor will use the Waste Tracking Log (Appendix C, Form C.15) to manage waste.

TABLE 2
**Velsicol Phase 2 ANP Sampling Analytical Parameters**

| Parameter | Method |
|---|---|
| Pesticides | SW-846 8081B |
| Pesticides in Air | TO-10A |
| TCLP VOCs | SW-846 1311/8260C |
| TCLP SVOCs | SW-846 1311/8270C |
| TRIS | SW-846 8270D |
| TCLP Herbicides | SW-846 1311/8151A |
| TCLP Pesticides | SW846 1311/8081B |
| PCBs | SW-846 8082A |
| TCLP Metals | SW-846 1311/6010C/7470A |
| Flashpoint | SW-846 1010 |
| pH (Soil) | SW-846 9045D |
| TCL VOCs | SW-846 8260C |
| TCL SVOCs | SW-846 8270C |
| TCL Herbicides | SW-846 8151A |

TABLE 2
**Velsicol Phase 2 ANP Sampling Analytical Parameters**

| Parameter | Method |
|---|---|
| TCL Pesticides | SW-846 8081B |
| TAL Metals (Soil) | SW-846 6010C/7471A |
| TAL Metals (Aqueous) | SW-846 6010C/7470A |
| pH (Aqueous) | SW-846 9040C |
| Standard Proctor | ASTM International D698 |
| Grain Size | ASTM International D422 |

TCLP = toxicity characteristics leaching procedure

### 6.3.4 Soil Compaction Testing

The earthwork subcontractor will place general backfill in 6-inch lifts, with compaction of 85 to 90 percent of standard Proctor maximum density (ASTM International D698). Topsoil will be placed in lifts a maximum of 6 inches thick and will be compacted between 75 and 85 percent of standard Proctor maximum density (ASTM International D698). The earthwork subcontractor will perform in situ density testing using a nuclear density gauge or approved equivalent to demonstrate proper compaction. General backfill will be placed from the base of the excavation to within approximately 6 inches of original grade, except for garden areas where general backfill will be placed to within approximately 18 inches of original grade. The remaining thickness required to match preconstruction grade (minus the thickness of sod to be placed) will be lightly compacted topsoil to minimize settlement while still allowing infiltration of water and penetration of roots. Areas used for off-street parking by residents will be compacted to a minimum of 90 percent of standard Proctor maximum density (ASTM International D698) to minimize settlement. Soil used for the top 6 inches for parking areas can be either general backfill or topsoil.

Final restored grade will take into account the thickness of the sod to be placed. For example, if the sod thickness is 0.2 foot, the final restored grade should be within minus 0.10 and minus 0.20 foot of the original grade.

## 6.4 Testing Plan and Log

As tests are performed, the CQM will record the following information on the Sampling and Testing Log (Appendix C, Form C.12):

- Date the test was conducted
- Date the test results were received results of the tests
- Whether they comply with the specifications
- Any remarks and acknowledgment that an accredited testing laboratory was used

Applicable project requirements, tests, or analytical procedures used must be cited on the Testing Plan and Log. The CQM will obtain all test results and update the Testing Plan and Log at a minimum of once a week, and maintain the records onsite in the project files.

A copy of the Testing Plan and Log will be attached to the daily report at the end of each month and forwarded to the Resident Inspector, SM, and program quality manager.

## 6.5 Testing Companies

Independent testing companies and testing laboratories that are authorized or certified to operate in the State of Michigan will be employed on this project. Prior to the start of the work, the name(s), facility information, qualifications, and certifications of the testing companies and laboratories will be acquired and maintained in the project files.

Laboratories performing chemical analysis of samples hold current accreditation under the USEPA National Environmental Laboratory Accreditation Program and hold current certification by the State of Michigan.

Laboratories performing geotechnical testing will be participating in an accreditation program and will be certified to perform the specified analytical method.

SECTION 7

# Inspection

An inspection is necessary for acceptance of all the items listed as DFOWs in Section 3. The inspections associated with the respective DFOWs are provided in Table 1. The project team needs to define the critical inspection tasks during the planning phase of the project and list them on the critical inspection log (Appendix C, Form C.13). The critical inspection log can be based on the list of DFOWs as listed in Table 1, for each DFOW. A critical inspection provides the basis for accepting an activity and its suitability to perform the purpose intended. The critical inspection involves the observation, measurement, and possible testing of the work at its point of installation to check compliance with project requirements. A punch list inspection includes work that is not critical but is required for successful completion of the work prior to final USEPA and property owner acceptance.

The CQM will be responsible for verifying the Quality Control and Inspection Log is completed. The CQM is responsible for documenting (written and photographic) the inspections in the critical inspection log and checking for documentation in the daily report. The CQM is responsible for maintaining the punch list during the progress of the work.

## 7.1 Inspection Punch List

Punch list items should be addressed during the course of the work and the punch list inspection will occur near the completion of work for each property. The CQM will inspect the work and develop a punch list of items that do not conform to the approved drawings and specifications. The punch list will include remaining items on the rework items list that were not corrected before the punch list inspection. The punch list will include the estimated date by which the deficiencies will be corrected. The CQM will make follow-up inspections to ascertain whether deficiencies have been corrected. Once this is accomplished, CH2M HILL will notify USEPA that the feature of work is ready for prefinal inspection.

## 7.2 Prefinal Inspection before Final Client Inspection

Property-specific reviews will be performed after each property is restored to document the restoration and the condition of the surrounding area. Photographs and/or video of the restored work areas will be obtained to document the post-construction condition. A letter will be prepared for the property owner documenting the completion of the RA at the property. The current property owner will be asked to sign off that his or her property has been restored to the condition agreed to during the preconstruction meetings or to identify any outstanding issues to be addressed.

After the property owner has signed off on the RA, a prefinal inspection is required to check that all aspects of the work will be acceptable to the client and that punch list work has been completed. A prefinal inspection punch list may be developed as a result of the inspection. Each deficiency noted in the punch list will be referenced (applicable specification paragraph, drawing, etc.). The CQM will check that all items on this list are corrected prior to notifying the SM/Resident Inspector that a final client inspection can be scheduled.

## 7.3 Final Client Inspection

The CQM, Resident Inspector, SM, other project management personnel, and client representative will be in attendance at the final client inspection. Other stakeholders may be in attendance, too. The inspection will be considered closed when the work has been accepted by the client representative and the stakeholders and acceptance has been documented and signed by all parties in a final inspection form.

SECTION 8

# Project Documentation

All project quality activities and submittals pertaining to the contract and subcontract documents and the CQAP will be documented.

## 8.1 Photographic Record

A project photographic record will be made and kept as part of the quality records. In addition to recording construction progress and “as-constructed” installation details, the photographic record will document deviations from design and nonconformance items. Each photograph will be marked with a sequence number, date, location, photographer, and description. Digital cameras will be used by the project team and photos electronically logged and filed for record purposes. The CQM will maintain the photographic record file (Appendix C, Form C.10 [303]).

## 8.2 Field Documentation

The object of field documentation is to check that appropriate project information is documented in logbooks during construction. Documentation is important for communicating with other staff members and other project representatives. The following regular QC observations, inspections, and records of general QC activities should be made:

- Record daily progress and associated QA and QC sampling
- Record construction operations, sequence, staging, etc.
- Maintain transportation and waste disposal records (Appendix C, Form C.15)
- Describe deviations from expected conditions, or unexpected problems and their resolution

The CQM will maintain a record of daily QC activities during construction in a field logbook. The logbook will be available upon request for review. It will be used to record at least the following information:

- Date of entry
- Project name and location
- Time that work starts and ends every day
- Summary of weather conditions
- General description of work, size of work crew, and equipment and personnel onsite
- Duration and type of breaks
- Start time and duration of downtime resulting from equipment breakdown, weather, or emergencies
- Summaries of QC meetings and actions recommended to be performed
- Conversations with subcontractors, property owners, or residents
- QC testing equipment and personnel
- Identification of work locations
- Description of materials delivered to the site, including QC data
- Decisions made regarding defective work or corrective measures implemented, or both
- Field tests
- Sampling activities

The bottom of each page of the field logbook shall be signed or initialed and each entry dated to show that notes are being entered daily.

A line-out will be placed on any part of an unused page. One-line strike-throughs will be used to show corrections to entries. The strike-throughs will be initialed and dated. No correction fluid may be used.

The field documentation will also be documented in the daily report.

## 8.3 Daily Report

The daily report is the daily record of operations on the job site and will be kept current (Appendix C, Form C.11). It is an essential tool for recording and reporting the daily production, safety, and quality activities of the project. The reports are the official record of work performance and compliance with project plans, drawings, and specifications. Therefore, it is important that the reports are correct and timely.

The Resident Inspector is responsible for preparing the daily report and submitting the reports to the SM. The SM and Resident Inspector will provide operational information, and the HSM will provide information on the health and safety activities for the daily report. The report also includes reports from subcontractor to address, at a minimum, the following:

- Quality aspects of the project that is being performed by the subcontractor
- Scheduling and resource issues
- Site safety inspections and concerns
- Environmental concerns
- Job progress
- Control inspections
- Tests performed and their results
- Personnel and equipment onsite
- Material received

The CQM will review the daily reports for accuracy and completeness because these reports are used to prepare the final reports for the project. The SM will review the reports and check that the quality process is working on the project. The project quality manager will review the reports to check that the quality processes and systems are working on the program.

The daily report template is included in Appendix C (Appendix C Form C.11). At a minimum, the following information should be included to the daily report:

- Tailgate safety meeting minutes
- Summary of work performed that day
- Man-hours for each subcontractor
- Equipment used onsite
- Changed conditions, delays, and conflicts encountered, including QC issues
- DFOWs
- Submittal status
- Inspection conducted and findings/result of inspection
- Test conducted
- Waste disposal summary

### 8.3.1 Monthly Progress Report

The Resident Inspector or CQM will prepare a monthly progress report (Appendix C, Form C.14). The report will be transmitted to the QA team members and the SM. The monthly progress report will include, at a minimum, the following items:

- Work accomplished in the past month
- Work scheduled for the next month
- Project schedule: total days worked and total days remaining to completion of the current phase of work
- Problems encountered and resolutions, and associated schedule and budget impacts
- Construction budget: basic contract, and approved and denied change orders

### 8.3.2 Project Records

Records that are generated by the QC system must be maintained in an orderly manner. The CQM will make sure the project quality records are readily available for reference. The records should be arranged based on input from the document manager and include the following items:

- Submittals, including Submittal Register
- Daily reports
- Meeting minutes
- Inspection reports—Preparatory, Initial, and Follow-up Phases
- Punch list inspection results
- Pre-final and final inspection results
- Rework items lists
- Test results including testing plan and log
- Chain of custody forms
- Construction change order and log
- Red-lined drawings/as-built drawing
- Field order and log
- RFIs arranged in numerical order and RFI log
- Nonconformance notices and corrective actions
- Certificates and qualifications
- Calibration records
- Photographs and photograph log (see Appendix C for photograph log template)
- Correspondence (e-mails, conversation records, etc.)
- Dust/particulate readings (daily)
- DDT personal and perimeter sampling results (monthly)
- Waste tracking

SECTION 9

# References


U.S. Environmental Protection Agency (USEPA). 2012. *Velsicol Chemical Corporation Superfund Site—Proposed Plan for Operable Unit 1, St. Louis, Michigan.* February 7.

