EARTH TECH | AECOM

DRAFT FINAL
REMEDIAL ACTION WORK PLAN
NEPERA SUPERFUND SITE

Site:
Nepera Chemical Company Superfund Site
Town of Hamptonburgh
Orange County, New York 10916

Submitted to:
United States Environmental Protection Agency, Region II
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New York, New York 10007

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February 2009

Project No. 106559

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List of Acronyms and Abbreviations

AC	Alternating Current
AMP	Air Monitoring Plan
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
ccm	cubic centimeters per minute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
C:N:P	Carbon:Nitrogen:Phosphorus
CQAPP	Construction Quality Assurance Project Plan
CRA	Conestoga Rovers and Associates
deg C	degrees Centigrade
deg F	degrees Fahrenheit
HDPE	High Density Polyethylene
HSCP	Health and Safety Contingency Plan
IC	Institutional Controls
kWh	kilowatt hours
MCL	Maximum Contaminant Level
NPL	National Priority List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
PC	Project Coordinator
PFLA	Phospholipid Fatty Acid
PID	Photo ionization Detector
PM	Project Manager
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAOs	Remedial Action Objectives
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCOs	Soil Cleanup Objectives
SVE	Soil Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
TAGM	Technical and Administrative Guidance Memorandum
TICs	Tentatively Identified Compounds
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

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1.0 INTRODUCTION

This document has been prepared on behalf of the Maybrook and Harriman Environmental Trust (Trust) and presents a Remedial Design (RD) Work Plan for the design of the remedy selected by the United States Environmental Protection Agency (USEPA) to address contaminated soils and groundwater at the Nepera Superfund Site (Site) located in Hamptonburgh, Orange County, New York. The objective of this RD Work Plan is to provide the framework for developing design documents for the USEPA-selected remedy. This framework will cover the RD tasks to be performed by the Trust.

The activities described in this RD Work Plan will be conducted under an Administrative Order on Consent (AOC) for the RD.

This RD Work Plan was developed consistent with applicable USEPA guidance documents, including:

- Guidance for Scoping the Remedial Design (USEPA, 1995a);
- Remedial Design/Remedial Action Handbook (USEPA, 1995b); and
- Guidance of USEPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties (USEPA, 1990).

1.1 Project Setting

The Site is located in the Town of Hamptonburgh, Orange County, New York on the southern side of Orange County Highway 4 (Figure 1). The Site is owned by Nepera, Inc. The Site is located approximately 1.5 miles southwest of the Town of Maybrook, New York. Approximately five acres of the 29.3 acres total property area were affected by historical lagoon operations (Figure 2). The former lagoon area is currently enclosed by a perimeter fence. No buildings exist at the Site other than a temporary storage container to properly store residual wastes. Access from Orange County Highway 4 is via a gravel road to a secured waste storage area. Other prominent site features includes the fenced in former lagoon area and an abandoned railway bed. Beaverdam Brook traverses the western edge of the Site flowing north to the Otter Kill just beyond the northern edge of the Site. The Site is bounded on the north by Orange County Highway 4, Beaverdam Brook to the west, Otter Kill to the south and an undeveloped track of land to the east.

Approximately 6,500 people live within three miles of the Site. The closest residences are located approximately 250-ft, 175-ft, and 450-ft to the west, north and northeast, respectively. These residences rely on private supply wells for water. The public water supply wells for the Village of Maybrook are located approximately 800-ft to the east-northeast of the Site. The landuse in vicinity to the Site is residential and agricultural.

The Site was purchased by the Pyridium Corporation in 1952. The Site was used for wastewater disposal between 1953 and 1962 in six constructed lagoons. These lagoons were used to dispose of wastewater generated at the plant site in Harriman, New York. No wastewater disposal has taken place at the Site since December 1967. All of the lagoons were back-filled with clean soil by 1974.

The Site was placed on the National Priority List (NPL) on June 10, 1986. The Site Superfund Identification Number is NY000511451. The original remedial investigation/feasibility study (RI/FS) program was conducted in accordance with the Stipulation Agreement entered into by Nepera, Inc. and Warner-Lambert Company with the New York State Department of Environmental Conservation (NYSDEC) in March 1988. Subsequently a Consent Decree lodged in 1988 by NYSDEC superseded the Stipulation Agreement. A record of decision (ROD) for the Site executed issued by the USEPA on September 28, 2007. The AOC was logged in Federal Court with Cambrex Corporation, Nepera, Inc., Warner-Lambert Company LLC and Pfizer, Inc, on October 3, 2008.

1.2 Remedial Action Summary

This section summarizes the remedy selected in the USEPA's ROD finalized in September 2007 (USEPA, 2007). The EPA has addressed the Site contaminants as a single operable unit. The selected remedy involves remediation of the soil and groundwater. The remediation of the contaminated soil involves the excavation of the soils within the former lagoons and treatment of these soils utilizing soil vapor extraction (SVE) and biological degredation within an engineered, below-grade biocell. The remediation of groundwater involves enhanced bioremediation with oxygen enrichment as necessary within the excavation below the natural overburden water table.

The general Remedial Action Objectives (RAOs) for the Site are to:

- Prevent exposure of human health receptors to contaminated soil and groundwater;
- Minimize migration of contaminants from the soils to groundwater;
- Restore aquifer(s) to beneficial use;
- Ensure that contaminants of concern (COCs) within soil and groundwater meet acceptable levels consistent with present and future landuse; and
- Minimize potential human contact with waste constituents.

As stated in the ROD, the major components of the selected remedy to meet the RAOs include:

- Excavating contaminated soils, with levels above the NYSDEC soil cleanup objectives (SCOs), and placement within the biocell;
- Treating soils within the biocell through SVE and biological degredation to levels below NYSDEC SCOs;
- Backfilling excavated areas not utilized for the placement of the biocell with clean fill;
- Bioremediating COCs in Site groundwater through the addition of oxygenating compounds within the excavated area of the former lagoons;
- Long-term groundwater monitoring to assess the effectiveness of enhanced bioremediation of groundwater COCs;
- Implementing institutional controls (ICs) in the form of an environmental easement/restrictive covenant;
- Developing a Site Management Plan (SMP) to address post-construction soil and groundwater at the Site;
- Placing engineering controls such as fencing and signs at the Site to prevent inadvertent exposure to Site contaminants;
- Developing a contingency plan to provide for treatment of the Village of Maybrook public water supply should the water supply be impacted by Site COCs; and
- Performing reviews of the Site remedies no less than once every five years, pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

1.3 Remedial Design Objectives

The primary objective of the RD for the Site is to develop plans for implementing the USEPA-selected remedy, consistent with the ROD, and to insure that the remedy is implemented in a safe and efficient manner. Specific activities to accomplish this RD objective are to:

- Design a soil remediation program for the excavation, segregation, and treatment (i.e., below grade biocell) of soils containing COCs at levels above the cleanup standards;

- Design a groundwater remediation program for the treatment (i.e., enhanced bioremediation with monitored natural attenuation) of groundwater containing COCs at levels above cleanup standards;
- Develop design documents for the soil and groundwater treatment programs consistent with the goal of achieving performance standards specified in the ROD;
- Develop RD deliverables to allow timely execution of the remedial action program; and
- Develop an effective monitoring program, starting with the implementation of a baseline monitoring program to allow an assessment of the results of the remedy implementation (including the monitored natural attenuation component) relative to the performance standards and remedial goals established by the USEPA.

1.4 Work Plan Organization

This RD Work Plan is organized into the following sections as shown below:

Section 1 – Introduction: presents background information and project objectives
Section 2 – Remedial Design: presents the engineering design process – including a description of the various design components – and the primary deliverables.
Section 3 – Community Air Monitoring: describes how air monitoring will be performed during remedial construction
Section 4 – Sampling and Analysis: describes the type, collection and analysis of environmental samples during remedial construction
Section 5 – Remedial Design Schedule: provides the schedule for components of the RD
Section 6 – References: presents references used to prepare this RD Work Plan

In addition, the following work plans are provided as appendices to this RD Work Plan:

- *Quality Assurance Project Plan* (QAPP) describes the quality assurance/quality control (QA/QC) protocols to be followed during the construction of the remedial design;
- *Health and Safety Contingency Plan* (HSCP) describes the occupational, safety, and health program to be implemented during the construction of the remedial design;
- *Air Monitoring Plan* (AMP) describes the air monitoring program to be implemented during the construction of the remedial design; and
- *Sampling and Analysis Plan* (FSP) describes the soil and groundwater sampling and analysis program to be implemented during the construction of the remedial design.

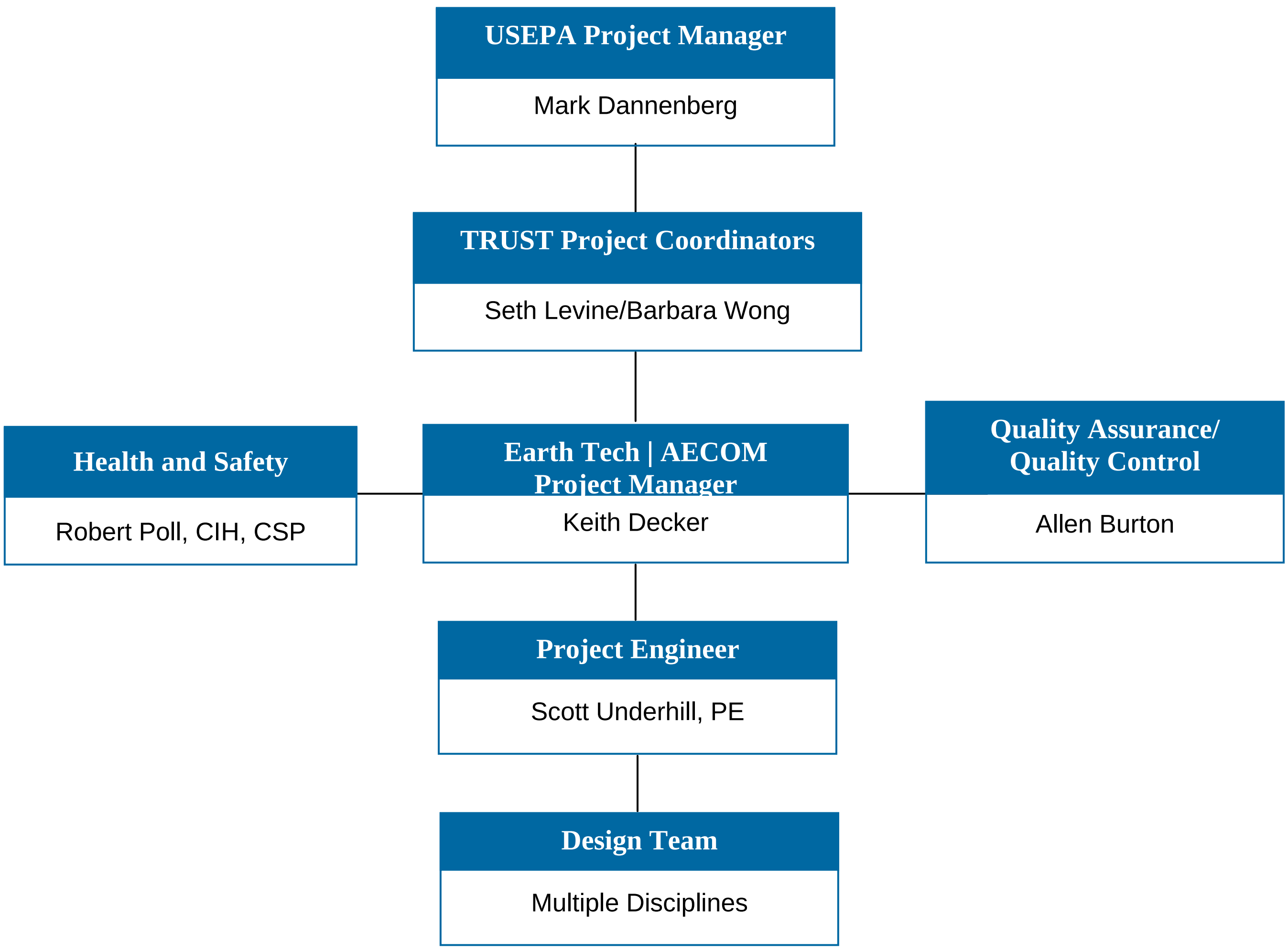
It should be noted that, outside of a property survey, no additional field activities will be performed pursuant to the RD Work Plan. The submittal of QAPP, HSCP, AMP, and SAP are intended to cover activities implemented during the remedial construction phase.

1.5 Overview of Remedial Design Process

Engineering design documents for the RD process are described in Section 5. There will be two primary stages to the remedial design: the Preliminary Design and the Final Design. The Preliminary Design stage, which will describe the conceptual frame work, sizing, and interaction of the components of the overall design, will result in the submission of a Preliminary Design Report to the USEPA. Long-lead-time equipment will be identified at this stage to facilitate timely equipment procurement. The Final Design stage will result in the submission of the Final Design Report, which will incorporate comments from the Preliminary Design and will include final plans, specifications, results from the value engineering study and plans required to initiate the remedial action (e.g., operations and maintenance (O&M) plan).

1.6 Organizational Structure and Responsibility

The implementation of the selected remedy consists of the RD stage and the remedial action (RA) stage. This project will be accomplished through the Trust, which consists of Cambrex and Pfizer. The Trust has selected Earth Tech Northeast, Inc (Earth Tech | AECOM) as the RD consultant. Further discussion about the AECOM organization can be found in the QAPP. The USEPA has full authority to approve of all RD submittal documents. The USEPA project manager (PM), Mark Dannenberg, will work directly with the Project Coordinator for the day to day management of all work to be performed on the RD. The project coordinator (PC) for this work is Seth Levine (Cambrex) as the primary with Barbara Wong (Pfizer) as the secondary. The Earth Tech | AECOM PM will be Keith Decker who will report to the PCs and the USEPA PM. The organizational chart for the RD project is shown below.



2.0 TECHNICAL APPROACH TO REMEDIAL DESIGN

This section provides the main components of the proposed remedial design treatment system for the Site. These components are the Basis of Design; limits of excavation; handling of excavated materials; biocell design components; backfilling of excavated areas; and enhanced bioremediation of the groundwater. These sections also provide the assumptions to be utilized for the design of the below grade biocell and enhanced bioremediation treatment systems.

2.1 Basis of Design

The Basis of Design evaluates current conditions at the Site in terms of geology, hydrogeology, and contamination and is summarized in a conceptual site model. Using the conceptual site model, an overall design approach of the below grade biocell and enhanced groundwater treatment systems will be combined and presented in an ‘isolation’ strategy that meets the RAOs provided in the ROD.

2.1.1 Site Geology and Hydrogeology

The two lithologic units (overburden and bedrock) at the Site are divided into three hydrogeologic units. The overburden units include a Shallow Aquifer underlain by a localized Overburden Aquitard. The Bedrock Aquifer resides in competent bedrock below the Site. The overburden is absent in several areas and has thicknesses of greater than 20-ft in the southern portion of the Site. The Shallow Aquifer consists of the more permeable outwash sand and gravel deposits and also the highly fractured shale interface directly above the competent bedrock. A high water table typically occurs in the first half of the year with the low water table occurring during the second half of the year with a water table elevation difference of 3-ft to 6-ft between seasons. The lagoon area is located in the south-central portion of the site, making the overburden thickness highly variable in this area.

The Overburden Aquitard unit consists of silt and clay (till) and is discontinuous over the site. Where present, the till acts as a confining unit and results in isolated or perched pockets of groundwater.

The Bedrock Aquifer occurs in the competent portion of the shale bedrock with groundwater traveling through open fractures. The bedrock shale becomes more competent with depth, with beds dipping to the southeast at 40 to 50 degrees below horizontal with a strike 30 degrees to the east.

2.1.2 Site Contaminants and Remedial Goals

Extensive sampling identified a number of compounds exceeding the NYSDEC SCOs. The primary COCs are volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The VOCs include benzene, toluene, ethylbenzene and xylene (BTEX), acetone and chlorobenzene. The SVOCs include 2-aminopyridine, 2-picoline, pyridine, aniline, benzoic acid, bis(2-ethylhexyl)phthalate and phenol. The primary groundwater COCs are also VOCs and SVOCs. The VOCs detected in either the Shallow or Bedrock Aquifer include BTEX, acetone and chlorobenzene with the higher concentrations being in the Shallow Aquifer. The SVOCs detected in either the Shallow or Bedrock Aquifer include 2-aminopyridine, 4-choloraniline (1 well) and bis(2-ethylhexylphthalate). The cleanup criteria for the site COCs for both soil and groundwater are presented in the table below. In addition, a soil cleanup guidance value of 400 ug/kg was developed for individual pyridine-based tentatively identified compounds (TICs). The value of 400 ug/kg for TICs is guidance and not a requirement to be met for site closure.

Site Specific Cleanup Objectives by Media

Contaminant	Soil Cleanup Objective[1] (ug/kg)	Groundwater Cleanup Objective[2] (ug/L)
Benzene	60	1
Chlorobenzene	1,100	5
Ethylbenzene	700	5
Toluene	1,600	5
Xylenes (total)	400	5
Acetone	50	50
2-Aminopyridine	400	1
Pyridine	400	50
Alpha Picoline	575	50
Aniline	1,500	5
Pyridine-related TICs	400[3]	50

[1]Soil cleanup objectives are from NYSDEC Subpart 375: Remedial Program Soil Cleanup Objectives or derived from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Determination of Soil Cleanup Objectives and Cleanup Levels, Division of Hazardous Waste Remediation (January 24, 1994).
[2]Groundwater cleanup objectives are based on the more conservative of the federal Maximum Contaminant Levels (MCLs) and the NYS Ambient Groundwater Standards and Guidance Values (NYSDEC, June 1998).
[3]Individual pyridine-related Tentatively Identified Compounds (TICs) have a site specific soil cleanup guidance value (and not objective).

2.1.3 Site Constituent Biodegradability

Biodegradation of BTEX compounds by direct metabolism is well documented under a wide variety of environmental conditions. Numerous studies have documented the metabolism of these compounds under aerobic conditions. Mineralization of BTEX has also been reported under a variety of facultative and anaerobic conditions including nitrate reducing, iron reducing, sulfate reducing and methanogenic conditions. Of these conditions, the biodegradation of BTEX under aerobic and nitrate reducing conditions is most rapid and energetically favorable to other anoxic mechanisms.

For many years anilines have been one of the most important industrially produced amines. They are used widely in the production of polyurethanes, rubber, azo dyes, petsicides and other chemical products. As a result of its wide production and use, aniline is a commonly detected compound at chemical manufacturing facilities. Biodegradation of aniline has been demonstrated in both aquatic and soil environments and biodegradation has been observed under both aerobic and anoxic conditions although aerobic degradation is believed to be a more ubiquitously applicable mechanism. Under aerobic conditions degradation produces a catechol intermediate via oxidative deamination. Aerobic degradation of aniline proceeds by oxidative deamination via dioxygenase attach which results in the formation of a catechol intermediate, which is further degraded by an *ortho* or *meta*-cleavage pathway. The anaerobic pathway used by sulfate reducing bacteria activates the molecule with sulfhydryl-CoA prior to reductive deamination.