U.S. Environmental Protection Agency (USEPA). 2012b. *Record of Decision— Velsicol Chemical Corporation/Pine River Superfund Site, Former Plant Site – Operable Unit 1, St. Louis, Michigan.* June 19.

U.S. Environmental Protection Agency (USEPA). 2014. *Velsicol Chemical Corporation Superfund Site Phase 2 Adjacent or Nearby Properties—Preliminary Basis of Design Report for Operable Unit 1, St. Louis, Michigan.* January.

Weston Solutions, Inc. 2006. *Remedial Investigation Report for Operable Unit 1—Velsicol Chemical Corporation Site, St. Louis, MI.* Prepared for the Michigan Department of Environmental Quality. November.

Weston Solutions, Inc. 2009. *Remedial Investigation Addendum Report for Operable Unit One—Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan.* Prepared for the Michigan Department of Environmental Quality. January.

Weston Solutions, Inc. 2011. *Feasibility Study for Operable Unit One—Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan.* Prepared for the Michigan Department of Environmental Quality. November.

Table 1

TABLE 1

**Project Inspection Activities by Task**

*Phase 2 Adjacent and Nearby Properties,*

*Velsicol Chemical Corporation*

| Task - DFOW | Inspection |
|---|---|
| **Utility Locating (DFOW 1)** | Verify that the earthwork subcontractor contacts MISS DIG and uses a third-party utility locating service to identify utilities before work begins at each property. The earthwork subcontractor shall verify the completion of the locates and submit documentation to the contractor a minimum of 3 days prior to beginning any invasive activities at each property.<br>Ensure utilities are properly protected and located<br>Contact City of St. Louis and utility pole owners to gain approval for excavating<br>Conduct initial H&S tailgate meeting, sign HASP, review AHAs and self assessment checklists |
| **Mobilization and Setup (DFOW 2)** | Verify the general backfill and topsoil meet the Michigan Part 201 Residential Soil criteria to be certified as "clean."<br>Determine and verify traffic routes<br>Collect photos of pre-existing site conditions<br>During the site walkthrough with the subcontractor, identify any vegetation that may be disturbed during the course of work that may contain protected migratory birds or other species. If active nests of protected birds or habitat of other endangered species are identified, instruct the subcontractor to take appropriate measures to minimize disturbance and to comply with the Migratory Bird Treaty Act and the Endangered Species Act. Migratory bird species in this geography begin nesting after April 1.<br>Verify that prior to the start of work, the property owner, the contractor, and the earthwork subcontractor will all sign an agreement describing the work to be performed at each property based on the information gathered at the initial property visit.<br>Identify and inspect staging areas for vegetative debris, storage of wastes, recyclable materials, storage container, general construction debris, and heavy equipment<br>Verify that materials and equipment are received in working order and in compliance with work plans and specifications<br>Verify that all construction equipment condition is acceptable and that features (such as backup alarms) function properly. Confirm fire extinguishers are present and up to date.<br>Ensure personnel have proper PPE to perform the work<br>Ensure appropriate MSDS are available on-site<br>Ensure spill prevention and recovery plan in place<br>Verify pre-existing conditions with video and photography as documentation, focusing on areas that could be damaged by construction.<br>Ensure break and rest areas are established and set up<br>Verify that signed access agreements for the current property owner are in the file with approvals from the preconstruction meeting with the property owner prior to beginning work.<br>Ensure erosion control measures are in place<br>Perform inspections to ensure construction limits are defined, utilities marked, and material staged in the designated areas<br>Identify decontamination pad area<br>Identify truck/heavy equipment pathways in and out FPS for transport of waste, decontamination and obtaining clean backfill and topsoil<br>Conduct initial H&S meeting with all subcontractors. Review AHAs, HASP (sign), and applicable self assessment checklists |

TABLE 1

**Project Inspection Activities by Task**

*Phase 2 Adjacent and Nearby Properties,*

*Velsicol Chemical Corporation*

| Task - DFOW | Inspection |
|---|---|
| **Property Remediation (DFOW 3)** | Verify that construction equipment is only operated between the hours of 7:00 a.m. and 6:00 p.m.<br>Verify that an orange plastic construction barrier fence, minimum 36-inch height, is installed around the excavation and work areas using steel "T" post spaced at 6-foot centers to separate pedestrian traffic from the work. The fence will be secured around open excavations before the end of each work<br>Verify that obstructions removed from the property are securely stored and returned upon completion of restoration.<br>Verify that the Earthwork Subcontractor performs air monitoring at the staging area and residential properties in accordance with the Air Monitoring Plan<br>Verify that the limits of construction for soil excavation are as follows: 1 foot away from permanent structures and fences and sloping away from the structure at a maximum slope of 1 horizontal to 1 vertical<br>Verify that the limits of construction for soil excavation are as follows: 1 ft away from property lines unless excavation continues onto neighboring property and adjacent property owner has provided access. Excavation may proceed across a property line into a right-of-way if it serves as part of that<br>Verify that sidewalks, driveways or similar surfaces adjacent to the excavation areas shall be covered daily with 6 mil polyethylene (or equivalent) from the start of excavation through completion of backfill. Manual cleaning shall be performed daily if spillage occurs onto these surfaces.<br>Verify that the materials are not stockpiled or permit traffic within drip lines of trees.<br>Verify that the Work is performed in accordance with the Soil Erosion and Sediment Control Plan.<br>Verify that the post-construction survey is performed prior to the start of restoration and landscaping activities.<br>Verify that the over-excavation tolerance is plus 0.1 foot, and under-excavation tolerance is minus 0.0 foot. The contractor may limit the depth of excavation if it is believed that further excavation may result in damage to structures or safety hazards.<br>Verify that the earthwork subcontractor immediately notifies the contractor if latent differing site conditions are encountered during construction. Such conditions include French drains, drain tile, unknown electrical and plumbing lines, and other similar conditions.<br>Verify that manual excavation is performed to a depth of 6-inches within 8 feet of the tree trunk. Verify that manual excavation is used to expose and tunnel under roots 1-inch in diameter or greater.<br>Manual excavation shall expose and tunnel under woody roots 1 inch in diameter or greater to preserve the roots.<br>Manual excavation shall follow the roots 1 inch in diameter or greater to the horizontal extent of the excavation to expose the roots.<br>If roots are damaged, earthwork subcontractor shall perform corrective pruning to create a clean cut and promote quick wound closure and regeneration<br>Verify that hand-digging is performed within 60 inches of approximate underground utility markings to verify actual location of the utility.<br>Verify that a post-excavation survey is performed prior to the initiation of backfill activities.<br>Verify that specified lines and grades as determined by pre-design investigation sampling and analysis indicate extents of excavation have been reached prior to authorizing backfilling of the excavation.<br>Verify that excavation areas are surveyed by the survey subcontractor to establish preconstruction control points and existing elevations.<br>Verify that the general backfill and topsoil will be compacted to between 85 and 90 percent maximum dry density, as determined by ASTM D698 (Standard Proctor), in lifts no greater than 6 inches until topsoil is within 6 inches of the surrounding grade.<br>Verify that the uppermost lift of topsoil is compacted to between 80 and 85 percent maximum dry density, as determined by ASTM D698 (Standard<br>Verify that the general backfill and topsoil will be compacted to between 90 and 95 percent maximum dry density, as determined by ASTM D698 (Standard Proctor), in areas used for off-street parking by residents.<br>Verify that Granular Fill material is placed within influence area adjacent to or beneath structures, sidewalks, slabs, pavements, curbs, piping, conduits, and other facilities.<br>Verify that Granular Fill is compacted to minimum of 90 percent relative compaction as determined in accordance with ASTM D698.<br>Verify that topsoil is finely graded to eliminate rough or low areas and to maintain levels, profiles, and contours of subgrade to within +0.1 ft of final grade.<br>Verify that stormwater runoff control is installed, and erosion controls in place according to the Soil erosion and sedimentation control plan and best management practices prior to excavation. |

TABLE 1

**Project Inspection Activities by Task**

*Phase 2 Adjacent and Nearby Properties,*

*Velsicol Chemical Corporation*

| Task - DFOW | Inspection |
|---|---|
| **Surveying (DFOW 4)** | Map and label the excavation boundary locations and average depth<br>Verify surveyor license and maintain copy in project files<br>Verify usage of proper reference datum<br>Verify existing monument correspondence with contract plans<br>Verify the correct drawings and reference points are being used<br>Ensure establishment and protection of temporary control points<br>Ensure establishment of project limits<br>Ensure adequacy of vertical and horizontal control<br>Ensure instrument calibration and accuracy necessary to meet surveying tolerances<br>Verify the legibility, accuracy, and completeness of surveyor's notes<br>Ensure delivery of electronic and hard-copy data deliverables<br>Ensure accuracy and completeness of as-built drawings |
| **Sampling/Testing (DFOW 5)** | Verify laboratory and credentials<br>Verify appropriate sampling equipment<br>Maintain sample log and chain of custody records<br>Verify equipment decontamination<br>Verify appropriate facilities and testing equipment are available and comply with testing standards<br>Verify the field instruments are calibrated in accordance with manufacturers' recommendations<br>Verify recording forms, including all of the test documentation requirements, have been prepared and are accurate and complete<br>Verify sampling and testing procedures are followed according to the air monitoring plan, T&D plan and CQAP. |
| **Waste Management (DFOW 6)** | Verify that stockpiled excavated material is covered and protected during inclement weather.<br>Verify that the trucks shall be fully loaded, within allowable hauling weight limits, prior to transporting the excavated materials.<br>Verify that each truckload shall be covered with a fully functioning tarp system that satisfies local, county, state and federal regulations before leaving the site and during transportation.<br>Verify that a temporary ground covering, 6 mil polyethylene or equivalent, shall extend a minimum of 2 feet under trucks to minimize the potential for soil to spill into roadways or other areas not requiring remediation.<br>Verify that the exterior of each transportation vehicle and load of waste shall be visually inspected and all loose soil/material removed and collected before leaving the site.<br>Verify that all moving, handling, and loading of excavated material, along with sequencing the activities is in accordance with the Earthwork Subcontractor's Transportation Plan<br>Verify that the transportation of nonhazardous wastes shall be completed by a transporter licensed for commercial transportation in the State of<br>Verify that the quantities of waste shall be recorded by documented weighing at the approved disposal facility. Copies of haul tickets shall be signed and provided to Contractor on a daily basis<br>Inspect storage areas for vegetative waste, storage of wastes, recyclable materials, storage containers, construction debris waste, and general trash<br>Verify proper labeling is placed on all waste storage containers, including start date as identified in the T&D plan.<br>Review the T&D plan, the disposal, recycling, or treatment facility qualifications, and the transportation schedule for hauling material off-site<br>Ensure containers are free of liquids or other foreign materials prior to filling<br>Verify that information provided on the waste manifest is complete and accurate<br>Verify that the disposal facility has accepted and disposed of the waste material at their facility and has provided the required completed documentation<br>Inspect containers routinely for integrity and to make sure they are inventoried<br>Inspect waste storage areas daily for releases, signs of corrosion, deterioration, or other conditions that could result in a release<br>Waste storage areas will be inspected on a daily basis for releases, signs of corrosion, deterioration, or other conditions that could result in a release |