Pyridine and its various substituted analogs (i.e. 2-aminopyridine) are hetrocylic nitroaromatic amines that occur in the environment as a by-product of industrial operations including coal gasification, mining, wood preserving, and chemical manufacturing. Pyridine and its monosubstituted derivatives are more water-soluble than their homocyclic analogs, and as such, are mobile in soil and more easily transported to groundwater. The combination of their solubility (completely miscible in the case of pyridine) and the propensity for these compounds to be both carcinogenic and teratrogenic makes them of concern as environmental pollutants.

Mechanisms exist for the attenuation of pyridine and substituted pyridine compounds in the environment. Some of these mechanisms include photolysis, volatilization, complexation, surface attenuation, and biodegradation. Of these mechanisms, biological degradation constitutes a major attenuation pathway for detoxification and dissipation of pyridine compounds. Biodegradation of pyridine is well documented under a wide variety of environmental conditions. Numerous studies have documented the metabolism of pyridine under aerobic conditions. Mineralization of pyridine has also been reported under a variety of facultative and anaerobic conditions including nitrate reducing, iron reducing, sulfate reducing and even methanogenic conditions. Of these conditions, the biodegradation of pyridine under aerobic and nitrate reducing conditions has been more extensively studied and shows the greatest promise. Numerous microbial cultures including various, Pseudomonas, Rhodococcus, Bacillus, Arthrobacter, Alcaligenes, Norcardia, and Micrococcus species have all demonstrated the ability to directly metabolize pyridine as a soul carbon source.

Two distinct pathways for the metabolism of pyridine are generally accepted. The first of the pathways, depicted in Figure 3a, involves cleavage of the ring between the C-2 and C-3 carbons to yield a 6-member semialdehyde, which is in turn hydrolyzed to formamide and succinate semialdehyde. Under this pathway formamide is subsequently converted to formate and ammonia by a specific amidase enzyme. Succinate semialdehyde is oxidized to succinate by a dehydrogenase enzyme, which is usually induced by pyridine.

The second pathway for pyridine metabolism, depicted in Figure 3b, involves C-2-N ring cleavage and is accompanied by pyridine induced glutarate-dialdehde dehydrogenase, glutarate-semialdehyde dehydrogenase, acetyl coenzymeA synthetase, and isocitrase enzyme activities.
The biodegradation of various substituted pyridines has also been evaluated. The degradation of these compounds is typically slower than that of unsubstituted pyridine compounds. Degradability of substituted pyridine compounds generally follows the order of pyridine = mono-hydroxypyridines > methylpyridines > aminopyridines and chloropyridines. Similar to pyridine, the greatest rates of biodegradation for the substituted amino pyridine compounds are typically observed under aerobic or nitrate reducing conditions. The differential in degradation rates is largely believed to be a function of the permeability of microorganisms to these compounds.

Biodegradation is considered a major attenuation pathway for pyridine compounds in the environment. In order for a bioremediation based remedial strategy to be successful and efficient at degradation of these compounds, the remedial design must be robust enough to incorporate operation of the system under conditions most conducive to biodegradation. Operation of a bioremediation system outside of these optimal conditions may result in extended remediation time frames or potentially incomplete treatment.

Since an understanding of the biodegradation and chemistry of pyridine and pyridine derivatives is a key remedial design component, a literature research was conducted into the biodegradation of pyridine and 2-aminopyridine. The result of this research concluded that the fate and transport of pyridine in the environment is well documented as illustrated above, but less data and information pertaining to the fate of 2-aminopyridine and other derivatives is available in the scientific community. Therefore, the biocell design incorporates features to allow for the efficient biodegradation of 2-aminopyridine and other substituted analogs.

Although information presented in the RI (Section 7.0 Chemical Fate and Transport) and in the Treatability Study (Appendix A, Environmental Fate Literature Review) and current data suggests that 2-aminopyridine and other derivatives are biodegradable, the rate of biodegradation is reported slower than pyridine and the degree to which biodegradation will occur is uncertain.

Given the uncertainty associated with rate of degradation of 2-aminopyridine, an 'isolation' strategy is included into the design, so even though the time required to achieve cleanup criteria for 2-aminopyridine may extend beyond the proposed time period, the RAOs in the ROD will be met at all times. During operation, remedial optimization will be integral to ensure the proper conditions for bioremediation exists (i.e., oxygen, moisture, nutrients). This may also include bioaugmenting the biocell matrix with pyridine degrading bacteria.

2.1.4 Conceptual Site Model

The single most important element in the remedial design process is a conceptual site model. The conceptual site model forms the basis of the design and provides a tool for communication and testing of the performance of the design. The conceptual site model describes the source areas, impacted media, migration pathways and transport mechanisms, and exposure points. A narrative of the conceptual site model for the Site is presented below and shown graphically in Figure 4.

The source of contamination was wastewater disposed into six lagoons between 1952 and 1967. Total volume of wastewater disposed and the constituents present are unclear, however it has been reported that up to 250 million gallons were disposed of at the site during its operation. Material discharged into the lagoons either evaporated or drained into the underlying Shallow Aquifer. No additional "source" material was added after 1967.

Releases from the lagoons likely occurred during the active life of the lagoons (i.e., between 1952 and 1967). Since 1967 the primary release mechanism would be leaching from precipitation as it infiltrated the former lagoons and the residual source materials. This leaching represents only a small percentage of the contaminant movement in comparison to the migration potential created by the large amounts of wastewater – concentrated with the COCs – that were directly discharged into the lagoons. Contaminants would have first adsorbed onto the underlying soils or evaporated into the atmosphere. Subsequent loadings would have continued to adsorb onto the soil matrix until the soil's adsorption capacity was exceeded, at which point the contaminants would have begun migrating downward to the underlying aquifer. Groundwater contamination observed during the RI and subsequent monitoring events likely represents initial lagoon seepage and the continued dissolution of contaminants from lagoon sediments into infiltrating precipitation.

Current release mechanism is rain and snow melt infiltrating through the former lagoons and entering the Shallow Aquifer. A downward vertical gradient exists between the Shallow and Bedrock Aquifer, therefore a portion of the groundwater traveling horizontally through the Shallow Aquifer eventually travels into the Bedrock Aquifer. Groundwater flow in the Shallow and Bedrock Aquifer both have a northern and southern component, with a groundwater high existing within the areas of former Lagoons 4 and 5. The horizontal groundwater velocities in the Shallow and Bedrock Aquifer are reported at 36 ft/year and 5.0 feet/year, respectively, indicating that groundwater is more likely to travel horizontally through the more permeable overburden and saprolite zones in the Shallow Aquifer than through the fractured shale Bedrock Aquifer.

2.1.5 Isolation Strategy

The proposed RD approach, which is consistent with the ROD, is to integrate an 'isolation' strategy in the design/construction of the biocell with 'remedial flexibility' in the operation of the biocell. This integrated approach removes uncertainties associated with extrapolating the bench-scale treatability study results to full-scale without compromising the goal of the remedial action: attainment of the RAOs through source treatment (i.e., biodegradation), elimination of exposure pathways (i.e., isolating source material), and removing and treating contaminated groundwater. This approach also will provide flexibility to adapt to varying site conditions during system operations.

The 'isolated' biocell design will have an impermeable cap to prevent human exposure and infiltration of precipitation and an impermeable liner on the sides and bottom to isolate the biocell from the underlying Shallow Aquifer (Figure 6). A water collection system will be installed along the base of the biocell to collect any leachate generated from within the biocell. Water from the collection system will be removed and then reinjected through an irrigation system installed at the top of the biocell system. Water recirculation will be used to maintain proper moisture control within the biocell soils. Preventing saturation of the biocell and having the proper moisture available for biodegradation will be crucial to the overall success of the biocell.

In addition, a highly permeable gravel layer may be placed below the biocell (Figure 6). On both the southern and northern sides of the biocell, horizontal wells will be installed within the drainage layer that may be used for future injections of oxygenating compounds to enhance bioremediation of the groundwater.

2.2 Delineation of Limits of Excavation

The identification of the source material is relatively straightforward as demonstrated during the treatability study. The highest concentrations of 2-aminopyridine and BTEX compounds were contained in black-stained soils. Likewise, the unstained soils did not have detected levels of 2-aminopyridine (with one exception) and only low levels of BTEX (all below cleanup criteria). The source material extent, though not completely defined during the RI, should be readily identifiable during the RA through visual observation aided by confirmatory sampling of the stockpiled unstained soils and endpoint sampling. The analytical data confirms that the black staining is directly related to the contaminants and defines source material. Interestingly enough, the existing data also indicates that the absence of black-staining typically reflects non-impacted conditions. In other words, black-stained soils are reflective of contaminated soils and non-stained soils most likely are not contaminated. This condition will allow the visually stained soils to be rapidly screened and automatically assumed contaminated, requiring treatment in the biocell. In a similar fashion, the unstained soils will initially be assumed to be uncontaminated, but will be segregated, stockpiled and sampled to verify this assumption. These existing conditions eliminate the need for further source area characterization prior to final design.

This approach is supported by results of both stained and unstained soil samples collected during the treatability study. The results indicate that only one sample out of ten soil samples collected from the unstained soils had an exceedence of 2-aminopyridine SCG (400 ug/kg), while 12 samples of the 13 samples collected from the stained soils had exceedences of 2-aminopyridine SCO. No BTEX exceedences were encountered in the unstained soils while six of the stained soils had exceedences.

Exceedences of 2-aminopyridine and BTEX in soil samples collected during the Treatability Study

Soil Type	Number of Samples	Number of 2-aminopyridine Exceedences	Number of BTEX Exceedences	Range of Sample Depths
Unstained	10	1 (10%)	0 (0)	2-4'
Stained	13	12 (92%)	6 (46%)	3-14'

Based on the review of the 51 test pit excavations performed in 1991 and 1995, a total of 2,149 cubic yards of soil was excavated and logged. Out of this soil, 31 percent or 656 cubic yards were stained. The test pit logs indicated that a majority of the stained soils existed 4-ft or more below ground surface. The percentage of stained soils, based on the test pit logs, below 4-ft was estimated to be 58 percent.

Percentage of Stained Soils from Test Pit Logs

Year	Number of Test Pits	Total Volume Removed from Test Pits (cubic yards)	Total Volume Stained in Test Pits (cubic yards)	Percentage of Stained Soil (Total Volume)	Percentage of Stained Soil (Below 4')
1991	38	1,925	584	30%	59%
1995	13	224	72	32%	56%
TOTAL	51	2,149	656	31%	58%

Assuming the total volume of soil within the foot print of the former lagoons is approximately 57,000 cubic yards, then the volume of stained soils requiring treatment is approximately 22,800 cubic yards (assuming 40% of all overburden material is stained). The percentage of rock and shale was estimated to be 20 percent (CRA, 2006b) or 11,400 cubic yards. For the purpose of the design, the following quantities are assumed: 33,100 cubic yards will require treatment within the biocell and 12,500 cubic yards of rock and shale will be available to construct the permeable layer under the biocell. Assuming a 75,000 square feet biocell with a 2-ft thick underlying permeable layer, approximately 6,000 cubic yards of rock and shale will be required.

Quantities of Soil and Rock Available for the Biocell Construction

Item	Quantity (cubic yards)
Total volume of soil	57,000
Soils requiring treatment (40% total volume)	22,800
Rock and shale from all soil (20% total volume)	11,400

Another variable to be considered during the design and construction of the biocell is the depth to competent rock. The depth of the biocell will not exceed 9 feet to prevent inundation of the lower part of the biocell by groundwater in the Shallow Aquifer. The depth to competent bedrock beneath the lagoons varies considerably, as shown below, and will need to be closely evaluated for placement of the biocell in order to (1) be able to contain the anticipated quantity of contaminated materials and (2) keep the bottom of the biocell above the water table. The permeable layer would be installed from a depth of approximately 7- to 9-ft below ground surface (bgs). Groundwater encountered during the test pit excavations ranged in depths from 8-ft to 12-ft bgs.

Depth to Competent Rock by Lagoon

Lagoon	Depth to Rock (feet below ground surface)		
	Minimum	Maximum	Average
1	3	> 14	9.6
2	5	> 15	10.0
3	3	20	14.6
4	7	19	12.1
5	6	> 13	10.4
6	2	9	3.7

2.3 Excavation, Segregation and Handling of Excavated Soils

Source removal/treatment begins with the excavation of the various lagoon materials and segregating these materials based on size, staining and other supporting analytical data. Approximately 20% of the excavated material has been assumed to consist of rock greater than 2-inch in diameter. The lagoon material will be screened to remove this rock to be used in the construction of the biocell.

Screened soils will also be segregated based on staining. Black-stained soils will be placed into stockpiles for placement into biocells once constructed. Unstained soils will be placed into approximately 500 CY stockpiles. Due to the limited space available on site, placement of unstained soils into smaller stockpiles will not be feasible. Once stockpiled, unstained soils will be sampled at the frequency described in the SAP. If results show the unstained soils are above soil cleanup objectives, then these soils will be further segregated and tested. Unstained soils above the soil cleanup objective will placed into the biocell. If results show that the unstained soils are below the soil cleanup objectives, the soils will be used a clean backfill.

Prior to being placed in a biocell, soils will be amended with a bulking agent (saw dust, composts, or other organic material) to increase air flow within the biocell; nutrients (fertilizer) to increase nitrogen and phosphorus; and lime to stabilize the pH of the soil. Screening and mixing of the soil would be approximately 250 tons per day.

2.4 Water Management During Construction

Water generated during construction activities will include water from dewatering excavations, groundwater entering open excavations, stormwater runoff from contaminated areas and decontamination water. All water generated during construction will be pumped into storage tanks located on-site. Disposal of stored water will be evaluated during the RD, but options include off-site disposal at a regulated facility, on-site treatment with off-site disposal (e.g., a publicly owned treatment works), or on-site treatment with on-site discharge.

2.5 Biocell Design

2.5.1 System Layout

Site conditions are an important part of the design and will dictate the layout of the biocells. Since no wetlands exist within the fenced-in area, all the area will be available for use during construction. However, bedrock surfaces vary considerably with numerous outcrops existing on the site. A review the bedrock surface elevations suggests that longer, narrower biocells aligned over former Lagoons 3, 4 and 5 may be better suited than the biocell layout over former Lagoons 1, 2 and 3, presented in the Feasibility Study. Figure 5 shows a conceptual site layout. Site access is not anticipated to be a concern since the existing access road off of County Highway No. 4 will be the primary means of access/egress. A site survey performed during the Preliminary Design stage will be used to determine property boundaries, utility locations and right-of-ways.

The rock screened from the soils will be used to create the base of the biocell. Above the stones, an impermeable layer will be constructed to separate the biocell soils from the permeable layer. Water collected from the base of the biocell will be reintroduced into the biocell to maintain the needed moisture in the cell matrix. During the development of the RD, any further contingencies for storage, treatment and discharge, or off-site disposal of water will be evaluated.

The biocell will be constructed over the drainage layer. A conceptual biocell schematic is shown in Figure 6. An impermeable liner will be placed on top of the underlying drainage layer to isolate the biocell soils. The amended soil mixture will then be placed in 1-ft lifts for a total thickness of up to 7-ft. Two series of perforated pipes will be installed at depths of 3-ft and 5-ft in alternate directions to ensure uniform distribution of air. A 6-in layer of coarse sand (from clean material screened on site) will be placed on top another layer of filter fabric covering the contaminated soil. Perforated piping will be placed in this layer for the application of water or other liquid amendments (e.g., nutrients). Finally, the entire biocell will be capped with a high density polyethylene (HDPE) liner to prevent precipitation from entering the cell. The area will then be covered with topsoil and seeded to promote the growth of grass. No shrubs, bushes or trees that could compromise the cap will be planted or allowed to grow on the cap. The cap will be graded to transport stormwater away from the biocell and towards downgradient surface water bodies (i.e., Beaverdam Brook). The intent is to leave the biocell permanently on site though all extraneous treatment equipment will be removed once cleanup objectives have been met.

2.5.2 Air Extraction and Treatment

The ROD specifies the biocell be operated first in SVE mode (high air flow rates) and then in biovent mode (lower air flow rates). During the treatability study, the air flow rates were 50 cubic centimeters per min (ccm) in SVE mode and 5 ccm in biovent mode. This equates to an air residence time of 11.7 and 117 minutes in SVE mode and biovent mode, respectively. If extrapolated to full scale application, then the flow rates for SVE mode and biovent mode would be 76,000 cubic feet per minute (cfm) and 7,600 cfm, respectively. Flow rates of these magnitudes for a biocell application are neither practical nor cost effective.

The proposed design is to operate the system in such a way as to minimize volatilization and maximize biodegredation. This will eliminate the need for off-gas treatment altogether (though some air treatment via activated carbon will be included) and facilitate in situ aerobic biodegradation. Although SVE would have a positive affect on the mass removal of residual BTEX compounds, it will have little affect on the 2-aminopyridine, as SVOC that is highly soluble and not prone to volatilization. In addition, aerobic biodegradation of BTEX within the biopiles rather than volatilization will enhance and sustain a sufficient microbial population for the degradation of the 2-aminopyridine, and eliminates the cost and maintenance associated with off-gas treatment of BTEX.

The primary goal of the biocell design is to supply enough oxygen to maintain aerobic conditions (i.e., oxygen levels above 5 percent) without excessive volatilization. In situ oxygen utilization of petroleum contaminated soils have been found to vary between 0.1 and 5.6 percent oxygen per hour. A study performed at 48 Air Force Bases in the United States found the following distribution of oxygen utilization rates prior to starting up any bioventing remediation system (Leeson and Hinchee, 1996):

Oxygen Utilization Rates at Various Air Force Bases

Oxygen Utilization (%/hr)	No. of Occurances
< 0.01	15
0.1 to 1	74
1 to 2	10
2 to 3	2
3 to 4	3
4 to 5	1
> 5	1
Total	106

After a six month period of operating the bioventing systems, only one of the 106 sites had a respiration rate greater than 1.0 %/hr.

These oxygen utilization rates will determine how much oxygen (air) will be required to support bioremediation within the biocell. The air flow rate for the system can then be determined by the following relationship:

$$Q = \frac{k_o V \theta_a}{(20.9\% - 5\%) \times 60\,\text{min/hr}}$$

where: Q = flow rate (cubic feet per minute)
k_o = oxygen utilization rate (%/hour)
V = volume of contaminated soil (cubic feet)
θ_a = gas-filled porosity (unitless)

Assuming a high oxygen utilization rate of 3 percent, it will take 4 hours for the oxygen level to drop from 20.9 percent to less than 5 percent. The oxygen replacement rate must therefore be high enough to ensure oxygen levels are always above 5 percent. Assuming an oxygen utilization rate of 4 percent per hour, an air-filled porosity of 0.3 within the biocell, and a biocell volume of 894,000 cubic feet (33,100 cubic yards), the required air flow rate is estimated to be 840 cfm. Given the low vacuum requirements, regenerative blowers will be used. The number and sizing of the vacuum blowers will be evaluated as part of the RD and be based on the number of treatment cells. The proposed process flow diagram is shown in Figure 7. Following biocell construction and prior to system startup, *in situ* respiration tests will be performed at each biocell to verify the oxygen demands.