TABLE 1

**Project Inspection Activities by Task**

*Phase 2 Adjacent and Nearby Properties,*

*Velsicol Chemical Corporation*

| Task - DFOW | Inspection |
|---|---|
| **Site Restoration (DFOW 7)** | Document and report material/product deficiencies and/or irregularities; implement corrective actions as necessary<br>Verify that the earthwork subcontractor reinstalls removed obstructions, repairs damage to permanent structures, and repairs or replaces property disturbed or damaged during or as a result of the earthwork subcontractor's construction activities.<br>Verify that the erosion control blankets are rolled out or laid in parallel to the direction of water flow (if applicable), with the netting on top.<br>Verify that the adjacent strip edges of erosion control blanket are overlapping each other at least 102 millimeters (mm; 4 inches). Strip ends shall overlap each other at least 178 mm (7 inches). A minimum of 1 staple per square meter shall be inserted flush with the ground surface to anchor to the soil<br>Verify that the erosion control measures, such as inlet protection, shall be removed by the earthwork subcontractor after the final street cleaning is performed, in accordance with specification 01 50 00<br>Verify that plants provided appear sound, healthy, vigorous, and free from insects, diseases, and injuries.<br>Verify the plants provided are equal to or exceeding measurements specified in plant list.<br>Observe that one tree and shrub of each variety are labeled with a securely attached waterproof tag bearing legible designation of botanical and common name.<br>Verify plantings are in same location as removed plant or unless otherwise agreed to by Property Owner.<br>Verify no planting, except ground cover, is closer than 18 inches to pavements, pedestrian pathways, and 36 inches to structures unless replacing plant that was previously located there.<br>Verify that amendments and fertilizer are mixed with topsoil prior to placing or applied on surface of topsoil and mixed thoroughly before planting.<br>Verify that planting soil is mixed by weight 3/4 approved topsoil with 1/4 approved organic matter (peat moss).<br>Verify that planting occurs within 2 days of mixing of amendments and fertilizer if planting for planting soil.<br>Verify that holes for planting are appropriate for the size and type of plant.<br>Verify that trees are planted before surrounding plants.<br>Verify that deciduous trees are staked and wrapped immediately after planting.<br>Verify that plantings are removed from their containers, prepared and planted as required by type.<br>Verify that planting beds and area of saucer around each plant are covered with 3 inch thick layer of selected mulch within 2 days after planting.<br>Verify that the planting area is saturated with water immediately after planting and watered throughout the maintenance period with the sod.<br>Verify the work described in Section 32 91 13, Topsoil Preparation, is completed before starting work of this section.<br>Verify that the erosion control blanket (if applicable), any staples or fasteners are removed.<br>Verify that the topsoil is harrowed just before laying sod, to a minimum of 3 inches deep with a disk, spring tooth drag, spike tooth drag or other equipment designed to condition the soil. A rake can be used for smaller areas.<br>Verify that the debris and stones larger than 1-1/2-inch diameter, and other objects that may interfere with planting and maintenance operations are removed.<br>Sod shall be a densely rooted blend of at least two bluegrass varieties with 30 percent content of a shade and drought tolerant species.<br>Verify that the earth bed is thoroughly watered with a minimum of 3.5 gallons per square yard before laying the sod.<br>Verify that the sod is laid within 24 hours after cutting and properly protected until placed<br>Verify that the sod is not planted when dormant or when ground is frozen.<br>Verify that the sod is not handled with pitch forks nor dump from vehicles.<br>Verify that the sod is laid to form solid mass with tightly fitted joints; butt ends and sides and do not overlap.<br>Stagger strips to offset joints in adjacent courses.<br>Work from boards to avoid damage to subgrade or sod.<br>Tamp or roll lightly to ensure contact with subgrade; work sifted soil into minor cracks between pieces of sod, remove excess to avoid smothering adjacent grass.<br>Prior to sod placement, verify that the prepared topsoil surface is watered.<br>Complete sod surface true to finished grade, even, and firm.<br>Verify that 6 gallons of water per square yard was sprayed within 8 hours after the sod has been applied.<br>Verify that the Earthwork Subcontractor uses an approved source of water. Water may not be used from the residence.<br>Verify that sod will be watered at 3.5 gallons per square yard twice per week for a period of four weeks after sod installation. Watering frequency may be modified by the Contractor due to weather conditions and sod moisture. |

TABLE 1

**Project Inspection Activities by Task**

*Phase 2 Adjacent and Nearby Properties,*

*Velsicol Chemical Corporation*

| Task - DFOW | Inspection |
|---|---|
| **Demobilization (DFOW 8)** | Review decontamination procedures, the Health and Safety Plan, T&D Plan, and relevant AHAs<br>Inspect work area to ensure all temporary staging, equipment, and unused materials are removed from the site<br>Inspect equipment used to perform site activities has been decontaminated<br>Perform punch list inspection<br>Ensure outstanding items on punch lists are complete |

**Notes:**

AHA - activity hazard analysis

MSDS - material safety data sheets

PPE - personal protective equipment

# Figures

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Figure 1
**Study Areas and Operable Units- Site Plan**
*Velsicol Chemical Corporation Superfund Site*
*St. Louis, Michigan*

CH2MHILL.

ES092012122721MKE EPA_Velsicol_Study Areas_v3 sls 09.20.12

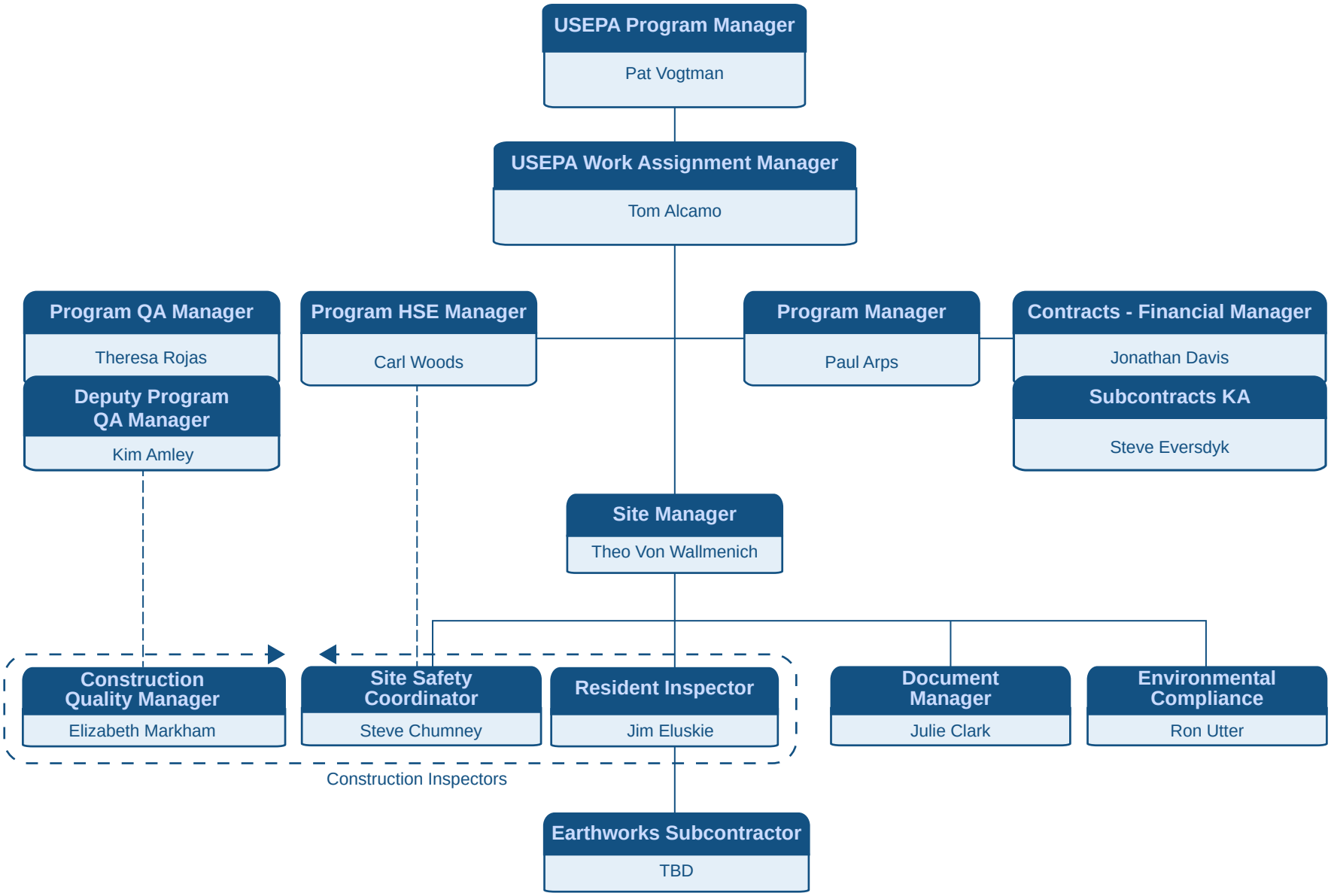


FIGURE 2
Organization Chart - CQAP
*Phase 2 ANP Velsicol OU1 - Remedial Action*
*St. Louis, Michigan*

# Appendix A
# Submittal Register

**Submittal Register—March 15, 2014**
**Remedial Design for Phase 2—Velsicol**
**St. Louis, MI**

| ITEM NO | DESCRIPTION OF SUBMITTAL | REFERENCE: Spec / Drawing | SUBSECTION OR NOTE REFERENCE(S) | APPROVING REQUIREMENT: Approval (A) or Information (I) | REQUIRED TIMING OR FREQUENCY OF SUBMITTAL | STATUS: -Accepted -Approved -Rejected | DATE APPROVED | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 1 | Certificate of insurance naming USEPA and Contractor as additional insured and waivers of subrogation against USEPA and Contractor, in accordance with the Subcontract | | 1.04 A | I | Initial<br>Prior to subcontract award | | | |
| 2 | P&P Bonds shall be either executed by or countersigned by a licensed resident agent of the surety having its place of business in the State of Michigan. | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 A | I | Initial<br>Prior to subcontract award | | | |
| 3 | Completed certification of compliant drug policy | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.1 | A | Initial<br>Prior to subcontract award | | | |
| 4 | Earthwork Subcontractor's site-specific health and safety plan and Activity Hazard Analysis (AHA) worksheets | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.2, 1.07 A, 1.07 D.2.a, 1.07 D.2.j | I | Initial<br>Prior to subcontract award | | | |
| 5 | Proof of training and medical monitoring programs | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.3 | A | Initial<br>Prior to subcontract award | | | |
| 6 | Material safety data sheets (MSDSs) | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.4 | I | Initial plus Updates<br>Prior to subcontract award | | | |
| 7 | Copies of Earthwork Subcontractor's business licenses as required by state and local statutes | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.5 | I | Initial<br>Prior to subcontract award | | | |
| 8 | Completed Waste Subcontractor Qualification Form | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.6 | A | Initial<br>Prior to subcontract award | | | |
| 9 | Transporter's valid U.S. DOT Number. | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.7 | I | Initial<br>Prior to subcontract award | | | |
| 10 | Transporter's valid EPA ID# (for hazardous waste transport) | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.8 | I | Initial<br>Prior to subcontract award | | | |
| 11 | Transporter's Certificate of Insurance | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.9 | I | Initial<br>Prior to subcontract award | | | |
| 12 | Waste disposal facilities, written evidence of a valid EPA CERCLA OSR approval (40 CFR 300.440); written evidence of a valid EPA/State Permit-to-Operate (40 CFR 264.11 & 265.11); and a summary of violations (formal and informal) and how they were resolved in the last 5 years. | SECTION 01 11 00<br>SCOPE OF WORK | 1.04 B.10 | I | Initial<br>Prior to subcontract award | | | |
| 13 | Current hazardous waste site training and medical surveillance documentation for all field personnel, as necessary | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.1, 1.07 D.2.d, | I | Initial<br>Post-Subcontract award | | | |
| 14 | Project Schedule and schedule narrative of Earthwork Subcontractor's approach in performing the Work | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.2 | A | Initial plus updates<br>Post-Subcontract award | | | |
| 15 | Subcontractor Quality Control Plan | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.3 | A | Initial<br>Post-Subcontract award | | | |
| 16 | Work Plan | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.4 | A | Initial<br>Post-Subcontract award | | | |
| 17 | Soil Erosion and Sedimentation Control Plan (update of plan drafted by Contractor) | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.5, 1.06 B.2 | A | Initial<br>Post-Subcontract award | | | |
| 18 | Transportation and Disposal Plan (update of Contractor's existing plan) which includes, pre-disposal, disposal and post-disposal plans | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.6 | A | Initial<br>Post-Subcontract award | | | |
| 19 | Daily reports (Subcontractor production report, Subcontractor quality control report, AHAs, and soil excavation/transportation log, waste disposal log, weight tickets, haul tickets) during the field operations period. | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.7, 1.07 D.2.a, 1.07 D.2.j | I | Daily<br>During the execution of Work | | | |
| 20 | Driver's vehicle registration and driver's license required for intrastate commerce in each state of operation | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.8 | I | When any new driver - changes-<br>During the execution of Work | | | |
| 21 | Summary of remedial actions completed at each property, including any deviations from the specified SOW | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.9 | A | Daily<br>During the execution of Work | | | |
| 22 | Bi-weekly updated schedule of values | SECTION 01 11 00<br>SCOPE OF WORK | 1.05 A.10 | A | Bi-weekly<br>During the execution of Work | | | |

**Submittal Register—March 15, 2014**
**Remedial Design for Phase 2—Velsicol**
**St. Louis, MI**

| ITEM NO | DESCRIPTION OF SUBMITTAL | REFERENCE: Spec / Drawing | SUBSECTION OR NOTE REFERENCE(S) | APPROVING REQUIREMENT: Approval (A) or Information (I) | REQUIRED TIMING OR FREQUENCY OF SUBMITTAL | STATUS: -Accepted -Approved -Rejected | DATE APPROVED | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 23 | Progress schedule and narrative report | SECTION 01 11 00 SCOPE OF WORK | 1.05 A.11 | A | Initial with updates During the execution of Work | | | |
| 24 | As-built redline drawings of all excavation areas with lateral and vertical limits of excavation. Beginning and ending elevation of excavation areas confirmed and documented by survey | SECTION 01 11 00 SCOPE OF WORK | 1.05 A.12 | I | Initial with updates During the execution of Work | | | |
| 25 | A table documenting information on wastes managed, including quantities generated at each location and disposition of wastes | SECTION 01 11 00 SCOPE OF WORK | 1.05 A.13 | I | Initial with updates During the execution of Work | | | |
| 26 | Fully completed manifests or delivery tickets for all waste streams documenting ultimate disposal | SECTION 01 11 00 SCOPE OF WORK | 1.05 A.14 | A | Initial with updates During the execution of Work | | | |
| 27 | Additional action and informational submittals required by the technical specifications | SECTION 01 11 00 SCOPE OF WORK | 1.05 A.15 | I | Initial with updates During the execution of Work | | | |
| 28 | Schedule of Values: Submit on form approved by Contractor | SECTION 01 29 00 PAYMENT PROCEDURES | 1.01 A.1, 1.02 | I | Bi-weekly | | | |
| 29 | Schedule of Estimated Progress Payments | SECTION 01 29 00 PAYMENT PROCEDURES | 1.01 A.2, 1.03 | I | Initial with updates | | | |
| 31 | Application for payment | SECTION 01 29 00 PAYMENT PROCEDURES | 1.01 A.3, 1.04, 1.05 | I | Initial with updates | | | |
| 32 | Payment | SECTION 01 29 00 PAYMENT PROCEDURES | 1.01 A.4, 1.06 through 1.08 | I | Final | | | |
| 33 | Utility locate tickets | SECTION 01 31 13 PROJECT COORDINATION | 1.01 A, 1.02 A and B | I | Initial | | | |
| 34 | Property Drawing showing Existing Conditions: Submit (2) 8-1/2x11 or 11x17 drawings within three (3) days after the Initial Residential Preconstruction Meeting. | SECTION 01 31 13 PROJECT COORDINATION | 1.01 B.1, 1.04 C.3 | I | Initial with updates | | | |
| 35 | Survey Documentation:<br>a. Survey No. 2–Post-Excavation Survey<br>b. Survey No. 3–Post-Construction Survey: | SECTION 01 31 13 PROJECT COORDINATION | 1.01 B.2, 1.05 | A | Initial with updates | | | |
| 36 | Volume calculations and drawings upon completion of work for each property, within seven days of the survey | SECTION 01 31 13 PROJECT COORDINATION | 1.05 E.2 | A | After every property | | | |
| 37 | Prior to final payment, submit a final Updated Progress Schedule | SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION | 1.01 A.4 | A | Once - prior to Final Payment | | | |
| 38 | A Preliminary Progress Schedule with the Earthwork Subcontractor's proposal | SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION | 1.01 A.1, 1.03 A, B, C,D. | A | Initial plus updates | | | |
| 39 | Detailed Progress Schedule<br>a. Submit prior to pre-construction conference<br>b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule | SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION | 1.01 A.2, 1.04 | A | Initial plus updates | | | |
| 40 | Prepare Action Submittals required by individual Specification sections | SECTION 01 33 00 SUBMITTAL PROCEDURES | 1.01 A, 1.03 | A | Initial plus updates | | | |
| 41 | Prepare Information Submittals required by individual Specification sections | SECTION 01 33 00 SUBMITTAL PROCEDURES | 1.01 B, 1.04 A | I | Initial plus updates | | | |
| 42 | Submittal schedule | SECTION 01 33 00 SUBMITTAL PROCEDURES | 1.04 H | A | Initial plus updates | | | |
| 43 | Subcontractor Quality Control (SQC) Report Format | SECTION 01 45 16.13 SUBCONTRACTOR QUALITY CONTROL | 1.03 A.1, 1.04 | I | Once - Initial | | | |

| ITEM NO | DESCRIPTION OF SUBMITTAL | REFERENCE: Spec / Drawing | SUBSECTION OR NOTE REFERENCE(S) | APPROVING REQUIREMENT: Approval (A) or Information (I) | REQUIRED TIMING OR FREQUENCY OF SUBMITTAL | STATUS: -Accepted -Approved -Rejected | DATE APPROVED | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 44 | Subcontractor Quality Control (SQC) Plan | SECTION 01 45 16.13 SUBCONTRACTOR QUALITY CONTROL | 1.03 A.2, 1.04, 3.03-3.05 | I | Once - Initial | | | |
| 45 | Subcontractor Quality Control (SQC) Report | SECTION 01 45 16.13 SUBCONTRACTOR QUALITY CONTROL | 1.03 A.3, 1.04, 3.03-3.04, 3.06 | I | Once - Initial | | | |
| 46 | Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.1 | I | Once - Initial | | | |
| 47 | Temporary Construction Submittals of Staging area plans and Fencing and protective barrier locations and details | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.2, 1.02 A | A | Initial plus updates | | | |
| 48 | Temporary Control Submittals : Soil Erosion and Sedimentation Control Plan | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.3.a; 1.04 B, C and D, 3.04 C, D | A | Initial plus updates | | | |
| 49 | Temporary Control Submittals : Noise Control Plan | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.3.b, 3.04 B | A | Initial plus updates | | | |
| 50 | Temporary Control Submittals : Fugitive Dust Control Plan | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.3.c, 3.04 E | A | Initial plus updates | | | |
| 51 | Temporary Control Submittals : Air Monitoring Plan | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.3.d, 3.04 A | A | Initial plus updates | | | |
| 52 | Temporary Control Submittals : Transportation and Disposal Plan | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.3.e, 3.05 | A | Initial plus updates | | | |
| 53 | Temporary Control Submittals : Water Supply Source | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A.4, 3.02 B | A | Initial plus updates | | | |
| 54 | Air Monitoring - DDT results from personal sampling pumps | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A 5 | I | Monthly | | | |
| 55 | Air Monitoring - PM10 results | SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS | 1.01 A 5 | I | Daily | | | |
| 56 | Record Documents: All remaining record documents not previously submitted | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 a, 1.02 | I | Once | | | |
| 57 | Special bonds, Guarantees, and Service Agreements | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 b | I | Once Initial | | | |
| 58 | Consent of Surety to Final Payment: As required in General Terms and Conditions | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 c | I | Once Initial | | | |
| 59 | Releases or Waivers of Liens and Claims: As required in General Terms and Conditions | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 d | I | Once Initial | | | |
| 60 | Releases from Agreements | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 e | I | Once Initial | | | |
| 61 | Final Application for Payment: Submit in accordance with General Terms and Conditions | SECTION 01 77 00 CLOSEOUT PROCEDURES BY THE SUBCONTRACTOR | 1.01 A.1 f | I | Once initial plus updates | | | |
| 62 | Utility locate completion documentation | SECTION 31 10 00 SITE PREPARATION | 1.02 A.1, 3.02 | A | Once Initial | | | |
| 63 | Revised property drawing documenting utility locations | SECTION 31 10 00 SITE PREPARATION | 1.02 A.2, 3.02 | A | Once initial plus updates | | | |
| 64 | Draft filled-in non-hazardous waste manifest prior to the start of excavation | SECTION 31 23 16 EXCAVATION | 1.02 A | A | Initial Prior to excavation | | | |
| 65 | Haul tickets submitted daily | SECTION 31 23 16 EXCAVATION | 1.02 B, 3.06 C | I | Daily | | | |