2.5.3 Water Management and Moisture Control During System Operation

An integral water management and injection system is also proposed for the design. Water management in the biopiles will include the removal of water from the bottom of the biocell. Extracted water from within the biocell will be reintroduced back into the biocell through a series of perforated, horizontal piping at the top of the biocell. The use of a water treatment system will be evaluated during the RD. Water disposition will be based on the moisture needs within the biocell. A complete water balance of the biocell will be performed as part of the RD.

2.5.4 Operational Considerations

Long-term operation of the biocell is critical for project efficiency and cost control. Too many times, system are designed for the start-up period (less than a few months) and not for the overall project life cycle. The intent of this design is to allow for proper system operation and regular optimization during all project stages. The proposed system allows operational flexibility for continual adjustments of system parameters to ensure effective treatment. Several of the key operational parameters are discussed below along with the approach to address each.

Oxygen. Maintaining oxygen levels above 5% is probably the most critical component to successful treatment. The biocell will contain numerous sampling points for oxygen measurement. Microwells (1/4-inch tubing with 6-inch screens) are proposed rather than expensive in situ oxygen probes, which have been found to provide inaccurate measurements. Overall system air flows will be balanced based on these measurements. Air flow will be increased to these areas, if oxygen levels are too low. If oxygen levels are high (above 20 percent), then air flow will be decreased. Adjustments will be possible through the use of a variable frequency drive on one of the blowers.

Nutrients. If nutrient levels drop below the recommended ratio of Carbon to Nitrogen to Phosphorus (C:N:P) of 100:10:1, then biodegradation may be limited. Nutrient levels will be monitored in the soil by installing locations throughout the biocell where grab soil samples can be collected and monitored for agronomic parameters (pH, soil moisture, organic matter) and essential macronutirents (nitrogen-TKN and orthophosphate). If the primary nutrients are adequate yet biological degradation rate is low, then other nutrients may be monitored (e.g., potassium, sulfate, calcium, magnesium). If at any point during system operation, one of the essential parameters falls out of balance, then the problem will be corrected by injecting a chemical into the biocell through the water management system. For example, if pH is low, then lime will be added, if nitrogen is low, then a liquid fertilizer will be added.

Temperature. The treatability study was run in a controlled climate at a constant temperature of approximately 68 deg F (20 deg C). The in situ soil temperatures measured between January 2007 and July 2007 had temperature measurements ranging from 36 deg F to 68 deg F (2 deg C to 20 deg C), with most of the variability occurring at shallower depths. At 12-ft bgs (most likely in the saturated soils), the temperatures ranged from 42 deg F to 59 deg F (5.5 deg C to 15 deg C). An increase in temperature results in an increase in microbiological activity: for example, an 18 deg F (10 deg C) rise in temperature results in doubling of biological activity (Leeson and Hinchee, 1996). Operation of the proposed biocell would thereby be limit to warmer months when the temperature of the biocell are above 50 deg F (10 deg C). The soil temperature in the 3-ft to 9-ft bgs soils reached 50 deg F during May. Treatment system operation is more difficult and expensive during colder months (e.g., snow removal, heating costs, potential for line freezing), therefore operating the system during the growing season, where the greatest contaminant reduction can be realized with the minimal amount of energy expended. As part of the design, temperature probes will be installed within the biocell at varying locations and depth to continuously monitor *in situ* temperatures.

Water/Moisture Content. Several design components are proposed to control water/moisture content and leachate. The first component allows leachate management within the treatment zone, via a sub-treatment cell collection area to a containment sump. This also provides water necessary to maintain moisture conditions amenable to in situ aerobic degradation process in the treatment zone and eliminates the need to treat the leachate for disposal purposes. The collected leachate will be recycled, to the extent necessary and practical, into the treatment zone resulting in resource sustainability. Recycling of the leachate will be accomplished by pumping the water from the collection sump into an infiltration piping network that will be constructed within the treatment zone. If needed, a potable water source will be identified to makeup additional water that may be required to maintain optimal system performance. The water management system also provides flexibility by allowing for the addition of nutrients and/or amendments to the recycled water being re-injected into the treatment zone. This level of flexibility provides simple, cost effective operational enhancements to ensure ease of performance optimization.

2.5.5 Performance Monitoring

Performance monitoring and evaluation is proposed to be done at regularly scheduled times. A complete description of the required monitoring will be presented in the O&M Plan to be developed as part of the RD. The proposed biocell monitoring measurements of overall air flow and contaminant concentrations, temperature and moisture readings from the *in situ* probes and oxygen/carbon dioxide readings from the monitoring points, and soil sampling of the biocell soils. These measurements will be evaluated to monitor the system’s effectiveness. If required, additional activities, such as microbial evaluation and bioaugmentation may be undertaken to ensure optimal performance of the biocell.

2.6 Backfill of Excavated Areas

Stockpiled soils that are neither stained nor have concentrations above the SCOs will be used as general backfill. The backfill will be used to fill in excavated areas not used for the placement of the biocell and also to regrade the site. Additional topsoil may be required to complete the cap of the biocell. The topsoil will be brought in from a local source and be sampled and analyzed in compliance with NYCRR Part 375 and shall be free of any contaminants. Part of the remedy will be to limit the amount of water recharge entering groundwater, so additional fill may be required to provide adequate site drainage or minor contouring of the existing soils will be performed to address drainage. This will require the installation of several swales around the biocells.

2.7 Sustainability

Resource sustainability is an integral part of the design consideration of this project, and incorporates community acceptance, public perception and stewardship. Any remedial action requires resource consumption, such as energy for equipment operation; however, many technologies are inherently resource friendly. This project is designed to evaluate resource friendly options that to the extent practical could potentially minimize the consumption of natural resources.

The biocell technology is one of the resource-friendly technologies with built-in sustainability features. The proposed remedy is designed to eliminate or recycle waste streams for beneficial reuse. The generation and subsequent need for treatment of contaminated vapors will be eliminated by applying a lower airflow into the treatment zone that promotes biodegradation and minimized volatilization. Additionally, effluent water that will be generated and collected will be recycled into the treatment zone. The recycling of these liquids will greatly reduce the need for makeup water and use of potable water.

2.8 Enhanced Bioremediation with Long-Term Monitoring

As defined in the ROD, enhanced bioremediation of the COCs in Site groundwater will be required as necessary following the removal of source area soils. During the RD, the use of enhanced bioremediation will be evaluated including such approaches as the placement of injection wells and timing of injections. During construction of the biocell, all contaminated material will be excavated and as a result, all groundwater in contact with the source material will be removed. Since all source soils and groundwater will be removed, implementation of an injection system to enhance bioremediation of Site groundwater through oxygenating additives during and immediately after construction is not warranted until new baseline groundwater conditions have been established. As part of the RD, a plan to monitor site groundwater conditions, including the location of sampling points, analytes to be sampled and frequency, will be included. The plan will include a flow chart outlining when, based on monitoring results, any additional enhancement of bioremediation would be implemented. Such enhancements would include the use of either existing wells or new injection points to target areas where concentrations in groundwater are persistent.

3.0 REMEDIAL DESIGN DELIVERABLES

This section describes the deliverables to be prepared in support of the RD, including progress reports and engineering design deliverables (i.e., Preliminary Design Report and Final Design Report). Elements to be included in these documents are described below.

3.1 Monthly Reports

Monthly reports will be submitted to the USEPA in accordance with the RD AOC. Monthly reports are to be submitted to the USEPA and NYSDEC by the fifteenth day of each month. The monthly reports shall include:

- Actions taken toward achieving compliance with the AOC during the month;
- Summary of all results of sampling and tests collected during the month;
- List of all work plans, plans and other deliverables submitted during the month;
- Description of all activities related to the RD, including data collection and work plan implementation that is scheduled for the next six weeks;
- Percentage of completion of work, resolved issues and potential delays;
- Modifications proposed to the work plans;
- Community relation summary during the month and a six week look ahead; and
- Coordination on conference calls and meetings.

3.2 Preliminary Design Report

The preliminary design stage will be initiated upon USEPA written approval of the RD Work Plan. The deliverables from the preliminary design stage will be the Preliminary Design Report, which will consist of a Basis of Design Report and preliminary drawings. The Basis of Design Report shall include the preliminary design assumptions and parameters, with an emphasis on the capacity and ability to meet the design objectives successfully, and shall include:

- Waste characterization and delineation;
- Pretreatment requirements;
- Volume and types of media requiring treatment;
- Treatment approaches for each media including rates and required qualities of waste streams;
- Performance standards;
- Long-term performance operations, maintenance and monitoring (OM&M) requirements;
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs), pertinent codes and standards; and
- Technical factors of importance to the design and construction including environmental control measures, constructability of the design, and the use of currently acceptable construction practices and techniques.

The Preliminary Design Report will also include preliminary drawings that will include at a minimum:

- Cover sheet identifying site location and listing of drawings;
- Process flow diagram;
- Piping and instrumentation diagram;
- General arrangement diagram; and
- Site drawings.

3.3 Final Design Report

Upon receiving written comments on the Preliminary Design Report from the USEPA, the final design stage will begin. The final design stage will take the preliminary design from 50% to 100%. The final design stage will include the finalizing the Basis of Design Report and preparing a Final Design Report. The Final Design Report shall contain:

- Final Basis of Design Report;
- Results of any value engineering studies;
- Final plans and specifications;
- Final engineers construction cost estimate; and
- Updated construction schedule.

3.4 Final Design Support Deliverables

The Final Design Report will be supported by a Construction Quality Assurance Project Plan (CQAPP), a SMP and a contingency plan to implement wellhead treatment. A brief overview of each of these plans is provided below.

3.4.1 Construction Quality Assurance Project Plan (CQAPP)

The CQAPP shall detail the approach to quality assurance during construction activities at the Site and shall specify a quality assurance official independent of the RA contractor to conduct the quality assurance program during the construction phase of the project. The CQAPP shall address sampling, analysis, and monitoring to be performed during the remedial construction phase. Quality assurance items to be addressed include, at a minimum, the following:

- Inspection and certification of the work;
- Measurement and daily logging;
- Field performance and testing;
- Post-construction drawings; and
- Post-construction sampling (e.g., end point sampling) to establish where the design specifications have been attained.

3.4.2 Site Management Plan (SMP)

A SMP will be developed to provide an understanding of the post-construction management of the site. Within the SMP, separate plans will be developed including an O&M Plan and a Certification Plan to insure that all post-construction ICs are in place.

The O&M Plan will be developed in accordance with the Superfund Remedial Design and Remedial Action Guidance (USEPA, 1995b). The O&M Plan shall also include, but not be limited to, the following:

- A description of the personnel requirements, responsibilities and duties, including a discussion for training and lines of authority;
- A description of all construction-related sampling, analysis, and monitoring to be conducted under the AOC; and
- A description of all related monitoring requirements.

3.4.3 Contingency Plan to Implement Wellhead Treatment

As required by the ROD, a contingency plan will be developed to provide for wellhead treatment of the Village of Maybrook water supply or private wells on an interim basis in the event that monitoring should indicate that the Village of Maybrook water supply or private wells have been impacted by Site-related contaminants above health-based levels.

4.0 REMEDIAL DESIGN SCHEDULE

The two primary deliverables for this RD AOC following acceptance of this Work Plan are the Preliminary RD Report and the Final RD Report. As required by the RD AOC, submission of the Final RD Report shall be no greater than 26 weeks (six months) following USEPA's written notification of approval of the RD Work Plan. To meet this schedule, the Preliminary RD Report will be submitted to the USEPA 11 weeks following approval of the RD Work Plan. The Final RD Report, upon receiving comments from the USEPA on the Preliminary RD Report (assuming a four week review time), would take an additional 11 weeks.

Proposed Remedial Design Schedule

Task	Duration	Timeline
EPA Approval of RD Work Plan	0 Weeks	Week 0
Preliminary RD Report to USEPA for review	11 Weeks	Week 11
USEPA Review of Preliminary RD Report	4 Weeks	Week 15
Final RD Report to USEPA for review	11 Weeks	Week 26

5.0 REFERENCES

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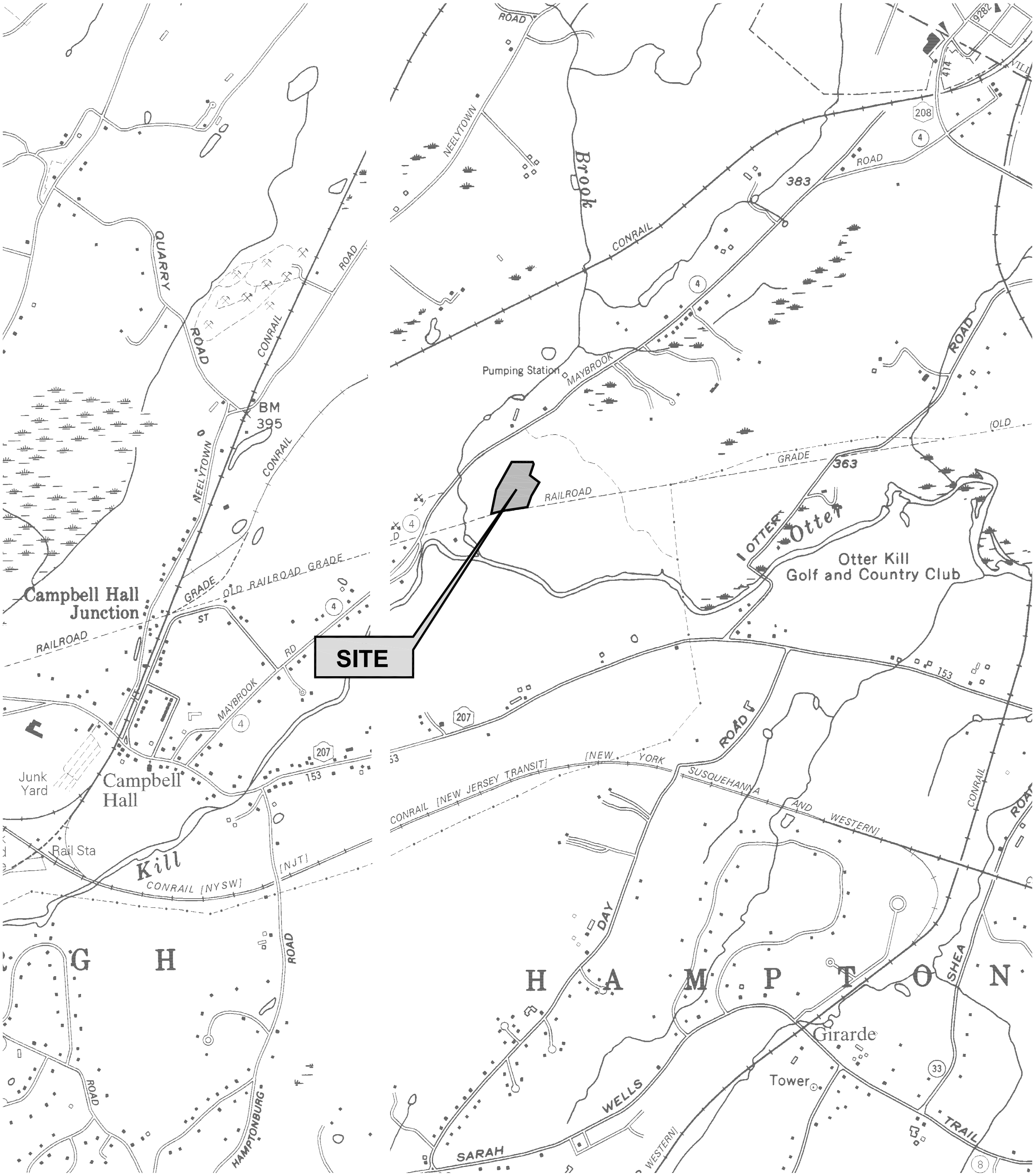
Figures



PLAN

0' 100' 200' 400'

MAP REFERENCE:
NYSDOT 7.5 MIN. QUADRANGLE, MAYBROOK SERIES.

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

SITE LOCATION MAP
NEPERA CHEMICAL
SUPERFUND SITE

MAYBROOK ROAD (CR 4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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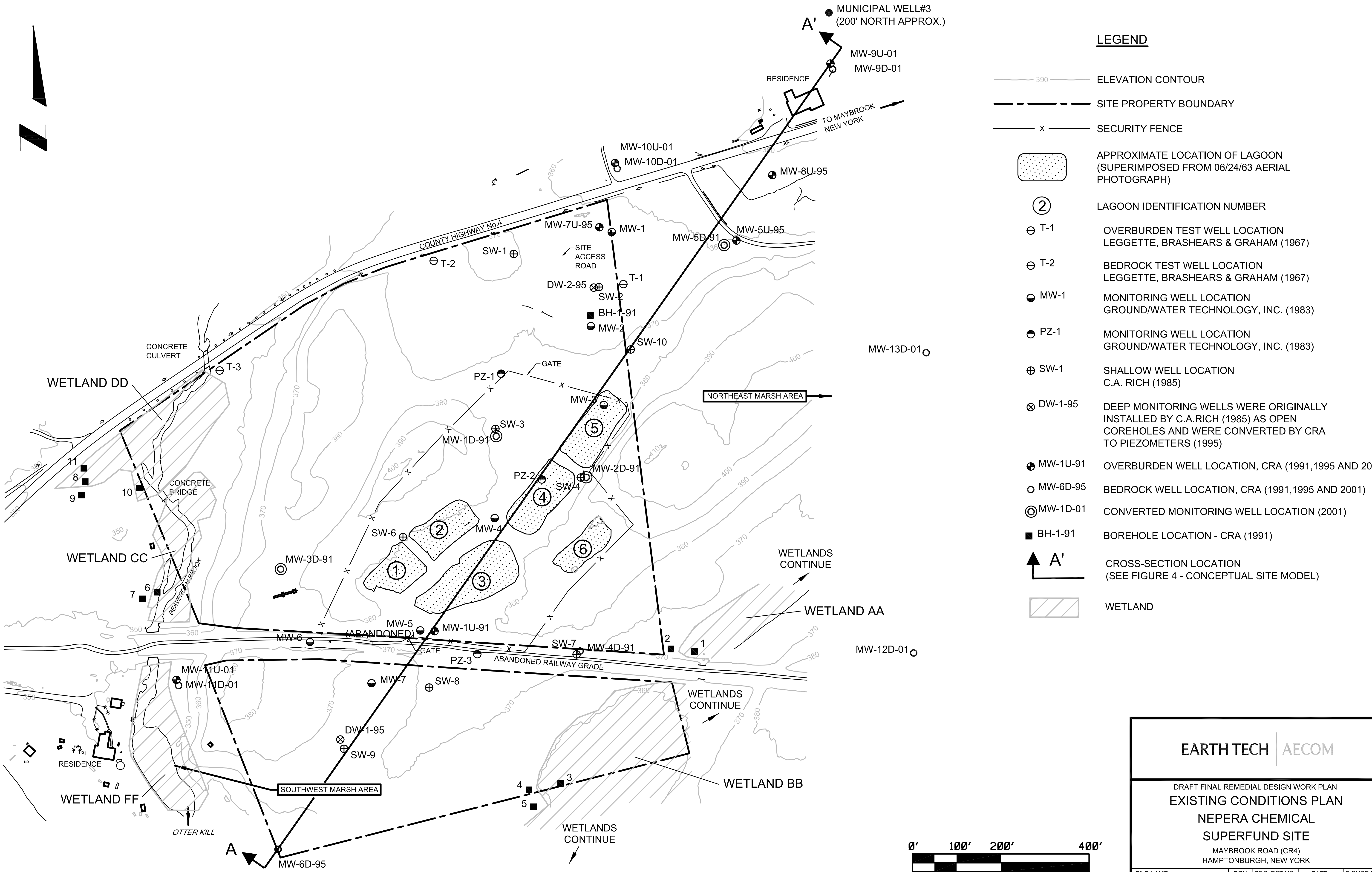