**Submittal Register—March 15, 2014**
**Remedial Design for Phase 2—Velsicol**
**St. Louis, MI**

| ITEM NO | DESCRIPTION OF SUBMITTAL | REFERENCE: Spec / Drawing | SUBSECTION OR NOTE REFERENCE(S) | APPROVING REQUIREMENT: Approval (A) or Information (I) | REQUIRED TIMING OR FREQUENCY OF SUBMITTAL | STATUS: -Accepted -Approved -Rejected | DATE APPROVED | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 66 | Completed non-hazardous waste manifests submitted daily | SECTION 31 23 16 EXCAVATION | 1.02 C, 3.06 C, 3.06 H | I | Daily | | | |
| 67 | Inspection or testing results for existing systems | SECTION 32 10 01 SITE RESTORATION | 1.01 A, 1.03 | A | After each property - updates with Final | | | |
| 68 | Manufacturer's Instructions or data sheets for replacement materials | SECTION 32 10 01 SITE RESTORATION | 1.01 B | I | Initial | | | |
| 69 | Samples | SECTION 32 10 01 SITE RESTORATION | 1.01 B | I | After each property - updates with Final | | | |
| 70 | Earthwork Subcontractor shall identify borrow source(s) for general backfill and topsoil for sampling and approval by Contractor for Chemical and gradation Analysis | SECTION 32 91 13 TOPSOIL PREPARATION | 1.04 A.1 | A | Initial plus updates | | | |
| 71 | Earthwork Subcontractor compaction test results | SECTION 32 91 13 TOPSOIL PREPARATION | 1.05 B, 3.03 | A | After each property - updates with Final | | | |
| 72 | Product labels/data sheets | SECTION 32 92 00 TURF AND GRASSES | 1.04 A. | I | Once - initial | | | |
| 73 | Certification of sod; include source and harvest date of sod, and sod seed mix | SECTION 32 92 00 TURF AND GRASSES | 1.04 B.1, 2.02 B | A | Once - initial | | | |
| 74 | Watering plan and schedule, identifying labor, equipment and materials to be used. | SECTION 32 92 00 TURF AND GRASSES | 1.04 B.2, 1.08, 2.01, 3.03 | A | Once initial plus updates | | | |
| 75 | Daily Log of Watering Activities including date and weather conditions, and for each property indicate times for start and end of watering and approximate volume of water delivered to property. | SECTION 32 92 00 TURF AND GRASSES | 3.03 E | A | After each watering event | | | |
| 76 | Pre-Selected Plant materials source list: subcontractor shall develop and submit a list of trees, shrubs and perennials that are readily available at local nurseries and appropriate for the region with the recommended available sizes | SECTION 32 93 00 TREES, SHRUBS, AND PERENNIALS | 1.03 A.1, 2.01 | A | Once - initial | | | |
| 77 | Product data on manufactured products specified | SECTION 32 93 00 TREES, SHRUBS, AND PERENNIALS | 1.03 A.2 | A | Once - initial | | | |
| 78 | Maintenance Data: Instructions for storage, planting, fertilizing, care, and maintenance of each type of plant for 1 year period in climate and location of the Project | SECTION 32 93 00 TREES, SHRUBS, AND PERENNIALS | 1.03 B.1, 1.06 A and B, 3.08 A | I | Once - initial | | | |
| 79 | Special Warranty | SECTION 32 93 00 TREES, SHRUBS, AND PERENNIALS | 1.03 B.2, 1.05 | I | Initial - Prior to work | | | |

Note: This submittal register is intended to include all contractor submittals included in the technical specifications and drawings. It does not necessarily include all contractually-required submittals and may not include all of the technical submittals due to subsequent changes to the contract documents or inadvertent omission.

# Appendix B
# Air Monitoring Plan

# Air Monitoring Plan

## Velsicol Chemical Corporation/Pine River Superfund Site Phase 2 Adjacent or Nearby Properties, Operable Unit 1, St. Louis, Michigan WA No. 164-RDRD-0532/Contract No. EP-S5-06-01

Updated: March 7, 2014

# Scope of Work

Personal and perimeter air sampling for dichlorodiphenyl trichloroethane (DDT) and real-time particulate air monitoring will be performed during Phase 2 excavation activities at the Velsicol Chemical Corporation Adjacent or Nearby Properties (ANP) site. The earthwork subcontractor (herein referred to as "subcontractor") will be responsible for collecting personal air samples from subcontractor staff and perimeter air samples at residential and commercial properties during excavation activities as required by this sampling plan, CH2M HILL's health and safety plan, the subcontractor's health and safety plan, and any applicable federal, state, or local regulations. The subcontractor is also responsible for conducting real-time and integrated dust monitoring during intrusive activities at each property, beginning with excavation and continuing through backfill and topsoil placement, and also on the former plant site (FPS) during soil stockpiling and waste disposal activities. CH2M HILL will collect personal air samples for DDT monitoring from CH2M HILL personnel. Air sampling procedures are described in greater detail in the following sections.

# Personal Air Sampling

## Sampling Approach

During excavation activities, personal DDT monitoring will be conducted on the employee (one per day) working within or near the property excavation with the greatest potential exposure. The employee will wear a personal sampling pump and will have a sample collected for laboratory analysis to determine personal exposure to DDT. The sampling results will be representative of the worst-case exposure that may occur to receptors outside the excavation, such as residents or pedestrians, from a given excavation. All samples will be collected and analyzed in accordance with the National Institute of Occupational Safety and Health (NIOSH) Method S274 "DDT" or equivalent, and analyzed by a laboratory accredited by the American Industrial Hygiene Association (AIHA) for that method. Normal turn-around on laboratory analysis of the samples is expected.

Based on the results of the first week of personal air sampling, the sampling plan will be reviewed to evaluate the effectiveness of the monitoring for the remainder of the field event. Factors to be considered include (1) results of the first round of personal air sampling, (2) level of soil contamination anticipated in future excavations based on previous soil sampling data, (3) soil conditions (wetness) anticipated, (4) level of work activity anticipated, and (5) correlation of real-time dust monitoring with actual personal air sampling results obtained.

## Sampling Method

Personal air samples will be collected in accordance with NIOSH Method S274 using a 37-mm cellulose ester membrane filter. A calibrated sampling pump will draw a representative air sample from the employee's breathing zone through the filter and collect particulates on the filter. The calibrated sampling pumps will sample within ± 5 percent of the recommended flow rate of 1.5 L/min. Samples will be collected for a 1-hour period (or dependent upon equivalent method) representative of worst-case exposure potential, resulting in

a total air volume of approximately 90 L. Sample collection time and volume will be recorded in accordance with the referenced NIOSH method. Normal turnaround on the laboratory analysis of samples is expected.

# Perimeter Air Sampling

## Sampling Approach

Perimeter air samples for DDT will be collected at two locations per property during excavation activities and at three locations at the FPS during stockpiling activities. Locations will be selected to evaluate both ambient and downwind levels. The sampling pumps may be placed on the dust monitoring tripods.

## Sampling Method

Perimeter air samples will be collected in accordance with NIOSH Method S274. A known volume of the air will be drawn through a 37-mm mixed-cellulose ester filter, and particulates will be collected on the filter using a calibrated personal sampling pump. The calibrated sampling pumps will sample within ± 5 percent of the recommended flow rate of 1.5 L/min. Samples will be collected for a 1-hour period (or dependent upon equivalent method) representative of worst-case exposure potential, resulting in a total air volume of approximately 90 L. Sample collection time and volume will be recorded in accordance with the referenced NIOSH method. Normal turn-around on laboratory analysis of samples is expected.

# Real-Time Perimeter Dust Monitoring

## Sampling Approach

Real-time dust monitoring will be performed using MIE DataRAM 4000 dust monitors, or equivalent, throughout the duration of intrusive activities beginning with excavation and continuing through backfill and topsoil placement at each property on the Velsicol ANP Site (two monitoring points). Dust monitoring also will be conducted during stockpiling and waste soil handling activities, which is expected to occur daily (three monitoring points).

Each day, a subcontractor representative will place a DataRAM in a location upwind of the property, representing background (ambient) conditions. At the discretion of the subcontractor representative, a DataRAM will be placed at a location to verify effectiveness of engineering controls in minimizing dust that might leave the construction activity exclusion zone. DataRams will be placed at three locations at the FPS (one upwind, two downwind) to record background readings and to verify effectiveness of engineering controls in minimizing dust generation that might leave the FPS. Dust readings will be recorded once per minute, along with a brief description of the activity taking place.

The DataRAM results will be downloaded each day so that the fluctuations in total dust concentrations can be observed. Alarm will be set at 0.150 milligram per cubic meter and at no time will exceed 1.5 milligrams per cubic meter. The subcontractor is responsible for submitting air monitoring data daily to CH2M HILL for real-time particulates.

# Notification of Personal and Perimeter Air Monitoring Results

The analytical laboratory will submit DDT sample results directly to the subcontractor for each of its personnel included in the air sampling program. The subcontractor must comply with OSHA standards 1910.120 and 1910.1026 regarding employee notification and recordkeeping requirement, and provide CH2M HILL with a monthly summary of personal and perimeter DDT results and real-time notification of exceedances.

# Recordkeeping

Documentation of air monitoring and air sampling must be retained as part of the project file and include the following:

- Calibration and IH sampling logs
- Instrument readings
- Weather conditions
- Description of activities, including external occurrences that may influence readings (vehicle traffic, etc.)
- Sample location (breathing zone, headspace)
- Operator's name and signature
- Date and time of sample
- Analytical results, including data from the laboratory and weekly Subcontractor summaries
- Field quality manager initial or signature, and date of review

# Appendix C
## Forms

CH2MHILL

# *SUBCONTRACT CLARIFICATION/ INTERPRETATION REQUEST*

CCIR NO: _____

_____

PROJECT: _____ PROJECT NO: _____

SUBCONTRACTOR: _____

Clarification/Interpretation Initiated By: _____

Regarding: Plan Sheet _____ of ____ Spec. Section: _____

**Description:**

_____
Prepared by

_____
Date

**Response Assigned to:**

_____
Signed

_____
Date

REV 10/95
FORM 270

| | |
|---|---|
| **FORM NO.** | 273 |
| **TITLE:** | Change Order |
| **PURPOSE:** | Provides contractual means for ordering modifications to the subcontract documents. |
| **PREPARED BY:** | Contractor or owner |
| **DIRECTED TO:** | Subcontractor |
| **COPIES TO:** | Contractor, owner, resident project representative |
| **COMMENTS:** | All revisions to the subcontract documents involving changes to the subcontract cost or subcontract times must be documented using this form. |

CH2MHILL

# *CHANGE ORDER*

CHANGE ORDER NO.[1]: _____

TO SUBCONTRACTOR: _____

PROJECT: _____ PROJECT NO: _____

OWNER: _____

CONTRACTOR: _____

**The following modification(s) to the Subcontract are hereby ordered (use additional pages if required):**

**Reason for Modification(s):**

**Attachments (List Supporting Documents):**

| Subcontract Amount or Price | | Subcontract Times (Calculate Days) | |
|---|---|---|---|
| Original | $ _____ | Original Duration | _____ Days |
| Previous Change Order(s) (Add/Deduct) | $ _____ | Previous Change Order(s) (Add/Deduct) | _____ Days |
| This Change Order (Add/Deduct) | $ _____ | This Change Order (Add/Deduct) | _____ Days |
| Revised Subcontract Amount | $ _____ | Revised Subcontract Time | _____ Days |

The Revised Subcontract Completion Date is:

_____ , _____

| Owner | Subcontractor | Contractor |
|---|---|---|
| By: _____ | By: _____ | By: _____ |
| Date: _____ | Date: _____ | Date: _____ |

[1] Number all Change Orders consecutively.

**Copies:** Owner
Field File



REV 06/07 FORM 273

| | |
|---|---|
| **FORM NO.** | 275 |
| **TITLE:** | Field Order |
| **PURPOSE:** | Orders minor revisions to the subcontract documents that do not involve changes in the subcontract price or subcontract times. |
| **PREPARED BY:** | Contractor |
| **DIRECTED TO:** | Subcontractor |
| **COPIES TO:** | Owner, resident project representative |
| **COMMENTS:** | Use sparingly; if the revision involves changes in the subcontract price or times, either a Change Order or Written Amendment should be implemented. |

CH2MHILL

# *FIELD ORDER*

TO SUBCONTRACTOR: _____ FIELD ORDER NO: _____

PROJECT: _____ PROJECT NO: _____

OWNER: _____

CONTRACTOR: _____

The following minor changes in the work have been ordered and authorized:

**Description of Changes:**

**Reason for Field Order:**

**Reference Drawing sheets and section(s) or detail(s):**

**Reference Specification section(s)/paragraph(s):**

The intent of this Field Order is to authorize minor variations to the Subcontract Documents not involving a change in Subcontract Price or Subcontract Times and which are compatible with the design concept of the completed Project. This Field Order is binding upon OWNER and also on SUBCONTRACTOR who will perform the work promptly. If OWNER or SUBCONTRACTOR believes an adjustment to the Subcontract Price or Subcontract Times is necessary, the party may make a claim therefore in accordance with the General Conditions.

Issued by Contractor:

By: _____
Authorized Representative

Date: _____

Subcontractor Receipt Acknowledgement:

By: _____

Title: _____

Date: _____

**Copy:**
1. Owner
2. Field File

CH2MHILL

# TRANSMITTAL OF SUB CONTRACTOR'S SUBMITTAL

(ATTACH TO EACH SUBMITTAL)

DATE: _____

**TO**: _____

_____

_____

_____

_____

Submittal No.: _____

☐ New Submittal ☐ Resubmittal

Project: _____

Project No.: _____

Specification Section No.: _____

**(Cover only one section with each transmittal)**

**FROM**: _____

Subcontractor

_____

_____

_____

Schedule Date of Submittal:

_____

**SUBMITTAL TYPE:** ☐ Shop Drawing ☐ Sample ☐ Informational

**The following items are hereby submitted:**

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

# *ROUTING OF SUBCONTRACTOR'S SUBMITTALS*

DATE: _____ PROJECT NO: _____

PROJECT: _____

SUBCONTRACTOR: _____

SUBMITTAL NO: _____

DATE OF SUBCONTRACTORS SUBMITTAL: _____

Is Hereby Transmitted For Action: _____

Item: _____

Specification Action: _____

| To | Initials & Date | Hours | Target Date |
|---|---|---|---|
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**Comments:**

**Copies:**

**Copies:**
1. Retained at Resident Inspector's office.
2. To Project Manager with diary sheet for the day.
3. To Subcontractor's Representative.

# *SUBMITTAL REVIEW COMMENTS*

CH2MHILL

**DATE:** _____ **PROJECT:** _____

**SUBMITTAL NO.:** _____ **PROJECT NO.:** _____

**SPEC SECTION:** _____ **REVIEWER NAME:** _____

**DESCRIPTION:** _____ **PAGE:** _____

**SUBMITTAL TYPE:** ☐**SHOP DRAWING** ☐**SAMPLE** ☐**INFORMATION**

| | |
|---|---|
| ☐ 1. APPROVED | ☐ 5. REVISE & RESUBMIT - Resubmittal required |
| ☐ 2. APPROVED AS NOTED | ☐ 6. NOT SUBJECT TO REVIEW |
| ☐ 3. PARTIAL APPROVAL – RESUBMIT AS NOTED Resubmittal required | |

| NO. | COMMENT | RELATED SPEC PARA./ DRAWING # |
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|---|---|
| **FORM NO.** | 442 |
| **TITLE:** | Defective/Rejected Work Notification |
| **PURPOSE:** | Written notice of deficiencies or rejection of work and a demand for corrective action. |
| **PREPARED BY:** | Contractor or resident project representative |
| **DIRECTED TO:** | Subcontractor |
| **COPIES TO:** | Owner, contractor |
| **COMMENTS:** | Description should contain accurate locations and specification references. The document may figure strongly in later contractor claims. EJCDC General Conditions require that “deficiencies” in the work be corrected; while “rejected” work must be removed and replaced. |

CH2MHILL

# *DEFECTIVE/REJECTED WORK NOTIFICATION*

TO SUBCONTRACTOR: _____ NOTIFICATION NO: _____

PROJECT: _____ PROJECT NO: _____

OWNER: _____ TIME: _____ AM/PM

CONTRACTOR: _____ OBSERVER: _____

Pursuant to the GENERAL CONDITIONS of the Contract, you are hereby notified of the following noncompliance violation:

Specification Section: _____ Paragraph: _____

**Violation:**

**Subcontract Requirement:**

Violation Detected by: ☐ Test ☐ Inspection ☐ Observation

Noncompliance Work is: ☐ Defective ☐ Rejected

Estimated Value of Noncomplying Work: $ _____

Defective work shall be corrected. Rejected work shall be removed and replaced. All costs shall be borne by the Subcontractor. Payment will not be made for defective or rejected work. Subcontractor shall notify Contractor when defective or rejected work is corrected.

Received by:

Contractor: _____
Authorized Representative

_____
Subcontractor

Date: _____

_____
Title

_____
Date

**Distribution:**
1. Contractor
2. Owner
3. Field File

CH2MHILL

# *DEFECTIVE/REJECTED WORK NOTIFICATION LOG*

PAGE: 1

PROJECT: _____ PROJECT NO: _____

SUBCONTRACTOR: _____

| Notification Number | Date | Spec Section | Defective/Rejected Work | Accepted | |
|---|---|---|---|---|---|
| | | | | By | Date |
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# *NOTIFICATION OF CORRECTION OF DEFECTIVE/REJECTED WORK*

TO SUBCONTRACTOR: _____ PREVIOUS NOTIFICATION NO: _____ DATE: _____

PROJECT: _____ PROJECT NO: _____

OWNER: _____

CONTRACTOR: _____

The below listed Defective/Rejected work has been reinspected and the results of the Subcontractor's corrective actions have placed the work in compliance with the Subcontract Documents.