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

EXISTING CONDITIONS PLAN

NEPERA CHEMICAL SUPERFUND SITE

MAYBROOK ROAD (CR4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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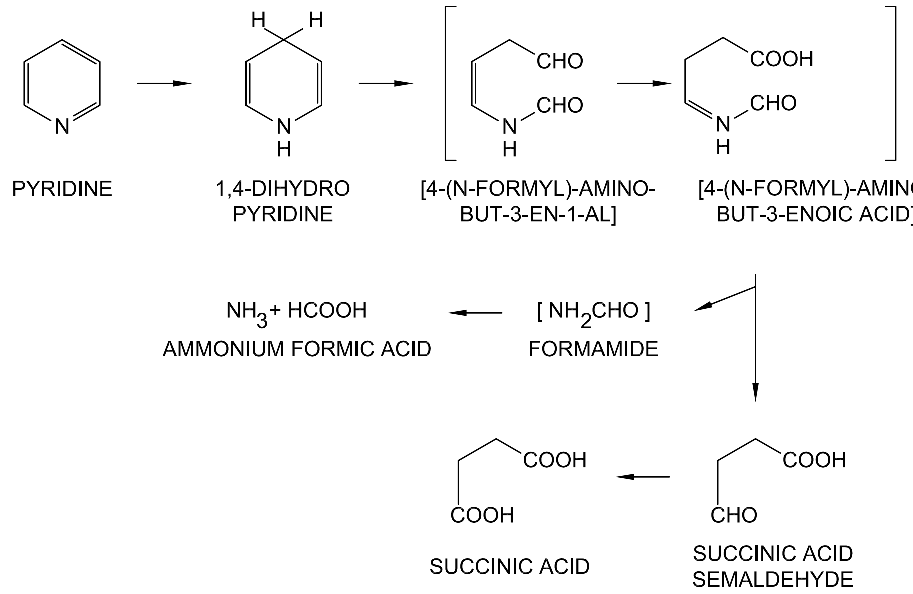

FIGURE 3a

Pyridine biodegradation pathway involving ring cleavage between C-2 and C-3 carbons

(Adapted from Kaiser *et al* 1996)

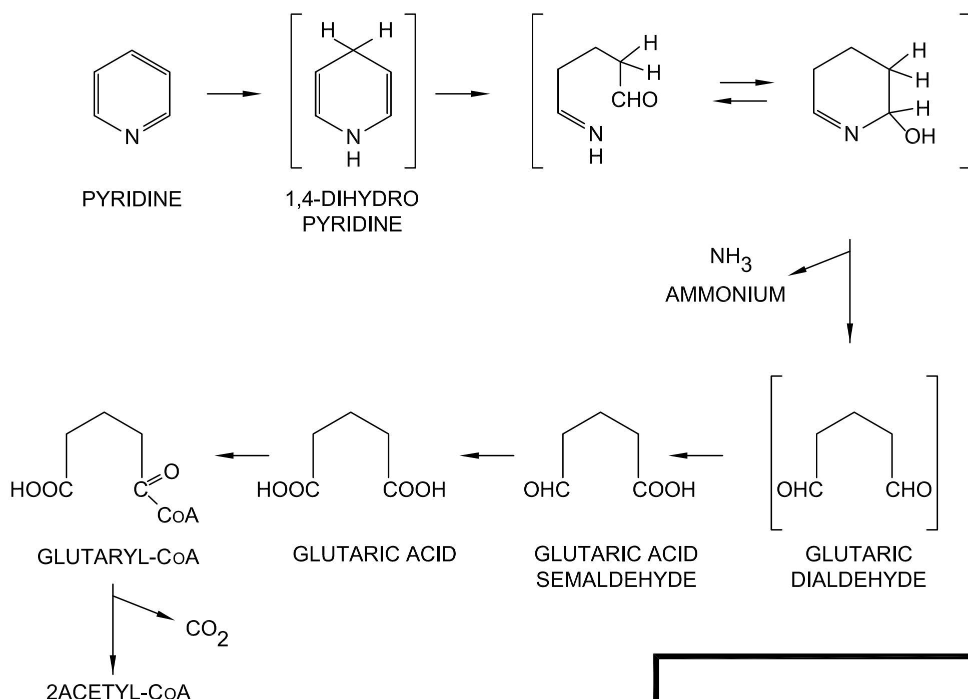

FIGURE 3b

Pyridine biodegradation pathway involving C-2-N ring cleavage

(Adapted from Kaiser *et al* 1996)

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

PYRIDINE BREAKDOWN PATHWAYS

NEPERA CHEMICAL

SUPERFUND SITE

MAYBROOK ROAD (CR 4)

HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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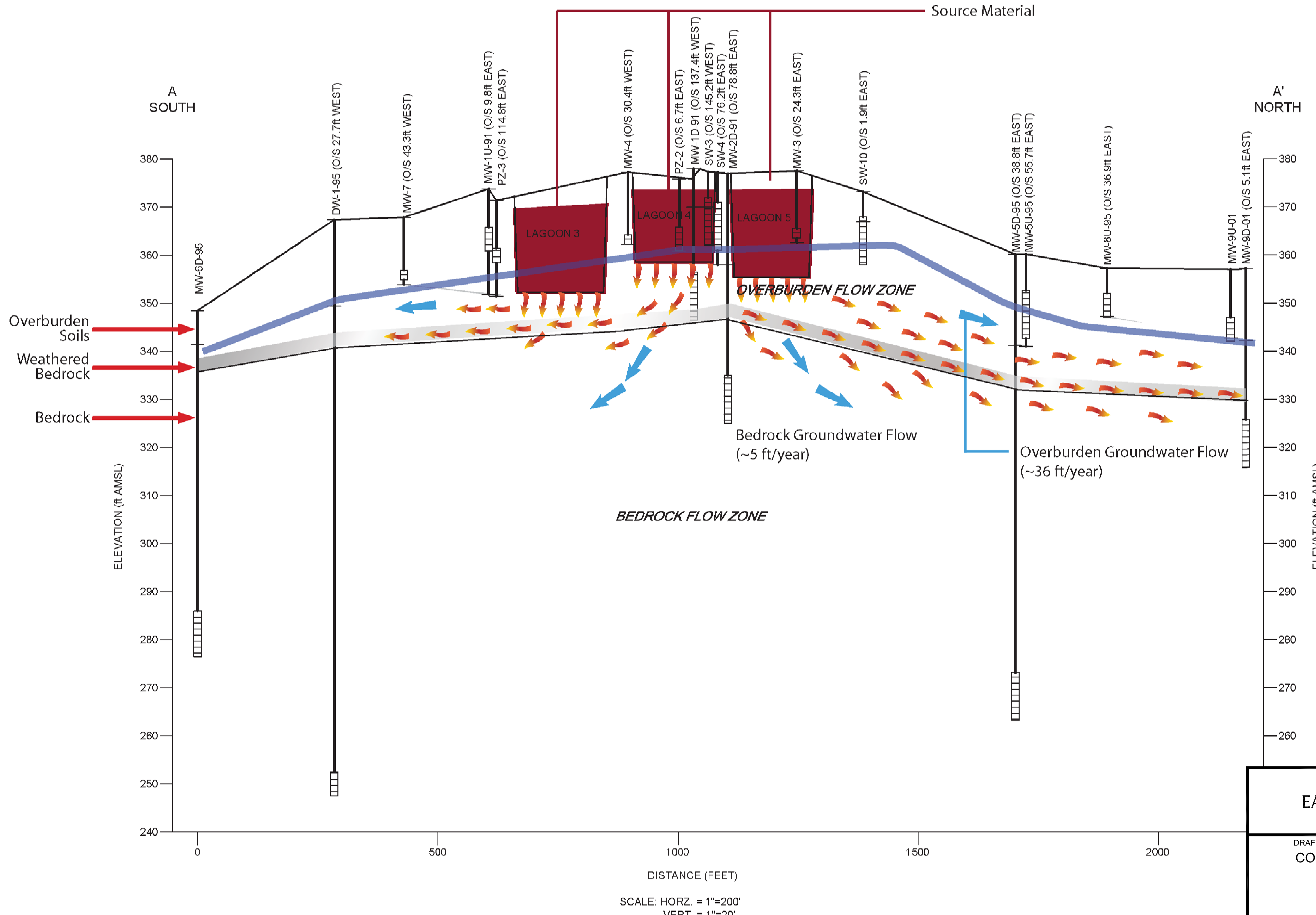

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

CONCEPTUAL SITE MODEL
NEPERA CHEMICAL
SUPERFUND SITE

MAYBROOK ROAD (CR4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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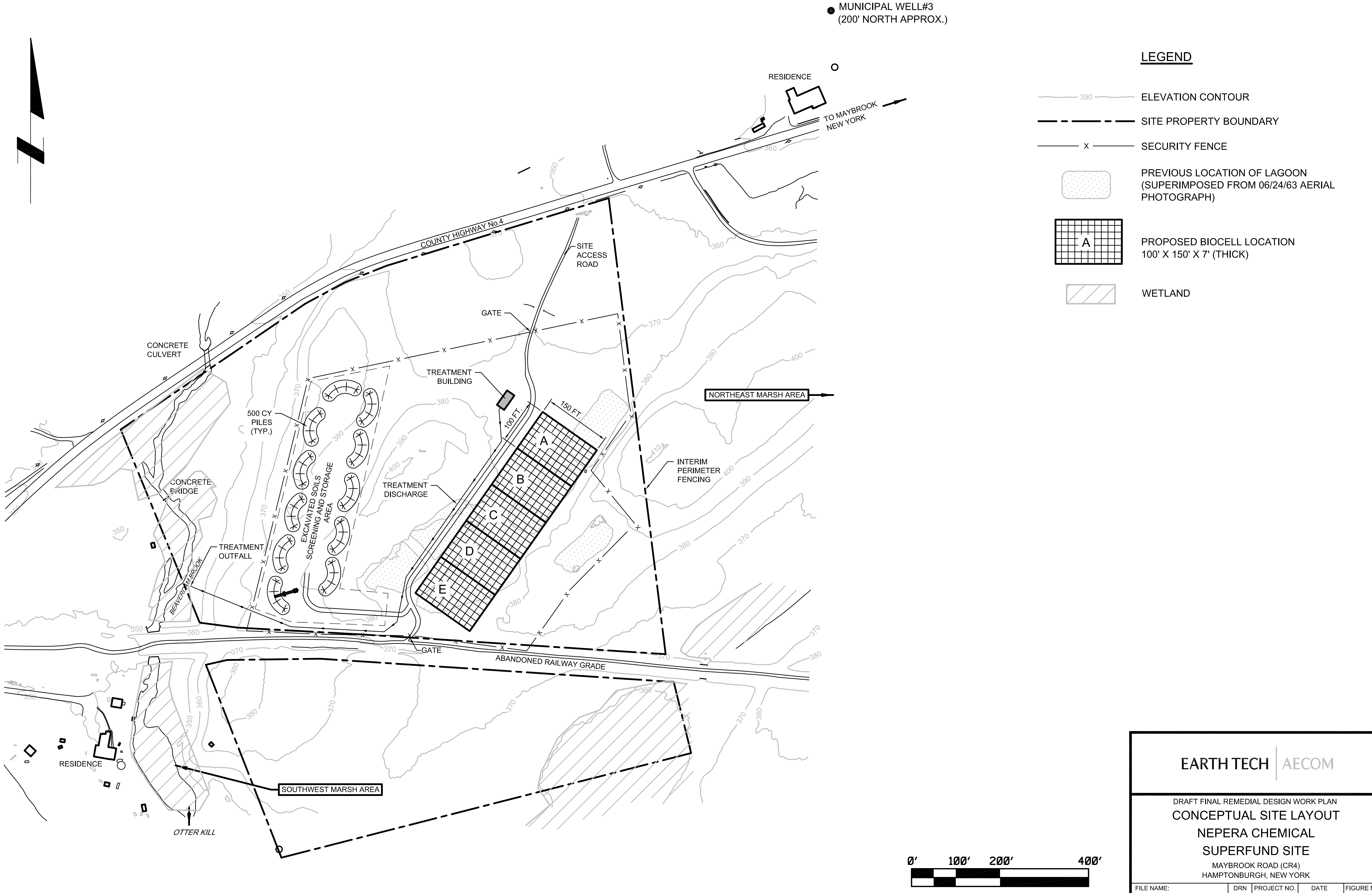

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

CONCEPTUAL SITE LAYOUT
NEPERA CHEMICAL
SUPERFUND SITE

MAYBROOK ROAD (CR4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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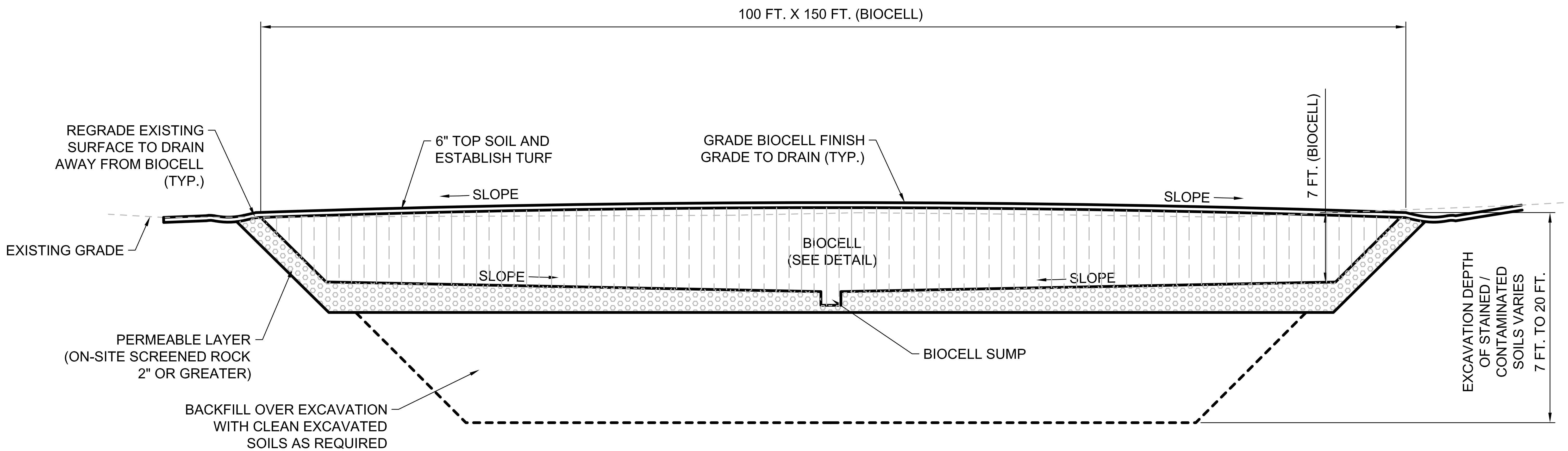
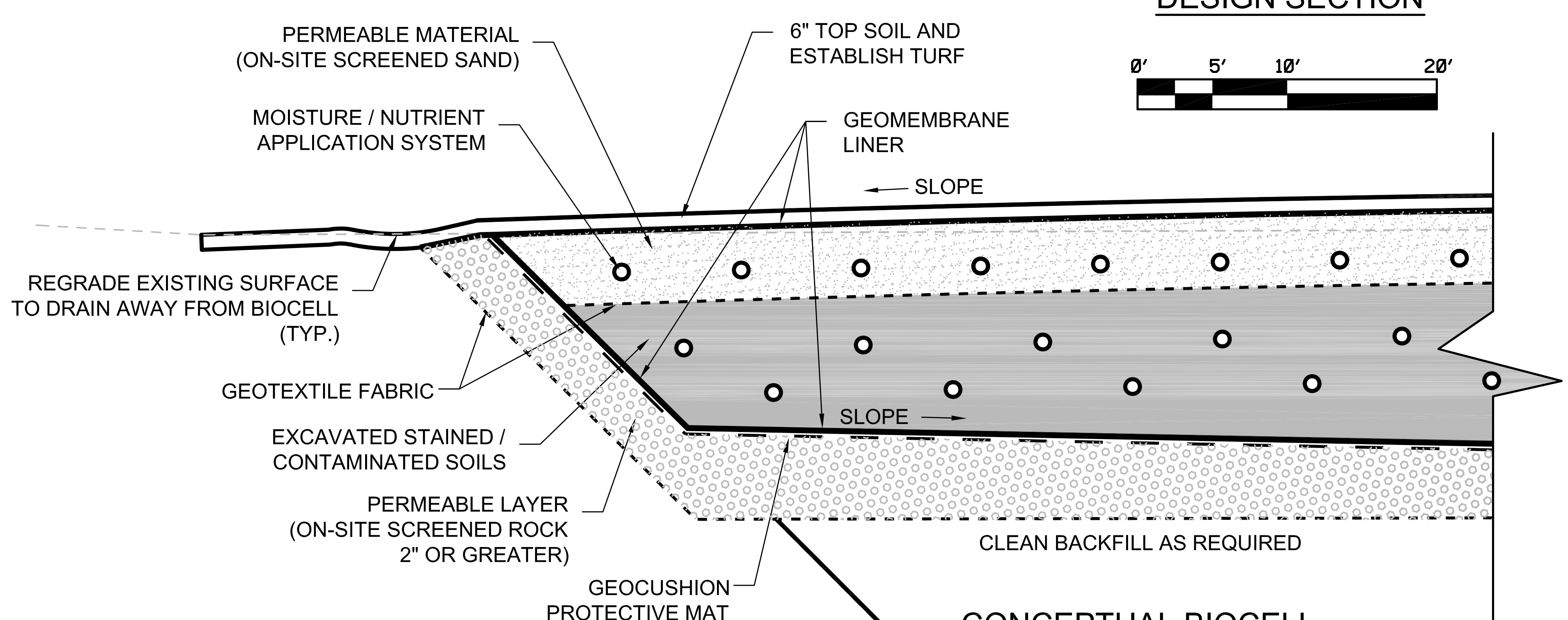


CONCEPTUAL BIOCELL DESIGN SECTION

0' 5' 10' 20'