**Description of Violation:**

**Description of Correction:**

Contractor: _____
Authorized Representative

Date: _____

**Distribution:**
1. Contractor
2. Owner
3. Field File

CH2MHILL

# *PHOTO RECORD FILE INDEX*

ROLL NO: _____

PERIOD FROM: _____ TO _____ 20 ___

PROJECT: _____ PROJECT NO: _____

PREPARED BY: _____

| Picture Number | Photo Description/Location | Date | Daily Log Number |
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| *CH2M HILL*<br>**Contract No. EP-S5-06-01** | **DAILY REPORT** | DATE OF REPORT:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|

| | | | |
|---|---|---|---|
| TO NO: | Proj No.: | **TASK**: | REPORT NO: |
| CONST MGR:: | | FIELD QC MANAGER: | SITE SAFETY COORD: |
| AM WEATHER: | | PM WEATHER: | MAX TEMP: F / MIN TEMP: F |

**SUMMARY OF WORK PERFORMED TODAY**

**JOB SAFETY**

| | | |
|---|---|---|
| Was A Job Safety Meeting Held This Date? | ☐ Yes ☐ No | **TOTAL WORK HOURS ON JOB SITE THIS DATE** (Including Continuation Sheets) |
| Were there any lost-time accidents this date? (If Yes, attach copy of completed OSHA report) | ☐ Yes ☐ No | CH2M HILL On-Site Hours |
| Was a Confined Space Entry Permit Administered This Date? (If Yes, attach copy of each permit) | ☐ Yes ☐ No | |
| Was Crane/Manlift/Trenching/Scaffold/HV Elec/High Work/Hazmat Work Done?? (If Yes, attach statement or checklist showing inspection performed) | ☐ Yes ☐ No | Subcontractor On-Site Hours |
| | | **Total On-Site Hours This Date** |
| Was Hazardous Material/Waste Released into the Environment? (If Yes, attach description of incident and proposed action) | ☐ Yes ☐ No | Cumulative Total of Work Hours From Previous Report |
| | | Total Work Hours From Start of Construction |

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

**EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB**

| DESCRIPTION OF EQUIPMENT/MATERIAL RECEIVED | MAKE/ MODEL/ MANUFACTURER | EQUIPMENT/ LOT NUMBER | INSPECTION PERFORMED BY | NUMBER/ VOLUME/ WEIGHT |
|---|---|---|---|---|
| | | | | |
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**EQUIPMENT USED ON JOB SITE TODAY.**

| EQUIPMENT DESCRIPTION | EQUIPMENT MAKE/MODEL | SAFETY CHECK PERFORMED BY | NUMBER OF HOURS | | |
|---|---|---|---|---|---|
| | | | USED | IDLE | REPAIR |
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**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

**VISITORS TO THE SITE:**

**LIST OF ATTACHMENTS** (OSHA report, confined space entry permit, incident reports, etc.):

**SAFETY REQUIREMENTS HAVE BEEN MET** ☐

CONSTR MGR SIGNATURE _____ DATE _____

| *CH2M HILL*<br>**Contract No. EP-S5-06-01** | **DAILY REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | DATE OF REPORT:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|

**LABOR SUMMARY**

| EMPLOYEE | EMPLOYER | TITLE/TRADE | WORK PERFORMED | HRS |
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*INCLUDE ALL PERSONNEL WORK HOURS IN THE TOTAL WORK HOURS ON JOB SITE*

CONSTR MGR SIGNATURE

DATE

| *CH2M HILL*<br>**Contract No. EP-S5-06-01** | **DAILY REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|

## DEFINABLE FEATURES OF WORK STATUS

| DFOW No. | Definable Feature Of Work | Preparatory | Initial | Follow-Up |
|---|---|---|---|---|
| 1 | | ☐ | ☐ | ☐ |
| 2 | | ☐ | ☐ | ☐ |
| 3 | | ☐ | ☐ | ☐ |
| 4 | | ☐ | ☐ | ☐ |
| 5 | | ☐ | ☐ | ☐ |
| 6 | | ☐ | ☐ | ☐ |
| 7 | | ☐ | ☐ | ☐ |
| 8 | | ☐ | ☐ | ☐ |
| 9 | | ☐ | ☐ | ☐ |
| 10 | | ☐ | ☐ | ☐ |
| 11 | | ☐ | ☐ | ☐ |
| 12 | | ☐ | ☐ | ☐ |
| 13 | | ☐ | ☐ | ☐ |
| 14 | | ☐ | ☐ | ☐ |
| 15 | | ☐ | ☐ | ☐ |

**PREPARATORY**

WAS PREPARATORY PHASE WORK PERFORMED TODAY? ☐ YES ☐ NO

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

| DFOW No.(from list above). | TASK/ACTIVITY | PREPARATORY PHASE REPORT NO. |
|---|---|---|
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## INITIAL AND FOLLOW-UP FEATURE OF WORK COMMENTS

| DFOW No.(from list above) | Phase | Comment/Finding/Action |
|---|---|---|
| | Initial ☐<br>Follow up ☐ | |
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| **REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)** | | | **REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)** | |
|---|---|---|---|---|
| TASK/ACTIVITY | DATE ISSUED | DESCRIPTION | TASK/ACTIVITY | CORRECTIVE ACTION(S) TAKEN |
| | | | | |
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| *CH2M HILL*<br>**Contract No. EP-S5-06-01** | **DAILY REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|

**SAMPLING/TESTING PERFORMED**

| SAMPLING/TESTING PERFORMED | SAMPLING/TESTING COMPANY | SAMPLING/TESTING PERSONNEL |
|---|---|---|
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**MATERIALS/EQUIPMENT INSPECTION (Materials received and inspected against specifications)**

| MATERIAL/EQUIPMENT DESCRIPTION | SPECIFICATION | MATERIAL ACCEPTED? | COMMENT/REASON/ACTION |
|---|---|---|---|
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |

**SUBMITTALS INSPECTION / REVIEW**

| SUBMITTAL NO | SUBMITTAL DESCRIPTION | SPEC/PLAN REFERENCE | SUBMITTAL APPROVED? | COMMENT/REASON/ACTION |
|---|---|---|---|---|
| | | | YES ☐ NO ☐ | |
| | | | YES ☐ NO ☐ | |
| | | | YES ☐ NO ☐ | |
| | | | YES ☐ NO ☐ | |

**OFF-SITE SURVEILLANCE ACTIVITIES, INCLUDING ACTIONS TAKEN**:

**ACCUMULATION/STOCKPILE AREA INSPECTION**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INSPECTION PERFORMED BY: | | | | SIGNATURE OF INSPECTOR: | | | |
| ACCUMULATION/ STOCKPILE AREA LOCATION | | | | | | | |
| NO OF CONTAINERS: | | NO OF TANKS: | | NO OF ROLL-OFF BOXES: | | NO OF DRUMS: | |

INSPECTION RESULTS:

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY/QUANTITIES:**

**GENERAL COMMENTS** (rework, directives, etc.):

**LIST OF ATTACHMENTS** (examples, as applicable: preparatory phase checklist, QC meeting minutes, safety meeting minutes, crane inspections, crane operation checklist, COCs, weight tickets, manifests, profiles, testing plan and log, etc.):

*On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.*

FIELD QC MANAGER'S SIGNATURE DATE

*On behalf of the contractor, I attest that the work for which payment is requested, including stored material, is in compliance with contract requirements.*

FIELD QC MANAGER'S SIGNATURE DATE

TESTING PLAN & LOG ES-P6-05

456991.FD.01
USEPA Region 5
Construction Quality Assurance Plan
Velsicol Chemical Corp Superfund Site ANP Phase 2A
St. Louis, MI

| Line No. | Reference | Test Required | Date Sampled | Sampled By | Tested By | Location of Test (on-site/ off-site) | Frequency | Date Test Completed | Remarks |
|---|---|---|---|---|---|---|---|---|---|
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TESTING PLAN & LOG ES-P6-05

456991.FD.01
USEPA Region 5
Construction Quality Assurance Plan
Velsicol Chemical Corp Superfund Site ANP Phase 2A
St. Louis, MI

| Line No. | Reference | Test Required | Date Sampled | Sampled By | Tested By | Location of Test (on-site/ off-site) | Frequency | Date Test Completed | Remarks |
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# *Field Critical Inspection Log*

CH2MHILL Constructors, Inc.

**Velsicol Chemical Corporation Superfund Site - Phase 2A Adjacent or Nearby Properties Soil Remediation**

**(Project No. 456991)**

**Property Addresses and Date Remedial Action Completed ([✓] inspection passed)**

| | Onsite Daily Inspection Activities | 203 North Delaware Street | 217 North Delaware Street | 313 North Street | 402 West Center Street | 422 West Washington Street | Issues (Y/N) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | Pre-Construction Meeting Completed and Property Owner Agreement Signed | | | | | | | |
| 2 | Access Agreement Signed | | | | | | | |
| 3 | Pre-Construction Survey Completed | | | | | | | |
| 4 | Utility Locate Requested | | | | | | | |
| 5 | Utility Locate Completed | | | | | | | |
| 6 | Site Preparation, including installation of protection measures and | | | | | | | |
| 7 | Clearing Completed | | | | | | | |
| 8 | Property Specific Air Monitoring | | | | | | | |
| 9 | Start of Excavation | | | | | | | |
| 10 | Excavation Completed | | | | | | | |
| 11 | Post-Excavation Survey Completed | | | | | | | |
| 12 | Start of Backfill | | | | | | | |
| 13 | Backfill Completed | | | | | | | |
| 14 | Post-Construction Survey Completed | | | | | | | |
| 15 | Restoration | | | | | | | |
| 16 | Final Street Cleaning | | | | | | | |
| 17 | Removal of Temporary Controls | | | | | | | |

## *Field Critical Inspection Log*

CH2MHILL Constructors, Inc.

**Velsicol Chemical Corporation Superfund Site - Phase 2A Adjacent or Nearby Properties Soil Remediation**

**(Project No. 456991)**

**Property Addresses and Date Remedial Action Completed ([✓] inspection passed)**

| | Onsite Daily Inspection Activities | 203 North Delaware Street | 217 North Delaware Street | 313 North Street | 402 West Center Street | 422 West Washington Street | Issues (Y/N) | Comments |
|---|---|---|---|---|---|---|---|---|
| 18 | Spring Landscaping | | | | | | | |
| 19 | Watering Period | | | | | | | |
| | Watering 1 | | | | | | | |
| | Watering 2 | | | | | | | |
| | Watering 3 | | | | | | | |
| | Watering 4 | | | | | | | |
| | Watering 5 | | | | | | | |
| | Watering 6 | | | | | | | |
| | Watering 7 | | | | | | | |
| | Watering 8 | | | | | | | |
| 20 | Punch list Inspection | | | | | | | |
| 21 | Punch list Completion | | | | | | | |
| 22 | Post-Construction Meeting | | | | | | | |
| 23 | Property Owner Signoff | | | | | | | |