CONCEPTUAL BIOCELL DESIGN DETAIL

NOT TO SCALE

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

CONCEPTUAL BIOCELL DESIGN

NEPERA CHEMICAL SUPERFUND SITE

MAYBROOK ROAD (CR4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
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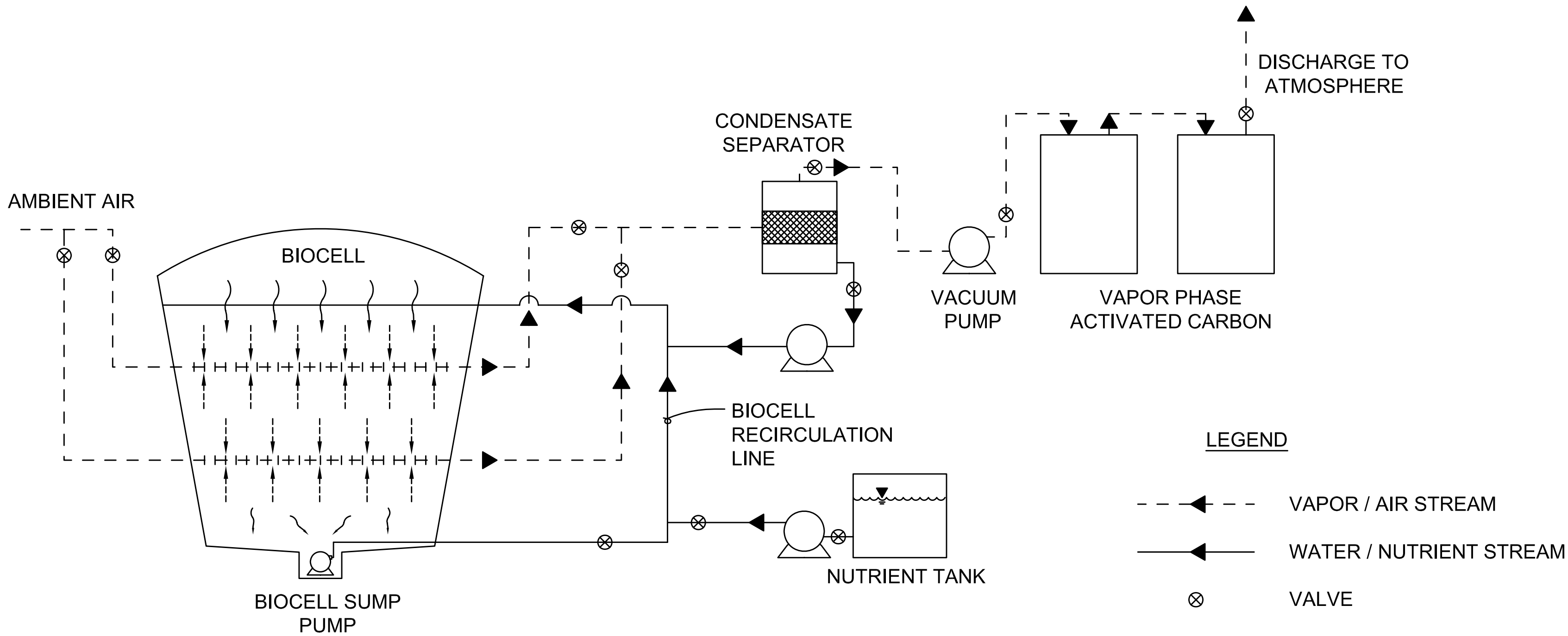

PROPOSED PROCESS FLOW DIAGRAM

NOT TO SCALE

EARTH TECH | AECOM

DRAFT FINAL REMEDIAL DESIGN WORK PLAN

PROPOSED PROCESS FLOW DIAGRAM
NEPERA CHEMICAL
SUPERFUND SITE

MAYBROOK ROAD (CR4)
HAMPTONBURGH, NEW YORK

FILE NAME:	DRN	PROJECT NO.	DATE	FIGURE NO.
NEPERA_RDWP.dwg	KM	106559	2/5/2009	07

Appendices

Appendix A

Quality Assurance Project Plan

DRAFT FINAL
QUALITY ASSURANCE PROJECT PLAN
NEPERA SUPERFUND SITE

Site:
Nepera Chemical Company Superfund Site
Town of Hamptonburgh
Orange County, New York 10916

Submitted to:
United States Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, New York 10007

Prepared for:
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Project No. 106559.04

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QAPP Worksheet #1
Title and Approval Page

Title: Nepera Superfund Site Quality Assurance Project Plan – Revision 0
Site Name/Project Name: Nepera Superfund Site
Site Location: Orange County Highway 4, Town of Hamptonburgh, Orange County, New York
Revision Number: Revision 0
Revision Date: February 5, 2009

U.S. Environmental Protection Agency, Region 2
Lead Organization

Earth Tech Northeast, Inc. (Earth Tech | AECOM)
40 British American Blvd
Latham, NY 12110
518-951-2200
Prepared by Allen Burton – Earth Tech | AECOM Allen.burton@aecom.com

05/02/09
Preparation Date (Day/Month/Year)

Investigative Organization's Project Manager: ______________________
Signature
Keith Decker, Earth Tech | AECOM
Printed Name/Organization/Date

Contracting Organization's Project Manager: ______________________
Signature
Seth Levine (Cambrex), Maybrook and Harriman Environmental Trust
Printed Name/Organization/Date

Lead Agency's Project Manager: ______________________
Signature
Mark Dannenberg, EPA Region 2
Printed Name/Organization/Date

Approval Signatures: ______________________
Signature
Mark Dannenberg, Project Manager, EPA Region 2
Printed Name/Title, Approval Authority/Date

____
Signature
William Sy, QA Officer, EPA Region 2
Printed Name/Title/Date

Document Control Number: NA

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Nepera Superfund Site
Site Location: Town of Hamptonburgh, Orange County, New York
Site Number/Code: Superfund Site ID NYD000511451
Operable Unit: **OU# NA**
Work Assignment Number: NA
Title: Quality Assurance Project Plan for Nepera Superfund Site Remedial Design
Revision Number: Rev No. 0
Revision Date: February 5, 2009
Contractor Name: Earth Tech | AECOM
Contract Title: NA
Contract Number: NA

1. **Identify guidance used to prepare QAPP:** Uniform Federal Policy for Quality Assurance Project Plans, Final Version 1, 2005

2. **Identify regulatory program:** EPA Region 2, Superfund

3. **Identify approval entity:** EPA Region 2

4. **Indicate whether the QAPP is a generic or a project-specific QAPP:** Project-Specific

5. **List dates of scoping sessions that were held:** December 15, 2008

6. **List dates and titles of QAPP documents written for previous site work, if applicable:**

Title	Approval Date
Quality Assurance Project Plan, RI/FS, Former Lagoon Site (Nepera Inc.), Town of Hamptonburg, Orange County, New York. Conestoga-Rovers &Associates, 1991	Unknown
Site Specific Quality Assurance Project Plan, 2001 [Note: this document has not been obtained, but its existence is inferred through reference in a data validation report [2002])	Unknown

7. **List organizational partners (stakeholders) and connection with lead organization:**
   - **Maybrook Harriman Environmental Trust** – Responsible Party for remediation of the Nepera Superfund Site, organization through whom Earth Tech | AECOM is working.
   - **Earth Tech Northeast (Earth Tech | AECOM) –** Consultant/Contractor for Maybrook Harriman Environmental Trust – Consultant for development of the Remedial Design (RD) and likely Remedial Action contractor.
   - **NYSDEC** – State Lead Agency (NYSDEC Site ID 3-36-006)

8. **List data users:**
   Mark Dannenberg, USEPA PM; Maybrook Trust; NYSDEC; NYSDOH

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:

- NA. However, some worksheets are filled out with generic information as the analytical laboratory has not yet been selected.

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

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
2.1 Title and Approval Page	- Title and Approval Page	1
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2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications - Special Personnel Training Requirements	5; WP Section 1.6 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps	9 10
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria	11 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations	13

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation - Project Schedule/Timeline	14 15 16
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3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References - Analytical Instrument Calibration - Analytical Instrument and Equipment Maintenance, Testing, and Inspection	23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form	27 26 Attachment A
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples - Screening/Confirmatory Analysis Decision Tree	28

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Worksheet No.
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records - Analytical Services - Data Management SOPs	29 30
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments - Audit Checklists - Assessment Findings and Corrective - Action Responses	31 32
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5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining		NA

QAPP Worksheet #3
Distribution List

[List those entities to whom copies of the approved QAPP, subsequent QAPP revisions, addenda, and amendments are sent]

QAPP Recipient	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Mark Dannenberg	Project Manager	EPA, Region 2	212-637-4251	212-637-4393	Dannenberg.Mark@epa.gov	NA
Michael Scorca	Hydrogeologist	EPA Region 2	212-637-4316	212-637-4393	Scorca.Michael@epa.gov	NA
William Sy	QA Officer	EPA, Region 2	732-321-4766	732-321-6622	Sy.William@epa.gov	NA
Seth Levine	Project Coordinator	Maybrook (Cambrex)	201-804-3038		Seth.Levine@cambrex.com	NA
Barbara Wong	Project Coordinator (Alternate)	Maybrook (Pfizer)	908-901-9808	646-441-6625	Barbara.Wong@pfizer.com	NA
Keith Decker	Project Manager	Earth Tech | AECOM	518-951-2200	518-951-2300	Keith.Decker@aecom.com	NA
Scott Underhill	Project Engineer	Earth Tech | AECOM	518-951-2200	518-951-2300	Scott.Underhill@aecom.com	NA
Allen Burton	QA Manager	Earth Tech | AECOM	973-338-6680 ext 214	973-338-1052	Allen.Burton@aecom.com	NA
TBD	Site FOL/SSO	Earth Tech | AECOM	518-951-2200	518-951-2225	Jane.doe@aecom.com	NA

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

[Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described; add additional sheets as required. Ask each organization to forward signed sheets to the central project file.]

Organization: EPA Region 2

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Mark Dannenberg	Project Manager	212-637-4251		
Michael Scorca	USEPA Hydrogeologist	212-637-4316		
William Sy	USEPA Region 2 QA Officer	732-321-6622		

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Organization: Maybrook-Harriman Trust/Earth Tech AECOM

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Seth Levine	Project Coordinator (Cambrex)	201-804-3038		
Barbara Wong	Alternate Project Coordinator (Pfizer)	908-901-6222		
Keith Decker	Project Manager	518-951-2229		
Scott Underhill	Project Engineer	518-951-2208		
Allen Burton	QA Officer	973-338-6680		
TBD	Site FOL/SSO	518-951-2200		

QAPP Worksheet #5
Project Organizational Chart

The Organization Chart is provided in Section 1.6 of the Draft Remedial Design WP (Earth Tech | AECOM, February 2009).

QAPP Worksheet #6
Communication Pathways

[Describe the communication pathways and modes of communication that will be used during the project, after the QAPP has been approved. Describe the procedures for soliciting and/or obtaining approval between project personnel, between different contractors, and between samplers and laboratory staff. Describe the procedure that will be followed when any project activity originally documented in an approved QAPP requires modification to achieve project goals or a QAPP amendment is required. Describe the procedures for stopping work and identify who is responsible.]

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Point of contract with EPA PM	ET Project Manager	Keith Decker	518-951-2200	All technical, QA and administrative matters in regard to the project (verbal, written or electronic)
Notification of potential changes to Work Plan, QAPP, HASP	ET FOL	TBD	973-338-6680	Will notify ET PM prior to implementation for review/approval (verbal, written or electronic)
Minor change to Work Plan, QAPP, HASP	ET Project Manager	Keith Decker	518-951-2200	Will notify ET FOL of approval of minor change (verbal, written or electronic); must sign official corrective action documentation (written only)
Major change to Work Plan, QAPP, HASP	ET Project Manager; QA Manager; NED Safety Manager	Keith Decker; Allen Burton; Bob Poll	518-951-2200 973-338-6680 518-817-3089	Will notify EPA PM prior to implementation for review/approval; will notify ET FOL of approval of major change (verbal, written or electronic); EPA and ET PM must sign official corrective action documentation (written only)
Recommendation to stop work (health and safety issue)	ET Site SSO	TBD	518-951-2200	Will notify ET PM and ET NJ Northeast Health and Safety Manager immediately (verbal, with written or electronic following); followup with EPA PM
Recommendation to stop work (non-health and safety issue)	ET FOL	TBD	518-951-2200	Will notify ET PM immediately (verbal, with written or electronic following); ET PM to notify EPA PM
Sample quality issue (e.g., broken sample bottles, incorrect preservation)	Laboratory (TBD)	TBD		Will notify the ET PM to determine corrective action (verbal, written or electronic)
Corrective action for sample quality issue	ET QA officer	Allen Burton	973-338-6680	Will respond to issue from laboratory with potential corrective action (verbal, written or electronic); will notify field team and EPA PM as needed.

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

[Identify project personnel associated with each organization, contractor, and subcontractor participating in responsible roles. Include data users, decision-makers, project managers, QA officers, project contacts for organizations involved in the project, health and safety officers, geotechnical engineers and hydrogeologists, field operation personnel, analytical services, and data reviewers.]

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Keith Decker	Project Manager	Earth Tech | AECOM	Overall quality of the work performed under contract; review of final reports and deliverables to USEPA. Implementing and executing the technical and administrative aspects of the project, contact with EPA PM.	BS Chemistry; 23 years of experience in environmental remediation and project management.
Scott Underhill	Project Engineer	Earth Tech | AECOM	Lead engineer in the development of the remediation system design.	BS Engineering, MS Environmental Engineering; 17 yrs experience in environmental enrg; 40 hr and 8 hr OSHA HAZWOPER supervisor.
TBD	FOL/SSO	Earth Tech | AECOM	Sampling activities; sample management and shipment, implantation/ compliance with site safety requirements.	40 hr and 8 hr OSHA HAZWOPER supervisor.
Allen Burton	QA Officer	Earth Tech | AECOM	Planning and oversight of QA and analytical aspects of the project	BS Chem E; 23 years experience in QA and Project management in Region 2; EPA R2 cert data validator (inorg.).
Chris Taylor	Chemist	Earth Tech | AECOM	Performs evaluations of laboratory results as needed	20 years experience validating data for Region 2, NJDEP, NYSDEC
Bob Poll	H&S Manager	Earth Tech | AECOM	Earth Tech | AECOM NE District H&S Manager	
TBD	Point of Contract	Laboratory	Coordinate sample and bottle pickup and delivery; point of contact for ET questions and requests.	NA

QAPP Worksheet #8
Special Personnel Training Requirements Table

[Provide the following information for those projects requiring personnel with specialized training. Attach training records or certificates to the QAPP, or note their location.]

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates[1]
Field Personnel	40-hour OSHA HAZWOPER	Commercial provider or in-house	Varies	All Earth Tech | AECOM Field Personnel	TBD, Earth Tech | AECOM (and others TBD)	ET personnel files
Field Personnel	8-hour refresher	In-house	Annual	All Earth Tech | AECOM field personnel	TBD, Earth Tech | AECOM (and others TBD)	ET personnel files
Field Ops Leader	8-hour supervisor	Commercial provider or in-house	One time	Field team leader and others as needed	TBD, Earth Tech | AECOM (and others TBD)	ET personnel files

[1]If training records and/or certificates are on file elsewhere, document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.

QAPP Worksheet #9
Project Scoping Session Participants Sheet

[Complete this worksheet for each project scoping session held. Identify project team members who are responsible for planning the project.]

Site Name/Project Name: Nepera Superfund Site – Remedial Design/Remedial Action
Site Location: Hamptonburgh, Orange County, NY
EPA Site IDL: NYD000511451
Operable Unit: **[OU#]** NA
Work Assignment Number: **[WA#]** NA

Date of Session: December 15, 2008
Scoping Session Purpose: [Reason for meeting, e.g., discuss project quality objectives, plan field investigation] Kickoff meeting for design stage

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Mark Dannenburg		USEPA	212-637-4251	Dannenburg.Mark@epa.gov	Project Manager
Michael Scorca		USEPA	212-637-4316	Scorca.Michael@epa.gov	Project Hydrogeologist
Jamie Folsom		NYSDEC	518-402-9564	jlfolsom@gw.dec.state.ny.us	Project Manager
Seth Levine		Cambrex Corp.	201-804-3038	Seth.Levine@cambrex.com	Project Coordinator
Barbara Wong		Pfizer	908-901-6222	BabaraWong@pfizer.com	Alternate Project Coordinator
George Hollerback		Quantum/ Pfizer	973-340-9808	ghollerbach@qmg-inc.com George.H.Hollerback@pfizer.com	
Keith Decker		Earth Tech | AECOM	518-951-2229	Keith.Decker@aecom.com	Project Manager
Scott Underhill		Earth Tech | AECOM	518-951-2208	Scott.underhill@aecom.com	Project Engineer

Comments/Decisions:

Introduction of team (Earth Tech | AECOM design engineer; S. Levine project coordinator with B. Wong alternate project coordinator).

Earth Tech was purchased by Earth Tech | AECOM since being selected as the Remedial Engineer by the contractor.

Periodic communications will consist of monthly reports with conference call 2-3 days later.

Any revisions to the project schedule should be submitted with the monthly report.

All reports go to M. Dannenburg, USEPA who will distribute, except for one copy to be sent directly to NYSDEC (J. Folsom).

USEPA did not plan on any specific community outreach efforts at this point other than to keep certain officials in the loop.

Action Items:

Trust to supply new site keys to USEPA.

Earth Tech | AECOM to provide updated schedule to USEPA with new start date.

USEPA to supply Earth Tech | AECOM with name and contact information of USEPA QA/QC

	Manager.
	Trust to supply summary of quarterly potable well sampling data to USEPA with a recommendation to reduce sampling frequency.
	USEPA to speak to NYSDOH to coordinate submittal of 2008 and future residential sampling results to property owners.
	USEPA to provide name and contact of oversight contractor when finalized.
	Trust to provide point of sampling at residences to USEPA.
	A change of address will be performed as it relates to USEPA ID #.
	Trust to coordinate with Town to obtain well sampling results.
	Trust/S. Levine to provide revised property title documents for draft environmental easement.
Consensus Decisions:	QAPP to be prepared using UFP-QAPP format.
	Notification to Proceed with the Remedial Design Work Plan is Dec. 15, 2008, the date of the meeting and not the date that Earth Tech | AECOM was accepted by the EPA as the Design Engineer.
	Agree to review meeting approximately three weeks after submittal of Remedial Design Work Plan.

QAPP Worksheet #10
Problem Definition

PROBLEM DEFINITION:

The site is a 29.3-acre former industrial waste disposal facility located in the Town of Hamptonburgh, near the Village of Maybrook, in Orange County. It is in a rural, residential and agricultural area near the confluence of two streams, with wetlands nearby. The former wastewater lagoon area, containing six backfilled lagoons, occupies an area of about five acres. Currently, much of the site is wooded and the former lagoon area is fenced and covered with grasses. Between 1953 and 1967, the lagoons were used to dispose of approximately 50,000 gallons a day of wastewater from the Nepera chemical plant in Harriman, New York. The plant produced a variety of pharmaceutical and industrial chemicals, including pyridine-based compounds. State inspectors detected leaks from the lagoons in 1958 and 1960. Because of the State's continuing concern about the proper containment of the waste and the threat to a local well field, operations were discontinued in December 1967. By 1974, all of the lagoons had been backfilled with soil.

A wide variety of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), as well as inorganic compounds and cyanide, have been found in the surface and subsurface soils in the former lagoon area. VOCs, SVOCs, and inorganic compounds have also been detected in groundwater monitoring wells at the site. People could potentially be harmed through ingestion or contact with contaminated groundwater or soils. Sampling groundwater from nearby residential wells continues to be conducted to determine if any site-related contaminants are present. In addition, the site is fenced thereby limiting potential for exposure to site-related, surface soil contamination.

Approximately 6,500 people live within a 3-mile radius of the site. The closest residences are located approximately 250 ft to the west, and 175 ft and 450 ft to the northeast. These residences rely on private supply wells for drinking water. Monitoring of these residential wells is conducted on an ongoing basis for all site-related contaminants. Furthermore, three public water supply wells owned by the Village of Maybrook, which lie approximately 800 ft north of the site, are monitored for site-related contaminants on a quarterly basis.

SITE HISTORY/CONDITIONS:

This site is being addressed in two stages: immediate actions and a long-term remedial phase focusing on cleanup of the entire site.

<u>Response Action Status</u>

Immediate Actions: All lagoons were filled by 1974, and a fence was constructed to limit access to the site. Three drums were discovered during the remedial investigation (RI) test pit excavation during 1991 and these were removed and disposed of after analysis. A fence was installed around the five-acre lagoon area in 1995.

Entire Site: In 1988, under a State-issued order, the potentially responsible parties agreed to conduct a remedial investigation and feasibility study (FS) to determine the nature and extent of the contamination at and emanating from the site and to identify and evaluate remedial alternatives. Following the review of the initial RI results, a second phase RI was begun in 1993 to expand the ground-water investigation and also to address additional on-site and off-site concerns. Additional groundwater monitoring wells were installed in 2002 and groundwater monitoring samples were collected in 2002, 2003, and 2004. In addition, extensive soil sampling activities were conducted in 2002. A Final RI was issued in March 2006. The final FS Report, addressing the subsurface and surface soil contamination and the groundwater contamination at the site, was issued in July 2007. A Record of Decision, which states the remedial actions to be taken at the site, was issued on September 28, 2007. The remedial actions involve excavation of all contaminated soils and subsequent treatment of these soils on-site. In addition, oxygenating compounds will be applied to contaminated groundwater to foster bioremediation of the contaminants.

Site Responsibility: This site is being addressed through federal, state, and potentially responsible party actions.

Cleanup Progress: Filling the wastewater lagoons and restricting access via fencing on the Nepera Chemical site has limited potential exposure to the public, while further investigations leading to the selection of final cleanup remedies continue. The RI was completed in March 2006 and the FS was issued in July 2007. The Proposed Plan detailing the remedial alternatives for the site was released for public comment in July 2007 and the Record of Decision was issued on September 28, 2007. In October 2008, A Consent Decree was entered which requires the PRPs to perform all remedial actions.

PROJECT DECISION STATEMENTS:

The principal data types which will be generated under the RDWP and covered by this QAPP are:

1. Soil Waste Characterization Sample Data – data will be compared to regulatory limits (e.g., 40 CFR 261.24 Table 1) and facility requirements to characterize excavated soils for proper disposal. If TCLP extract results exceed regulatory criteria, soils will be managed as hazardous waste.
2. Soil Confirmation Samples – If confirmation data show that concentrations are less than cleanup criteria, excavation has been completed. If concentrations exceed cleanup criteria, then additional remediation is necessary.
3. Wastewater – Wastewater, generated from equipment decontamination and excavation dewatering, will be stored on-site and characterized for either off-site disposal or on-site treatment and disposal.

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

WHO WILL USE THE DATA?

Data will be used by USEPA, NYSDEC/NYSDOH, Earth Tech | AECOM, Maybrook and Harriman Environmental Trust.

WHAT WILL THE DATA BE USED FOR?

Soil classification data will be used by Earth Tech | AECOM/Maybrook to determine if excavated, non-stained, soils require treatment or can be used for on-site backfill.

Soil confirmation data will be used by Earth Tech | AECOM/Maybrook to determine when a given excavation is complete. Data reported as below cleanup goals will be reviewed by USEPA.

Wastewater data will be used to verify compliance with disposal requirements.

WHAT TYPE OF DATA ARE NEEDED

Waste classification data needed includes toxicity characterization leaching procedure (TCLP) data for volatiles and semi-volatiles (contaminants of concern at the site include at least two characteristic VOCs [benzene and chlorobenzene] and one characteristic SVOC [pyridine]).

Soil confirmation data needed include all site-specific COCs for which cleanup criteria have been established. It is anticipated that this can be accomplished by conventional VOC and SVOC analyses, with the SVOC analytical suite expanded to include aniline, alpha-picoline, 2-aminopyridine, and pyridine and related TICs.

Wastewater will be sampled and analyzed in accordance with disposal requirements. At this time it is assumed that this will entail analysis for VOCs, SVOCs, and metals.

HOW "GOOD" DO THE DATA NEED TO BE IN ORDER TO SUPPORT THE ENVIRONMENTAL DECISION?

Laboratory data will be reviewed based on lab-reported QC forms, and also qualitatively assessed for reasonableness based on site history and previous data. If initial review suggests potential oversight laboratory QA problems, ET project/QA manager will recommend corrective action, which may include formal data validation. The laboratory completeness goal is 100 percent; failure to meet this goal may require re-sampling.

HOW MUCH DATA ARE NEEDED?

Soil characterization – stockpiles will be analyzed for characterization; each sample will be a composite of five sub-samples for each 500 cubic yard stockpile.

Confirmation soil samples will be taken at the frequency established in the WP (Section 4.2.2); the frequency (number of samples) is contingent upon the perimeter of the excavation and the area of the base of the excavation.

Wastewater Data – grab sample representative of effluent tank contents to verify compliance with disposal requirements.

WHERE, WHEN, AND HOW SHOULD THE DATA BE COLLECTED/GENERATED?

- Frequency – as needed (based on completion of excavation; generation of stockpiles; and filling of wastewater effluent tanks)
- Quantity –
  - Waste characterization: one composite per 500 cubic yard stockpile.
  - Confirmation sampling: One sample for every 900 SF of area; plus one sample for every 50 ft of sidewall
  - Wastewater – one sample from the effluent tank prior to discharge
- Procedure – See WP section 4.2 (soil sampling) and 4.3 (water sampling)

WHO WILL COLLECT AND GENERATE THE DATA?

Samples will be collected by the Earth Tech | AECOM personnel, who will ship the samples to the analytical laboratory, who will analyze the samples and generate the data. The analytical laboratory will be selected later, subject to USEPA approval.

HOW WILL THE DATA BE REPORTED?

The analytical laboratory will tabulate and compile analytical results and associated QA/QC information.

A full, validatable data package (e.g., NYSDEC Category B or CLP-like package) will be generated for soil confirmation data.

Waste characterization data may be reported as a reduced deliverable (e.g., NYSDEC Category A, including results, narrative, custody information, and QC forms).

Wastewater data will be reported on the forms required by the permit.

Data will be reported both in hard copy and electronically. Electronic data submissions will include an Excel-compatible form.

ANSETS forms will be completed (by ET and submitted to USEPA quarterly during periods in which samples are analyzed).

HOW WILL THE DATA BE ARCHIVED?

Generated data (field- and/or laboratory-related) will be stored in the project files when not undergoing processing/review. Project data are stored electronically on the Earth Tech | AECOM server in the 'project data' folder established for the Nepera Superfund Site (ET Project 106559).

At the close of the oversight project, the project files will be copied to CD, and the hard copies and electronic copies sent to Maybrook and Harriman Environmental Trust. Data that may be archived elsewhere will not be included in the project files.

QAPP Worksheet #12-1
Measurement Performance Criteria Table

Matrix	Aqueous (Wastewater)
Analytical Group	Volatile Organic Compounds (VOCs)
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (Lab-Specific limits) [2]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
WP Section 4.3.4	SW-846 8260 or EPA 624	Precision	RPD ≤ 50 percent	LCS /Laboratory control sample duplicate (LCSD)	S & A
		Accuracy/Bias	50-150% recovery	LCS/LCSD, system monitoring compounds and surrogates	S & A
		Accuracy/ Representativeness	4 ± 6 °C	Temperature Blank checks/ Data validation	S
		Accuracy/ Representativeness	within holding times	Laboratory report/ Data validation	S
		Comparability	Comparable units and methods	Data assessment	S & A
		Comparability	RPD ≤ 50% ABS ≤ 2RL[3]	Split samples	S & A
		Completeness	≤ 90%	Data assessment	S & A
		Sensitivity	1 - 5 µg/L for most target VOCs; see WS#15-1	Low calibration standard and all sample results (RLs on form I or equivalent).	A
		Sensitivity/ Accuracy	≤ RLs	Trip blanks Equipment rinsate blanks Method blanks	S & A

[1]Reference number from QAPP Worksheets #21 and #23.
[2]Generic limits shown; lab-specific limits to be provided after laboratory is selected.
[3]Absolute difference (ABS) less than 2X reporting limit if detected concentration < 5X RL.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	SVOCs
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (Lab-specific limits)[2]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
WP Section 4.3.4	SW 846 8270 or EPA 625	Precision	RPD ≤ 50 percent	LCS /Laboratory control sample duplicate (LCSD)	S & A
		Accuracy/Bias	50-150% recovery	LCS/LCSD, system monitoring compounds and surrogates	S & A
		Accuracy/ Representativeness	4 ± 6 ° C	Temperature Blank checks/ Data validation	S
		Accuracy/ Representativeness	within holding times	Laboratory report/ Data validation	S
		Comparability	Comparable units and methods	Data assessment	S & A
		Comparability	RPD ≤ 50% ABS ≤ 2RL[3]	Field duplicate samples	S & A
		Completeness	≤ 90%	Data assessment	S & A
		Sensitivity	1 to 5 µg/L for most target SVOCs; see WS #15-2	Low calibration standard and all sample results (RLs on form I or equivalent).	A
		Sensitivity/ Accuracy	≤ RLs[2]	Equipment rinsate blanks Method blanks	S & A

[1]Reference number from QAPP Worksheets #21 and #23.
[2]Generic limits shown; lab-specific limits to be provided after laboratory is selected.
[3]Absolute difference (ABS) less than 2X reporting limit if detected concentration < 5X RL

QAPP Worksheet #12-3
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	VOCs
Concentration Level	Low/Medium

Sampling Procedure[1]	Analytical Method/ SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria[2] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
WP Sections 4.2.1 (characterization samples) and 4.2.2 (confirmation samples)	SW 846 8260	Precision	RPD ≤ 50 percent	LCS /Laboratory control sample duplicate (LCSD)	S & A
		Accuracy/Bias	50-150% recovery	LCS/LCSD, system monitoring compounds and surrogates	S & A
		Accuracy/ Representativeness	4 ± 6 °C	Temperature Blank checks/Data validation	S
		Accuracy/ Representativeness	within holding times	Laboratory report/ Data validation	S
		Comparability	Comparable units and methods	Data assessment	S & A
		Comparability	RPD ≤ 50% ABS ≤ 2RL[3]	Field duplicate samples	S & A
		Completeness	≤ 90%	Data assessment	S & A
		Sensitivity	5 µg/kg for most target VOCs; see WS #15-3	Low calibration standard and all sample results (RLs on form I or equivalent).	A
		Sensitivity/ Accuracy	≤ RLs[2]	Equipment rinsate blanks Method blanks	S & A

[1]Reference number from QAPP Worksheets #21 and #23.
[2]Generic limits shown; lab-specific limits to be provided after laboratory is selected.
[3]Absolute difference (ABS) less than 2X reporting limit if detected concentration < 5X RL

QAPP Worksheet #12-4
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	SVOCs - expanded
Concentration Level	Low to Medium

Sampling Procedure[1]	Analytical Method/ SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria[2] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
WP Sections 4.2.1 (characterization samples) and 4.2.2 (confirmation samples)	SW 846 8270	Precision	RPD ≤ 50 percent	LCS /Laboratory control sample duplicate (LCSD)	S & A
		Accuracy/Bias	50-150% recovery	LCS/LCSD, system monitoring compounds and surrogates	S & A
		Accuracy/ Representativeness	4 ± 6 °C	Temperature Blank checks/Data validation	S
		Accuracy/ Representativeness	within holding times	Laboratory report/ Data validation	S
		Comparability	Comparable units and methods	Data assessment	S & A
		Comparability	RPD ≤ 50% ABS ≤ 2RL[3]	Field duplicate samples	S & A
		Completeness	≤ 90%	Data assessment	S & A
		Sensitivity	330 µg/kg for most target SVOCs; see WS #15-4	Low calibration standard and all sample results (RLs on form I or equivalent).	A
		Sensitivity/ Accuracy	≤ RLs[2]	Equipment rinsate blanks Method blanks	S & A

[1]Reference number from QAPP Worksheets #21 and #23.
[2]Generic limits shown; lab-specific limits to be provided after laboratory is selected.
[3]Absolute difference (ABS) less than 2X reporting limit if detected concentration < 5X RL.

QAPP Worksheet #12-5
Measurement Performance Criteria Table

Matrix	Aqueous (Wastewater)
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (Lab-Specific limits) [2]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
WP Section 4.3.4	SW-846 6010 or EPA 200.7	Precision	RPD ≤ 50 percent	LCS /Laboratory control sample duplicate (LCSD)	S & A
		Accuracy/Bias	50-150% recovery	LCS/LCSD, system monitoring compounds and surrogates	S & A
		Accuracy/ Representativeness	4 ± 6 °C	Temperature Blank checks/Data validation	S
		Accuracy/ Representativeness	within holding times	Laboratory report/ Data validation	S
		Comparability	Comparable units and methods	Data assessment	S & A
		Comparability	RPD ≤ 50% ABS ≤ 2RL[3]	Field duplicate samples	S & A
		Completeness	≤ 90%	Data assessment	S & A
		Sensitivity	Metal-specific; see WS #15-5	Low calibration standard and all sample results (RLs on form I or equivalent).	A
		Sensitivity/ Accuracy	≤ RLs[2]	Trip blanks Equipment rinsate blanks Method blanks	S & A

[1]Reference number from QAPP Worksheets #21 and #23.
[2]Generic limits shown; lab-specific limits to be provided after laboratory is selected.
[3]Absolute difference (ABS) less than 2X reporting limit if detected concentration < 5X RL

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

[Identify secondary data and information that will be used for the project and their originating sources, if known at time of preparation of QAPP. Specify how the secondary data will be used and the limitations on their use.]

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data May Be Used (if deemed usable during data assessment stage)	Limitations on Data Use
Prior site data (previous split sampling events)	Conestoga Rovers & Associates	Remedial Investigation/ Feasibility Study Report	Site characterization, preparation of Record of Decision, initial establishment of limits of remediation.	None.

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks: Earth Tech | Earth Tech | AECOM will conduct soil and wastewater sampling. Earth Tech | Earth Tech | AECOM's designated laboratory will be responsible for providing sample bottles and analyte-free water for trip blanks and equipment rinsate blanks.

Documentation Tasks: Earth Tech | Earth Tech | AECOM observations of the sampling effort will be recorded in field logbooks. COCs will be provided by the laboratory or by Earth Tech | AECOM. Sample labels will be provided by the sample bottle vendor and completed by Earth Tech | AECOM field representatives.

Analysis Tasks: Soil and water samples will be delivered to the analytical laboratory by commercial delivery service, courier, or Earth Tech | AECOM personnel for analysis of VOCs, SVOCs, and metals.

Quality Control Tasks: Each shipment of aqueous samples which contains samples for VOC analysis will include one trip blank. The laboratory will report site-specific or batch QC sample analysis for additional QC. Additional QC sample information provided on Worksheet #26.

Assessment/Audit Tasks: The analytical laboratory is subject to audit by certifying state agencies (NYSDOH-Wadsworth) and other audits/reviews necessary to maintain its NELAC accreditation. No project-specific audits of the oversight laboratory will be conducted.

Data Review Tasks: Analytical data will be reviewed based on the QC information reported on standard forms by the laboratory. If this review suggests potential problems with any of the data sets, further action (e.g., detailed review of full data packages, including raw data) may be recommended.

Data Management Tasks: Field (as possible) and analytical data (validated) will be stored in electronic files on Earth Tech | AECOM's Latham NY office server.

QAPP Worksheet #15-1
Reference Limits and Evaluation Table

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

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits – SW846 8260B		Achievable Laboratory Limits[2]	
				MDLs [1]	Method QLs [5]	MDLs	RLs
Acetone	**67-64-1**	**50 µg/L**	**10 µg/L**	**0.04 ug/L**	**10 - 25 µg/L**	**NA µg/L**	**10 µg/L**
Benzene	**71-43-2**	**1 µg/L**	**1 µg/L**	**0.04 ug/L**	**1 - 5 µg/L**	**NA µg/L**	**1 µg/L**
Bromodichloromethane	75-27-4	NA	NA	0.08 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Bromoform	75-25-2	NA	NA	0.12 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Bromomethane	74-83-9	NA	NA	0.11 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Carbon Tetrachloride	56-23-5	NA	NA	0.21 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Chlorobenzene	**108-90-7**	**5 µg/L**	**5 µg/L**	**0.04 ug/L**	**1 - 5 µg/L**	**NA µg/L**	**1 µg/L**
Chloroethane	75-00-3	NA	NA	0.10 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Chloroform	67-66-3	NA	NA	0.03 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Chloromethane	74-87-3	NA	NA	0.13 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Dibromochloromethane	124-48-1	NA	NA	0.05 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,2-Dichlorobenzene	95-50-1	NA	NA	0.03 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,3-Dichlorobenzene	541-73-1	NA	NA	0.12 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,4-Dichlorobenzene	106-46-7	NA	NA	0.03 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Dichlorodifluoromethane	75-71-8	NA	NA	0.10 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,1-Dichloroethane	75-34-3	NA	NA	0.04 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,2-Dichloroethane	107-06-2	NA	NA	0.04 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,1-Dichloroethene	75-35-4	NA	NA	0.12 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
cis-1,2-Dichloroethene	156-59-2	NA	NA	0.12 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
trans-1,2-Dichloroethene	156-60-5	NA	NA	0.06 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,2-Dichloropropane	78-87-5	NA	NA	0.04 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
cis-1,3-Dichloropropene	10061-01-5	NA	NA	0.12 ug/L	NA	NA µg/L	1 µg/L
trans-1,3-Dichloropropene	10061-02-6	NA	NA	0.12 ug/L	NA	NA µg/L	1 µg/L
Ethylbenzene	**100-41-4**	**5 µg/L**	**5 µg/L**	**0.06 ug/L**	**1 - 5 µg/L**	**NA µg/L**	**1 µg/L**
Methylene Chloride	75-09-2	NA	NA	0.03 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	0.04 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Tetrachloroethene	127-18-4	NA	NA	0.14 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Toluene	**108-88-3**	**5 µg/L**	**5 µg/L**	**0.11 ug/L**	**1 - 5 µg/L**	**NA µg/L**	**1 µg/L**
1,1,2-Trichloroethane	79-00-5	NA	NA	0.10 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
1,1,1-Trichloroethane	71-55-6	NA	NA	0.08 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Trichloroethene	79-01-6	NA	NA	0.19 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Trichlorofluoromethane	75-69-4	NA	NA	0.08 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Vinyl Chloride	75-01-4	NA	NA	0.17 ug/L	1 - 5 µg/L	NA µg/L	1 µg/L
Xylenes (total)	**1330-20-7**	**5 µg/L**	**5 µg/L**	**0.11 ug/L**	**1 - 5 µg/L**	**NA µg/L**	**1 - 3 µg/L**

[1]Analytical MDLs are those documented in SW-846 Method 8260B, Table 1.
[2]Achievable RLs will be provided as part of laboratory selection process. MDLs are determined annually.
[3]The project quantitation goal is to meet the site-specific limits for compounds (COCs) in **boldface** as specified in ROD and meet the limits to be specified for disposal.
[4]Action limits (cleanup goals) as specified in ROD for COCs. Project action levels will be limits specified in the disposal requirements.
[5]SW-846 Method 8260B Table 3 provides generic reporting limits of 5 µg/l for 5 mL purge and 1 µg/L for 25 mL purge.