# *MONTHLY SUMMARY OF CONSTRUCTION ACTIVITIES*

DATE: _____

PROJECT: _____ PROJECT NO: _____

SUBCONTRACTOR: _____

SUBCONTRACT AMOUNT: _____ AMOUNT THIS PERIOD: _____

AMOUNT TO DATE: _____ % COMPLETE: _____

**WORK PROGRESS**

**Current:**

**Projected:**

**Delivery Problems and/or Delays. Corrective Action Taken:**

**Potential Modifications:**

**Potential Claims:**

_____
CH2M HILL, Inc.

# Waste Tracking Log

| TO No | Project No | Project Name | Site Description | Container Type | Container Desig. | Waste Profile Sample No | Sub-contractor | Transporter | Date Transported | Transporter EPA ID | Load ID | Disposal Facility | Disp Fac EPA ID | Media | Waste Type (Haz, Nonhaz, TSCA) | Waste Code/ Haz Waste No | Disposal Date | Manifest Number | Disposal Treatment Method (Enter disposal quantity under appropriate method) | | | | | Certif of Disp/ Destruc Date | Comments/ Notes | File Status (see note) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | Incineration | Recycle | Landfill | Other | Unit | | | |
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**Checklist for Michigan Permit-by-Rule for Construction Activities Requirements**
**OU1 ANP Phase 2A Remedial Action**
**Velsicol Chemical Site - St. Louis, Michigan**
**October 10, 2013**

| Permit Requirements | Applicable? | Notification to Agency? | Calendar-Based Action item? | Requirement Location (if applicable) |
|---|---|---|---|---|
| (1) (a) File with the department, on a form approved by the department, notice of coverage pursuant to the provisions of this rule before the initiation of construction activity. | No; Administrative | Yes | No | N/A |
| (1) (a) (i) Notice of coverage shall include a copy of the individual soil erosion and sedimentation control permit for the site as issued to the construction permittee; or if the construction activity is to be carried out by an authorized public agency, certification by the authorized public agency that an approved control plan exists; or, for part 615 or part 631 permits, a copy of the permit, along with any forms or diagrams pertaining to soil erosion and sedimentation control that were part of the permit application. | No; Administrative | Yes | No | N/A |
| (1) (a) (ii) Notice of coverage shall include acknowledgement by the construction permittee that any discharge that is made pursuant to the provisions of this rule shall be in compliance with part 31 of the act and the rules promulgated there under. | No; Administrative | Yes | No | N/A |
| (1) (a) (iii) Notice of coverage shall include a location map and a description of the nature of the construction activity. | No; Administrative | Yes | No | N/A |
| (1) (a) (iv) Notice of coverage shall include the location of the proposed discharge and identification of the receiving water. | No; Administrative | Yes | No | N/A |
| (1) (a) (v) Notice of coverage shall include the total area of the site and the area of the site that is expected to undergo construction activity during the life of the project. | No; Administrative | Yes | No | N/A |
| (1) (a) (vi) Notice of coverage shall include name and certification number of a certified storm water operator responsible for inspection of the construction activity in accordance with subrule (2)(e) of this rule. | No; Administrative | Yes | No | N/A |
| (1) (b) Provide a valid signature of the construction permittee or authorized representative on the notice of coverage. If the construction permittee is a partnership, association, corporation, industry, municipality, state agency, or interstate body, the valid signatory for the notice of coverage shall be determined in accordance with R 323.2114. | No; Administrative | Yes | No | N/A |
| (2) (a) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall not directly or indirectly discharge wastes such as discarded building materials, concrete truck washout, chemicals, lubricants, fuels, litter, sanitary waste, or any other substance at the construction site into the waters of the state in violation of part 31 of the act or rules promulgated there under. | Yes | No | No | Prohibited in spec. section 01 50 00, 3.04 C 2. |
| (2) (b) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall be in compliance with a soil erosion and sedimentation control permit for the site or, if the construction activity is carried out by an authorized public agency, the approved control plan, including the selected control measures that are applicable to the site. | Yes | No | No | Compliance with SESC Plan required in spec. section 01 50 00, 3.04 C 1. |
| (2) (c) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall properly maintain and operate the soil erosion control measures. | Yes | No | No | SESC Plan - section 3.1 |

**Checklist for Michigan Permit-by-Rule for Construction Activities Requirements**
**OU1 ANP Phase 2A Remedial Action**
**Velsicol Chemical Site - St. Louis, Michigan**
**October 10, 2013**

| Permit Requirements | Applicable? | Notification to Agency? | Calendar-Based Action item? | Requirement Location (if applicable) |
|---|---|---|---|---|
| (2) (d) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall have the soil erosion control measures under the specific supervision and control of a storm water operator who has been certified by the department as properly qualified to operate the soil erosion control measures. The certification shall be done in accordance with the requirements of R 323.1251 et seq. [For the Velsicol OU1 ANP Phase 2A RA, the certified storm water operator will be employed by the earthwork subcontractor.] | Yes | No | No | SESC Plan - section 3.3 |
| (2) (e) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall cause the construction activity to be inspected by a certified storm water operator once per week, and within 24 hours after every precipitation event that results in a discharge from the site, and ensure that any needed corrective actions are carried out. A log of the inspections and corrective actions shall be maintained on file by the construction permittee for review and shall be retained by the construction permittee for a period of 3 years from the date of the inspection or corrective action. | Yes | No | Yes | SESC Plan - section 5.1 |
| (2) (f) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall, in accordance with the requirements for on-land facilities as set forth in spillage of oil and polluting materials, being part 5 of these rules, provide facilities and comply with reporting procedures for containment of any accidental losses of oil or other polluting materials. | Yes | No | No | Required to be addressed in site-specific HASP as described in spec. section 01 11 00 1.07 D 2 i. |
| (2) (g) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall dispose of solids, sediment, filter backwash, or other waste that is removed from or results from the treatment or control of storm water in compliance with applicable state laws and regulations and in a manner that prevents any waste from entering waters of the state. | Yes | No | No | |
| (2) (h) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall allow the department to enter upon the site at any reasonable time before the expiration of the authorization to discharge as set forth in subrule (5) of this rule, upon presentation of credentials and other documents as may be required by law, for the purpose of inspecting conditions relating to the pollution of any waters or determining compliance with the provisions of this rule. | Yes | No | No | CH2M HILL will maintain control of site and will permit agency access as requested. |
| (2) (i) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall, upon request, make available for public inspection or provide to the department all reports or logs prepared pursuant to the provisions of this rule. | Yes | No | No | CH2M HILL will provide information from daily reports and earthwork subcontractor daily reports as requested. |
| (2) (j) A construction permittee that has authorization to discharge under a national permit pursuant to subrule (1) of this rule shall file a revised notice of coverage in compliance with the provisions of subrule (1) of this rule before any expansion of the construction activity or change in the soil erosion control measures that requires a change in the soil erosion and sedimentation control permit. | No; Administrative | No | No | N/A |

**Checklist for Michigan Permit-by-Rule for Construction Activities Requirements**
**OU1 ANP Phase 2A Remedial Action**
**Velsicol Chemical Site - St. Louis, Michigan**
**October 10, 2013**

| Permit Requirements | Applicable? | Notification to Agency? | Calendar-Based Action item? | Requirement Location (if applicable) |
|---|---|---|---|---|
| (3) The department may require that discharges from a construction activity be authorized by an individual national permit if it has been determined by the department that unlawful pollution cannot be adequately guarded against, and there is or may be water quality degradation that will violate the commission act unless requirements in addition to those in the soil erosion and sedimentation control permit are imposed. A determination by the department for an individual national permit or other additional control constitutes grounds for revocation of the authorization to discharge pursuant to the provisions of this rule. | No; Administrative | No | No | N/A |
| (4) The department may require that discharges from a construction activity be authorized by an individual national permit if it has been determined by the department that the responsible part 91 permitting entity or authorized public agency is not carrying out a program that is adequate to ensure that the requirements of part 91 of the act are complied with. | No; Administrative | No | No | N/A |
| (5) (a) The authorization to discharge pursuant to the provisions of this rule expires when the soil erosion and sedimentation control permit expires, or is revoked or terminated by the part 91 permitting entity in accordance with the provisions of part 91 of the act and 1969 PA 306, MCL 24.201 et seq., or when the authorized public agency determines that the project has been completed by the stabilization of earth change activity. | No; Administrative | No | No | N/A |
| (5) (b) The authorization to discharge pursuant to the provisions of this rule expires five years from the date of the notice that is filed pursuant to the provisions of subrule (1)(a) of this rule, if the authorization to discharge has not previously expired pursuant to subdivision (a) of this subrule. This authorization may be extended by filing a new notice in compliance with the provisions of subrule (1)(a) of this rule. The construction permittee shall file a notice of termination with the department, on a form approved by the department, when authorization to discharge expires as set forth in accordance with subdivision (a) of this subrule. The notice of termination shall include the name and address of the construction permittee, the location of the construction site, and the mailing address, if available, and certification that stabilization of earth change activity has been completed or, if the certification cannot be made, the reason why the authorization to discharge has expired. | No; Administrative | No | No | N/A |
| (6) The department may revoke authorization to discharge pursuant to the provisions of this rule if an individual national permit is required pursuant to the provisions of subrule (3) of this rule or in compliance with R 323.2159. | No; Administrative | No | No | N/A |
| (7) Nothing in this rule shall be construed to preclude the institution of any legal action or relieve the construction permittee from any responsibilities, liabilities, or penalties to which the construction permittee may be subject pursuant to part 31 of the act or rules promulgated there under. | No; Administrative | No | No | N/A |
| (8) The provisions of this rule are severable, and if any provision of this rule or the application of any provisions of this rule to any circumstances is held invalid, the application of the provisions of this rule to other circumstances and the remainder of this rule shall not be affected by the invalidity. | No; Administrative | No | No | N/A |
| (9) The construction permittee shall take all reasonable steps to minimize any adverse impact to the surface or groundwaters of the state that result from noncompliance with any of the conditions specified in this rule. | Yes | No | No | |

**Checklist for Michigan Permit-by-Rule for Construction Activities Requirements**
**OU1 ANP Phase 2A Remedial Action**
**Velsicol Chemical Site - St. Louis, Michigan**
**October 10, 2013**

| Permit Requirements | Applicable? | Notification to Agency? | Calendar-Based Action item? | Requirement Location (if applicable) |
|---|---|---|---|---|
| (10) If, for any reason, the construction permittee does not comply with, or will be unable to comply with, any of the conditions that are specified in this rule, the construction permittee shall provide the department with the following information, in writing, within 5 days of becoming aware of the noncompliance or inability to comply: (a) A description of the noncompliance and its cause; (b) The period of noncompliance, including exact dates and times, or, if the noncompliance is not corrected, the anticipated time that the noncompliance is expected to continue and the steps taken to reduce, eliminate, and prevent recurrence of the noncompliance. | Yes | Yes | No | |
| (11) The provisions of this rule do not convey any property rights in either real or personal property, or any exclusive privileges, authorize any pollution, impairment, or destruction of the natural resources of the state, or the violation of any federal, state, or local laws or regulations, or obviate the necessity of obtaining permits or approvals from other units of government as may be required by law. | No; Administrative | No | No | N/A |
| (12) The provisions of this rule do not exempt the construction permittee from giving notice to public utilities and complying with each of the requirements of 1974 PA 53, MCL 460.701 et seq. | Yes | No | No | Required in spec. section 01 31 13 1.02 |
| (13) This rule shall not provide authorization to discharge storm water from construction activity which is mixed with non-storm water, or which is subject to an existing national permit or general permit. | Yes | No | No | Water discharge requirements in spec. section 01 50 00 3.06 |