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Water
Analytical Group: Semivolatile Organic Compounds – Expanded List
Concentration Level: Low

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits – SW846 8270D		Achievable Laboratory Limits[2]	
				MDLs	Method QLs [1]	MDLs	RLs
Benzaldehyde	100-52-7	TBD µg/L	TBD µg/L	NA µg/L	NA	NA µg/L	NA µg/L
Phenol	108-95-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Bis(2-Chloroethyl)Ether	111-44-4	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2-Chlorophenol	95-57-8	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2-Methylphenol	95-48-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Bis(2-Chloroisopropyl)Ether	108-60-1	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Acetophenone	98-86-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
4-Methylphenol	106-44-5	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
N-Nitroso-Di-N-Propylamine	621-64-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Hexachloroethane	67-72-1	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Nitrobenzene	98-95-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Isophorone	78-59-1	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2-Nitrophenol	88-75-5	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4-Dimethylphenol	105-67-9	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Bis(2-Chloroethoxy)Methane	111-91-1	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4-Dichlorophenol	120-83-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Naphthalene	91-20-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
4-Chloroaniline	106-47-8	TBD µg/L	TBD µg/L	NA µg/L	20 µg/L	NA µg/L	NA µg/L
Hexachlorobutadiene	87-68-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Caprolactam	105-60-2	TBD µg/L	TBD µg/L	NA µg/L	NA	NA µg/L	NA µg/L
4-Chloro-3-Methylphenol	59-50-7	TBD µg/L	TBD µg/L	NA µg/L	20 µg/L	NA µg/L	NA µg/L
2-Methyl Naphthalene	91-57-6	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Hexachlorocyclopentadiene	77-47-4	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
1,2,4,5-Tetrachlorobenzene	95-94-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4,6-Trichlorophenol	88-06-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4,5-Trichlorphenol	95-95-4	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
1,1'-Biphenyl	92-52-4	TBD µg/L	TBD µg/L	NA µg/L	NA	NA µg/L	NA µg/L
2-Chloronaphthalene	91-58-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2-Nitroaniline	88-74-4	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
Dimethyl Phthalate	131-11-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Acenaphthylene	208-96-8	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,6-Dinitrotoluene	606-20-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
3-Nitroaniline	99-09-2	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
Acenaphthene	83-32-9	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4-Dinitrophenol	51-28-5	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
4-Nitrophenol	100-02-7	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
Dibenzofuran	132-64-9	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,4-Dinitrotoluene	121-14-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2,3,4,6-Tetrachlorophenol	58-90-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Fluorene	86-73-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Diethylphthalate	84-66-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
4-Chlorophenyl Phenyl Ether	7005-72-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
4-Nitroaniline	100-01-6	TBD µg/L	TBD µg/L	NA µg/L	20 µg/L	NA µg/L	NA µg/L
4,6-Dinitro-2-Methylphenol	534-52-1	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
N-Nitrosodiphenylamine	86-30-6	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Water
Analytical Group: Semivolatile Organic Compounds – Expanded List
Concentration Level: Low

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits – SW846 8270D		Achievable Laboratory Limits[2]	
				MDLs	Method QLs [1]	MDLs	RLs
4-Bromophenyl Phenyl Ether	101-55-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Hexachlorobenzene	118-74-1	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Atrazine	1912-24-9	TBD µg/L	TBD µg/L	NA µg/L	NA	NA µg/L	NA µg/L
Pentachlorophenol	87-86-5	TBD µg/L	TBD µg/L	NA µg/L	50 µg/L	NA µg/L	NA µg/L
Phenanthrene	85-01-8	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Anthracene	120-12-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Carbazole	86-74-8	TBD µg/L	TBD µg/L	NA µg/L	NA	NA µg/L	NA µg/L
Di-n-butyl phthalate	84-74-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Fluoranthene	206-44-0	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Pyrene	129-00-0	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Butylbenzylphthalate	85-68-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
3,3'-Dichlorobenzidine	91-94-1	TBD µg/L	TBD µg/L	NA µg/L	20 µg/L	NA µg/L	NA µg/L
Benzo(a)anthracene	56-55-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Chrysene	218-01-9	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Bis(2-ethylhexyl)phthalate	117-81-7	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Di-n-octyl phthalate	117-84-0	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Benzo(b)fluoranthene	205-99-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Benzo(k)fluoranthene	207-08-9	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Benzo(a)pyrene	50-32-8	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Indeno(1,2,3-cd)pyrene	193-39-5	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Dibenzo(a,h)anthrcene	53-70-6-3	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
Benzo(g,h,i)perylene	191-24-2	TBD µg/L	TBD µg/L	NA µg/L	10 µg/L	NA µg/L	NA µg/L
2-Aminopyridine [4]	**504-29-0**	**1 µg/L**	**1 µg/L**	NA µg/L	**NA**	NA µg/L	NA µg/L
Pyridine	**110-86-1**	**50 µg/L**	**50 µg/L**	NA µg/L	**NA**	NA µg/L	NA µg/L
Alpha-picoline	**109-06-08**	**50 µg/L**	**50 µg/L**	NA µg/L	**NA**	NA µg/L	NA µg/L
Aniline	**62-53-3**	**5 µg/L**	**5 µg/L**	NA µg/L	**NA**	NA µg/L	NA µg/L
Pyridine-related TICs (each)	**NA**	**50 µg/L**	**50 µg/L**	NA µg/L	**NA**	NA µg/L	NA µg/L

[1]Method QLs are those documented in SW-846 Method 8270D, Table 2. NA= No published limit available.
[2]Achievable RLs will be provided as part of laboratory selection process. MDLs are determined annually.
[3]The project quantitation goal is to meet the site-specific limits for compounds (COCs) in **boldface** as specified in the ROD.
[4]Action limits (cleanup goals) are specified in ROD.

QAPP Worksheet #15-3
Reference Limits and Evaluation Table

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

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits – SW846 8260B		Achievable Laboratory Limits[2]	
				MDLs	Method QLs [1]	MDLs	RLs
Acetone	**67-64-1**	**50 µg/kg**	**10 µg/kg**	**NA µg/kg**	**10 - 25 µg/kg**	**NA µg/kg**	**10 µg/kg**
Benzene	**71-43-2**	**60 µg/kg**	**5 µg/kg**	**NA µg/kg**	**1 - 5 µg/kg**	**NA µg/kg**	**5 µg/kg**
Bromodichloromethane	75-27-4		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Bromoform	75-25-2		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Bromomethane	74-83-9		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Carbon Tetrachloride	56-23-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Chlorobenzene	**108-90-7**	**1100 µg/kg**	**5 µg/kg**	**NA µg/kg**	**1-5 µg/kg**	**NA µg/kg**	**5 µg/kg**
Chloroethane	75-00-3		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Chloroform	67-66-3		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Chloromethane	74-87-3		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Dibromochloromethane	124-48-1		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,2-Dichlorobenzene	95-50-1		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,3-Dichlorobenzene	541-73-1		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,4-Dichlorobenzene	106-46-7		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Dichlorodifluoromethane	75-71-8		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,1-Dichloroethane	75-34-3		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,2-Dichloroethane	107-06-2		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,1-Dichloroethene	75-35-4		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
cis-1,2-Dichloroethene	156-59-2		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
trans-1,2-Dichloroethene	156-60-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,2-Dichloropropane	78-87-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
cis-1,3-Dichloropropene	10061-01-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
trans-1,3-Dichloropropene	10061-02-6		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Ethylbenzene	**100-41-4**	**1000 µg/kg**	**5 µg/kg**	**NA µg/kg**	**1-5 µg/kg**	**NA µg/kg**	**5 µg/kg**
Methylene Chloride	75-09-2		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,1,2,2-Tetrachloroethane	79-34-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Tetrachloroethene	127-18-4		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Toluene	**108-88-3**	**700 µg/kg**	**5 µg/kg**	**NA µg/kg**	**1-5 µg/kg**	**NA µg/kg**	**5 µg/kg**
1,1,2-Trichloroethane	79-00-5		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
1,1,1-Trichloroethane	71-55-6		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Trichloroethene	79-01-6		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Trichlorofluoromethane	75-69-4		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Vinyl Chloride	75-01-4		5 µg/kg	NA µg/kg	1-5 µg/kg	NA µg/kg	5 µg/kg
Xylenes (total)	**1330-20-7**	**1600 µg/kg**	**15 µg/kg**	**NA µg/kg**	**3 - 15 µg/kg**	**NA µg/kg**	**15 µg/kg**

[1] Method QLs are those documented in SW-846 Method 8260B, Table 1.
[2] Achievable RLs will be provided as part of laboratory selection process. MDLs are determined annually.
[3] The project quantitation goal is to meet the site-specific limits for compounds in **boldface** as specified in ROD.
[4] Action limits as specified in ROD for COCs.

QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Semivolatile Organic Compounds – Expanded List
Concentration Level: Low

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits–SW846 8270D		Achievable Laboratory Limits[2]	
				MDLs [1]	Method QLs [5]	MDLs	RLs
Benzaldehyde	100-52-7	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
Phenol	108-95-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Bis(2-Chloroethyl)Ether	111-44-4	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2-Chlorophenol	95-57-8	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2-Methylphenol	95-48-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Bis(2-Chloroisopropyl)Ether	108-60-1	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Acetophenone	98-86-2	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
4-Methylphenol	106-44-5	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
N-Nitroso-Di-N-Propylamine	621-64-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Hexachloroethane	67-72-1	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Nitrobenzene	98-95-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Isophorone	78-59-1	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2-Nitrophenol	88-75-5	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,4-Dimethylphenol	105-67-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Bis(2-Chloroethoxy)Methane	111-91-1	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,4-Dichlorophenol	120-83-2	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
Naphthalene	91-20-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
4-Chloroaniline	106-47-8	NA mg/kg	NA mg/kg	NA µg/kg	1300 µg/kg	NA µg/kg	NA µg/kg
Hexachloro-1,3-butadiene	87-68-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Caprolactam	105-60-2	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
4-Chloro-3-Methylphenol	59-50-7	NA mg/kg	NA mg/kg	NA µg/kg	1300 µg/kg	NA µg/kg	NA µg/kg
2-Methyl Naphthalene	91-57-6	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Hexachlorocyclopentadiene	77-47-4	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
1,2,4,5-Tetrachlorobenzene	95-94-3	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
2,4,6-Trichlorophenol	88-06-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,4,5-Trichlorphenol	95-95-4	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
1,1'-Biphenyl	92-52-4	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
2-Chloronaphthalene	91-58-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2-Nitroaniline	88-74-4	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
Dimethyl Phthalate	131-11-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Acenaphthylene	208-96-8	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,6-Dinitrotoluene	606-20-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
3-Nitroaniline	99-09-2	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
Acenaphthene	83-32-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,4-Dinitrophenol	51-28-5	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
4-Nitrophenol	100-02-7	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
Dibenzofuran	132-64-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,4-Dinitrotoluene	121-14-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2,3,4,6-Tetrachlorophenol	58-90-2	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
Fluorene	86-73-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Diethylphthalate	84-66-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
4-Chlorophenyl Phenyl Ether	7005-72-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
4-Nitroaniline	100-01-6	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
4,6-Dinitro-2-Methylphenol	534-52-1	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
N-Nitrosodiphenylamine	86-30-6	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg

QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Semivolatile Organic Compounds – Expanded List
Concentration Level: Low

Analyte	CAS Number	Action Limit [4]	Project Quantitation Limit [3]	Published Method Limits–SW846 8270D		Achievable Laboratory Limits[2]	
				MDLs [1]	Method QLs [5]	MDLs	RLs
4-Bromophenyl Phenyl Ether	101-55-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Hexachlorobenzene	118-74-1	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Atrazine	1912-24-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Pentachlorophenol	87-86-5	NA mg/kg	NA mg/kg	NA µg/kg	3300 µg/kg	NA µg/kg	NA µg/kg
Phenanthrene	85-01-8	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Anthracene	120-12-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Carbazole	86-74-8	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
Di-n-butyl phthalate	84-74-2	NA mg/kg	NA mg/kg	NA µg/kg	NA	NA µg/kg	NA µg/kg
Fluoranthene	206-44-0	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Pyrene	129-00-0	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Butylbenzylphthalate	85-68-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
3,3'-Dichlorobenzidine	91-94-1	NA mg/kg	NA mg/kg	NA µg/kg	1300 µg/kg	NA µg/kg	NA µg/kg
Benzo(a)anthracene	56-55-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Chrysene	218-01-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Bis(2-ethylhexyl)phthalate	117-81-7	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Di-n-octyl phthalate	117-84-0	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Benzo(b)fluoranthene	205-99-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Benzo(k)fluoranthene	207-08-9	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Benzo(a)pyrene	50-32-8	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Indeno(1,2,3-cd)pyrene	193-39-5	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Dibenzo(a,h)anthrcene	53-70-6-3	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
Benzo(g,h,i)perylene	191-24-2	NA mg/kg	NA mg/kg	NA µg/kg	660 µg/kg	NA µg/kg	NA µg/kg
2-Aminopyridine [4]	**504-29-0**	**400µg/kg**	**400µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**
Pyridine	**110-86-1**	**400 µg/kg**	**400 µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**
Alpha-picoline	**109-06-08**	**575µg/kg**	**575µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**
Aniline	**62-53-3**	**1510 µg/kg**	**1510 µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**	**NA µg/kg**
Pyridine-related TICs (each)	**NA**	**400 µg/kg**	**400 µg/kg**	**NA µg/kg**	**NA**	**NA**	**NA**

[1] Method QLs are those documented in SW-846 Method 8270D Table 2; based on GPC cleanup and 30 g sample. NA= No published limit available.
[2]Achievable RLs will be provided as part of laboratory selection process. MDLs are determined annually.
[3] The project quantitation goal is to meet the site-specific limits for compounds in **boldface** as specified in ROD
[4] Action limits as specified in ROD for COCs.

QAPP Worksheet #15-5
Reference Limits and Evaluation Table

Matrix: Wastewater
Analytical Group: Metals
Concentration Level: Low

Analyte	CAS Number	Project Action (Quantitation) Limit (µg/L) [1]	Method QLs (µg/L) [2]	Achievable Laboratory Limits (µg/L) [3]	
				MDLs	RLs
Aluminum	7429-90-5	100	100	93.9	200
Antimony	7440-36-0	3	3	0.71	20
Arsenic	7440-38-2	50	50	2.26	8
Barium	7440-39-3	1000	1000	0.83	6
Beryillum	7440-41-7	3	3	0.24	5
Cadmium	7440-43-9	5	5	0.11	4
Calcium	7440-70-2	NC	NC	68.0	1000
Chromium	7440-47-3	50	50	0.22	6
Cobalt	7440-48-4	5	5	0.18	8
Copper	7440-50-8	200	200	5.89	10
Iron	7439-89-6	300	300	35.6	100
Lead	7439-92-1	50	50	1.18	7
Magnesium	7439-95-4	35000	35000	30..5	1000
Manganese	7439-96-5	300	300	0.07	5
Mercury	7439-97-6	0.7	0.7	.017	0.2
Nickel	7440-02-0	100	100	0.46	5
Potassium	7440-09-7	NC	NC	53.3	1000
Selenium	7782-49-2	10	10	1.34	7
Silver	7440-22-4	50	50	.030	6
Sodium	7440-23-5	NC	NC	161	1000
Thallium	7440-28-0	8	8	1.62	20
Vanadium	7440-62-2	14	14	2.14	10
Zinc	7440-66-6	2000 (G)	2000	4.84	8

[1]Project action levels will be limits specified for disposal. Values shown are NY Class A water standards (G = guidance value) as published in TOGS 1.1.1.
[2]The project quantitation goal is to meet the limits to be specified in the disposal requirements.
[3]Non-specific limits shown for illustration only. Achievable RLs and MDLs will be provided as part of laboratory selection process. MDLs are determined annually.

QAPP Worksheet #16
Project Schedule/Timeline Table

[List activities that will be performed during the course of the project. Include the anticipated start and completion dates.]

Activities	Organization	Dates (MM/DD/YY) Anticipated Date(s) of Initiation	Dates (MM/DD/YY) Anticipated Date of Completion	Deliverable	Deliverable Due Date
Preparation of QAPP	Earth Tech | AECOM	12/15/08	TBD	QAPP	Draft 12/31/08 Revision 1 - 2/28/08
Procurement of Subcontract Laboratory	Earth Tech | AECOM			Laboratory Qualifications to EPA for review	
Collection of Field Samples	Earth Tech | AECOM			NA (logbook entries; sample custody documentation)	
Field Inspection/Oversight	Earth Tech | AECOM			NA (included in Closure Report)	30 days after each event
Laboratory Analysis of Samples	TBD		28 days after submission of samples [2]	None (internal product only, data not released until reviewed)	
Review of Laboratory Results	As needed by Earth Tech | AECOM personnel		28 days after analysis of samples [3]	Hardcopy Data Packages and EDDs	
Data Assessment	Earth Tech | AECOM			Within Site Closure Report	
Data Compilation	Earth Tech | AECOM			Within Site Closure Report	
Site Certification Report	Earth Tech | AECOM			Report	TBD [5]

[1]Field sampling dates are TBD.
[2]Based on a 28-day analytical turnaround time for full data package from the last sample being shipped to the laboratories. Results will be provided on an accelerated turnaround basis to allow for site work to move forward.
[3]Based on 14 days for internal review/validation from completion of analysis.
[4]Includes time for internal review of document prior to submittal to EPA.
[5]One report is planned. Content may vary based on type of report requested by EPA PM. Schedule may vary depending on availability of data.

QAPP Worksheet #17
Sampling Design and Rationale

[Describe the project sampling approach. Provide the rationale for selecting sample locations and matrices for each analytical group and concentration level, or provide synopsis of overall sampling approach and reference individual subsections in QAPP for more specific descriptions.]

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): Sampling approach is driven by regulation (for waste classification-soil and wastewater discharge) and Record of Decision (site closure sampling – soil).

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]:

Waste classification and soil confirmation data needed include all site-specific COCs for which cleanup criteria have been established. It is anticipated that this can be accomplished by conventional VOC and SVOC analyses, with the SVOC analytical suite expanded to include aniline, alpha-picoline, 2-aminopyridine, and pyridine and related TICs.

Wastewater data will be sampled and analyzed in accordance with the disposal requirements yet to be established.

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

[List all site locations that will be sampled (using range of IDs if applicable). Complete all required information (i.e., depth may not be applicable), using additional worksheets if necessary.]

Sampling Location(s)	Matrix	Depth (units)	Analytical Group(s)	Concentration Level	No. of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Soil stockpiles	Excavated soil	NA (composite from stockpile)	Site COCs (VOCs and site-specific SVOCs)	Low	TBD	WP Section 4.2	Characterize soil for treatment in biocell or use as backfill
Excavations	In situ soil	NA (Sidewall and bottom of excavation)	Site COCs (VOCs and site-specific SVOCs)	Low	TBD	WP Section 4.2	Determine if excavation in a given area is complete (remaining in situ concentrations less than cleanup goals).
Effluent tank	Wastewater	NA (grab sample from tank)	Various, as per permit; assumed VOCs, SVOCs, metals	Low	varies	WP Section 4.3.4	Verify effectiveness of groundwater treatment system and compliance with disposal requirements.

[1]Sampling is conducted by ET.

QAPP Worksheet #19
Analytical SOP Requirements Table

[For each matrix, analytical group, and concentration level, list the analytical and preparation method/SOP and associated sample volume, container specifications, preservation requirements, and maximum holding time.]

Matrix	No. of Samples	Analytical Group	Concen-tration Level	Analytical and Preparation Method/ SOP Reference[1]	Minimum Sample Volume	Containers (number, size, and type) [3]	Preservation Requirements	Maximum Holding Time (preparation/ analysis) [2]
Soil	TBD	Volatile Organics Compounds	Low	SW 846 8260	15 g	3 x 5 g EnCore or 4-oz glass jar, teflon lined cap, minimal headspace	cool to 4°C	14 days
Soil	TBD	Semivolatile Organic Compounds (modified)	Low	SW 846 8270	30 g	8 oz glass jar	cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Soil	TBD	TCLP organics (VOCs and SVOCs)	Low	SW-846 1311 followed by 8260 and 8270	100 g	8 oz glass jar	cool to 4°C	14 days to TCLP extract; 14 days for VOC analysis; 14 days for SVOC extract, then 40 for SVOC analysis
Wastewater	TBD	Volatile Organics Compounds	Low	USEPA 624 or SW846 8260	3 x 40-mL	(3) 40 mL VOA vials w/Teflon lined septum	HCl to pH<2; cool to 4°C	14 days preserved (7 days unpreserved)
Wastewater	TBD	SVOCs	Low	USEPA 625 or SW846 8270	1 L	2 x 1-L amber glass	cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Wastewater	TBD	Metals	Low	USEPA 200.7 or SW846 6010	100 mL	250 mL plastic	HNO_3 to pH<2; cool	6 months

The number in parentheses in the "Sample Container" column denotes the number of containers needed.
Laboratory Fortified Matrix analysis conducted at a frequency of 1 per 20 samples.
[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2]Holding time is technical holding time and is calculated from time of sample collection.
[3]Container types and quantities as listed in "US EPA Region 2 Laboratory – Volume, Container & Preservation Requirements," April, 2005. Subject to change.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

[Summarize by matrix, analytical group, and concentration level the number of field QC samples that will be collected and sent to the laboratory.]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples [3]	No. of Field Blanks	No. of Trip Blanks	No of PE Samples
Wastewater	Volatile Organics	Low	EPA 624 or 8260	TBD	0	1 set per 20	0	1 per shipment	0
Wastewater	SVOCs, metals	Low	EPA 625 or 8270; EPA 200.7 or 6010	TBD	0	1 set per 20	0	0	0
Soil – confirmation	VOCs, SVOCs	Low	SW846 8260 and 8270	TBD	1 per 20	1 set per 20	1/week	0	0
Soil – Waste classification	TCLP VOCs, SVOCs	Low	SW846 1311 then 8260 and 8270	TBD	0	1 set per 20	0	0	0

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2]Number of samples for each event to be determined in the field.
[3]Each QC sample for VOCs requires additional volume (i.e., three additional VOA vials per QC sample). Soil SVOC QC does not require additional volume.

QAPP Worksheet #21
Project Sampling SOP References Table [1]

[Author to list all SOPs associated with project sampling; reference number must match SOP # in Attachment to the QAPP (where the copies of the SOPs are located).]

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
WP Section 4.2.1	Soil Sampling Field Protocols (draft; February 2009)	Earth Tech | AECOM	Stainless steel trowels or spoons	NA (site-specific)	Stainless steel bowl for homogenizing composites.
WP Section 4.2.2	Confirmation Soil Sampling and Analysis (draft; February 2009)	Earth Tech | AECOM	Stainless steel trowels or spoons	NA (site-specific)	
WP Section 4.3	Wastewater Sampling and Analysis Plan	Earth Tech | AECOM	None	NA (site-specific)	

[1]WP = Remedial Design Work Plan; Draft; Earth Tech | AECOM, February 2009.

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table[1]

[Identify all field equipment and instruments (other than analytical instrumentation) that require calibration, maintenance, or testing/inspection and provide the SOP reference number for each type of equipment. In addition, document the frequency of activity, acceptance criteria, and corrective action requirements on the worksheet.]

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
pH meter	Two buffers (pH 4 and 7)	Clean probe, charge battery.	Check calibration against pH 7 buffer	Twice Daily	± 0.1 unit	recalibrate	FOL	NA
Organic vapor meter	Check against certified calibration gas	Clean instrument; charge battery.	Check against benzene equivalent or other gas as recommended by manufacturer.	Daily	± 0.1 ppm	recalibrate	Field team; FOL/SSL	NA

[1]Specific equipment to be used has not yet been established. Calibration and maintenance of equipment to be conducted in accordance with instrument manual and manufacturer's recommendations.

QAPP Worksheet #23
Analytical SOP References Table

[List all SOPs that will be used to perform on-site or off-site analysis. Indicate whether the procedure produces screening or definitive data. Include copies of the SOPs as attachments or reference in the QAPP (if required).]

EPA Reference Number	Laboratory Title, Revision Date, and/or Number [1]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N) [3]
EPA 624 [2] or SW846 8260	Analysis of Volatile Organic Compounds by GC/MS	Definitive	VOCs	GC/MS	TBD	N
EPA 625 [2] or SW846 8270	Analysis of Semivolatile Organic Compounds by GC/MS	Definitive	SVOCs (expanded)	GC/MS	TBD	Y (project-specific analyte list)
EPA method 200.7 or SW 846 6010	Determination of Metals by ICP-AES	Definitive	Inorganics (metals)	ICP	TBD	N

[1]Copies of analytical SOPs will be provided after laboratory is selected.
[2]Methods 624 and 625 are applicable to water samples only.
[3]Methods may require modification (e.g., additional low calibration standards) to meet project quantation limits.

QAPP Worksheet #24
Analytical Instrument Calibration Table

[Identify all analytical instrumentation that requires calibration and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.]

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	See SOP.	Initial calibration: 3-6 pt calibration whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.), or if the continuing calibration acceptance criteria have not been met. Continuing calibration: Once every 12 hours Mass Calibration Check – at beginning of each 12-hr period	Initial calibration/ Continuing calibration: relative response factor (RRF) greater than or equal to minimum acceptable response factor listed in Method 624/625 or 8260/8270; %RSD must be less than or equal to 20% for at least 90% of analytes. Mass calibration per SOP.	Initial calibration: inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate. Continuing calibration: inspect system, recalibrate the instrument, and qualify data. Mass calibration: re-tune and re-run. Mass cal criteria must be met prior to any analyses.	Laboratory GC/MS Technician / Analyst	TBD
ICP-AES	See SOP; as per instrument manufacturer's recommended procedures	Initial calibration: daily or once every 24 hours and each time the instrument is set up. Continuing calibration: beginning and end of run, and frequency of 10% or every 2 hours during an analysis run.	As per instrument manufacturer's recommended procedures, with at least 2 standards.	Inspect the system, correct problem, re-calibrate, re-analyze samples.	Laboratory ICP Technician / Analyst	TBD

[1]Procedures and SOPs shown are generic. Laboratory-specific SOPs and procedures will be provided after laboratory has been selected.

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

[Identify all analytical instrumentation that requires maintenance, testing, or inspection and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.]

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations	Acceptable re-calibration; see SOP.	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	Laboratory technician or GC/MS Laboratory Supervisor	EPA 624/625 or SW846 8260/8270 [2]
ICP	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see SOP.	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	Inorganic Laboratory Technician or supervisor	EPA 200.7, or SW846 6010 [2]

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2]Instrument maintenance program as per laboratory's quality management program.

QAPP Worksheet #26
Sample Handling System

[Identify personnel and components of the project-specific sample handling system.]

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Earth Tech | AECOM (collects samples).
Sample Packaging (Personnel/Organization): Earth Tech | AECOM
Coordination of Shipment (Personnel/Organization): Earth Tech | AECOM
Type of Shipment/Carrier: Courier or commercial overnight delivery service
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian, Lab TBD
Sample Custody and Storage (Personnel/Organization): Sample Custodian, Lab TBD
Sample Preparation (Personnel/Organization): Sample Technicians, Lab TBD
Sample Determinative Analysis (Personnel/Organization): Sample Technicians, Lab TBD
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Typically samples are delivered to analytical laboratory within one day of collection.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): As per analytical methodology.
Biological Sample Storage (No. of days from sample collection): Not applicable.
SAMPLE DISPOSAL
Personnel/Organization: Sample Technicians, Laboratory TBD
Number of Days from Analysis: Until analysis and QA/QC checks are completed; default standard policy is disposal of samples and extracts 60 days after issuance of analytical report.

QAPP Worksheet #27
Sample Custody Requirements

[Briefly describe the procedures that will be used to maintain sample custody and integrity – reference text sections and figures from QAPP.]

Sample Identification Procedures:

Each sample will be labeled with a unique identification code corresponding to the excavation, stockpile, or tank from which the sample is obtained. Trip blanks are designated as "TB" with a date code. Field duplicates are given an ID similar to the environmental sample with which they are paired (e.g., by adding 50 to the original field sample ID number).

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

The definition of sample custody according to Office of Enforcement and Compliance Monitoring National Enforcement Investigations Center (NEIC) Policies and Procedures USEPA (1986) states that a sample is under custody if it is in one's possession, it is in one's view after being in one's possession, it is locked up after being in one's possession, or if it is in a secure area. Under this definition, the team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred properly. The chain-of-custody report is employed as physical evidence of sample custody.

Samples will be shipped from the field directly to each laboratory via FedEx or an equivalent overnight carrier. (Samples may be hand-delivered by Earth Tech | AECOM personnel or laboratory courier if the laboratory is local.) Samples will be shipped from the field the same day they are collected. All courier receipts and/or paperwork associated with the shipment of samples will serve as a custody record for the samples while they are in transit from the field laboratory. Custody seals should remain intact during this transfer.

When the samples are delivered to the laboratory, signatures of the laboratory personnel receiving them and courier personnel relinquishing them will be completed in the appropriate spaces on the chain-of-custody record. This will complete sample transfer.

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

Laboratory custody procedure requirements will be described in the Laboratory's Quality Management Plan. These documents identify the laboratory custody procedures for sample receipt and log-in, sample storage, tracking during sample preparation and analysis, and laboratory storage of data.

It will be the laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis. To track field samples through data handling, Earth Tech | AECOM will maintain copies of chain-of-custody forms. Coolers are secured with nylon fiber tape and at least two custody seals (or equivalent) are placed across cooler openings. Since custody forms are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign the chain-of-custody form.

Disposal of the samples will occur only after analyses and QA/QC checks are completed, and 60 days after issuance of analytical report.

QAPP Worksheet #28-1
QC Samples Table

[Complete a separate worksheet for analytical method (e.g., OLM04.3 vs. OLC03.2), matrix (e.g., soil vs. groundwater), analytical group (e.g., VOCs vs. metals), and concentration level (if applicable).]

Matrix	Aqueous (wastewater) and soil
Analytical Group	Volatile Organic Compounds
Concentration Level	Low
Sampling SOP(s)	NA
Analytical Method/SOP Reference	Laboratory SOP (EPA 624 [aqueous only] or SW846 8260)
Sampler's Name	TBD
Field Sampling Organization	Earth Tech | AECOM
Analytical Organization	Laboratory (TBD)
No. of Sample Locations	TBD

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits [1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria [1]
Tuning (Mass calibration check)	At beginning of run and every 12 hours	Meet all PBFB criteria	Check instrument, reanalyze, re-tune	lab personnel	Sensitivity	Meet all PBFB criteria
Method Blank (Lab Reagent Blank)	Prior to each analytical run	< MDL	Identify source and correct prior to continuing analysis	lab personnel	Sensitivity/ Contamination	< RL
Trip Blank	One per shipment including aqueous VOCs	< RL	Identify source and correct	Field and/or laboratory personnel	Sensitivity/ Contamination	< RL
Initial Calibration	Prior to sample analysis	Max % RSD ≤ 20% of average RRF; no more than 10% of analytes failure	Check instrument, recalibrate; qualify data	lab personnel	Accuracy/ Precision	RSD ≤ 20% of average RRF; no more than 10% of analytes failure
Continuing calibration check standard	Every 12 hours	RRF % D ≤ 30%; not more than 10% of analytes failure;	Recalibrate, qualify data	lab personnel	Accuracy	RRF % D ≤ 30%; not more than 10% of analytes failure
Laboratory Fortified Matrix	1 per ≤ 20 samples	Mean recovery average 70-130 %R	Assume matrix bias; qualify data; note in case narrative	lab personnel	Accuracy	Recovery 70-130% (each analyte)

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits [1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria [1]
LCS/Lab Fortified Blank (LFB) (AQC)	2 per batch of ≤ 20 samples	Average recovery 70 – 130% R; RPD ≤ 20%	Qualify data unless high recovery and/or not detected	lab personnel	Accuracy/ Precision	Average recovery 70 – 130% R; RPD ≤ 20%
Surrogate Compounds	all samples, standards, and blanks	70% - 130% R	Reinject; qualify data	lab personnel	Extraction efficiency, Accuracy	70% - 130% R
Internal Standards	all samples, standards, and blanks	-30 to +40% from initial/ continuing calibration (for superfund program)	Check instruments, reanalyze affected samples if possible. If reanalysis not possible qualify data (except non detects with high IS recovery).	lab personnel	Accuracy	-30 to +40% from initial/ continuing calibration

[1]Recovery and precision limits are generic; QC samples, frequency, and acceptance limits will be updated after laboratory is selected.

QAPP Worksheet #28-2
QC Samples Table

[Complete a separate worksheet for analytical method (e.g., OLM04.3 vs. OLC03.2), matrix (e.g., soil vs. groundwater), analytical group (e.g., VOCs vs. metals), and concentration level (if applicable).]

Matrix	Aqueous (wastewater) and soil
Analytical Group	Semivolatile Organic Compounds
Concentration Level	Low
Sampling SOP(s)	NA
Analytical Method/SOP Reference	Laboratory SOP (EPA 625 [aqueous only] or SW846 8270)
Sampler's Name	TBD
Field Sampling Organization	Earth Tech | AECOM
Analytical Organization	Laboratory (TBD)
No. of Sample Locations	TBD

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits [1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria [1]
Tuning (Mass calibration check)	At beginning of run and every 12 hours	Meet all DFTPP criteria	Check instrument, reanalyze, re-tune	lab personnel	Sensitivity	Meet all PBFB criteria
Method Blank (Lab Reagent Blank)	1 per extraction batch of ≤ 20 samples	< MDL	Identify source and correct prior to continuing analysis	lab personnel	Sensitivity/ Contamination	< RL
Initial Calibration	Prior to sample analysis	RSD ≤ 35% of average RRF; no more than 10% of analytes failure; no RSD > 60%	Check instrument, recalibrate; qualify data	lab personnel	Accuracy/ Precision	RSD ≤ 20% of average RRF; no more than 10% of analytes failure
Continuing calibration check standard	Every 12 hours	Min RRF 0.05 Max % D ≤ 20%; not more than 10% of analytes failure but no RSD >60%	Recalibrate, qualify data	lab personnel	Accuracy	RRF % D ≤ 30%; not more than 10% of analytes failure
Laboratory Fortified Matrix (Matrix Spike)	1 per ≤ 20 samples	Mean recovery average 70-130 %R	Assume matrix bias; qualify data; note in case narrative	lab personnel	Accuracy	Recovery 70-130% (each analyte)

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits [1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria [1]
LCS/Lab Fortified Blank (LFB) (AQC)	2 per batch of ≤ 20 samples	Average recovery 70 – 130% R; RPD ≤ 20%	Qualify data unless high recovery and/or not detected	lab personnel	Accuracy/ Precision	Average recovery 70 – 130% R; RPD ≤ 20%
Surrogate Compounds	all samples, standards, and blanks	30% - 130% R for BN 20% - 120% for AE	Reinject; qualify data	lab personnel	Extraction efficiency, Accuracy	30% - 130% R for BN 20% - 120% for AE
Internal Standards	all samples, standards, and blanks	Factor of two (-50% to +100%)	Check instruments, reanalyze affected samples if possible. If reanalysis not possible qualify data (except non detects with high IS recovery).	lab personnel	Accuracy	Factor of two (-50% to +100%)

[1]Recovery and precision limits are generic; QC samples, frequency, and acceptance limits will be updated after laboratory is selected.

QAPP Worksheet #28-3
QC Samples Table

Matrix	Aqueous (Wastewater)
Analytical Group	Metals (ICP)
Concentration Level	Low/Trace
Sampling SOP(s)	NA
Analytical Method/SOP Reference	Laboratory SOP (EPA 200.7 or SW846 6010)
Sampler's Name	TBD
Field Sampling Organization	Earth Tech | AECOM
Analytical Organization	Laboratory (TBD)
No. of Sample Locations	TBD

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples	all constituents < RL (< 50 µg/L for iron, < 10 µg/L for manganese)	Investigate source of contamination	Laboratory personnel	Senstivity/ Contamination	all constituents < RL
Continuing Calibration Check Std	1 per ≤ 10 samples	80 – 120% R	Reanalyze; qualify data	Laboratory personnel	Accuracy	80 – 120% R
Laboratory Matrix Spike	1 per ≤ 20 samples	80-120%R*	Qualify data	Laboratory personnel	Accuracy	80-120%R
Low Level Check Std	Beginning and end of each analytical run	± 30 % of true value	Check instrument; recalibrate	Laboratory personnel	Accuracy	± 30 % of true value
Initial Calibration Verification (ICV)	After each calibration; every 10 samples; end of each analytical run	90% - 110%	Check instrument; reanalyze	Laboratory personnel	Accuracy	90% - 110%
Initial Calibration Blank (ICB)	After ICV	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity/ contamination	< RL
Continuing Calibration Blank	After every CCB	< RL	Investigate source of contamination	Laboratory personnel	Sensitivity/ contamination	< RL
Serial Dilution	Matrix spike sample	RPD < 20%	Qualify data	Laboratory personnel	Precision	RPD < 20%
Interference Check Sample [ICP 200.7]	beginning, and end of each analytical run	< RL except Al, Fe, Ca, K, Mg, and Na	As per method/SOP	Laboratory personnel	Precision	< RL except Al, Fe, Ca, K, Mg, and Na

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS) / Lab Fortified Blank (LFB)	2 per extraction batch of ≤ 20 samples	Average recovery 80-120%; RPD < 20%	Qualify data	Laboratory personnel	Accuracy/ Precision	Average recovery 80-120%; RPD < 20%

[1]Recovery and precision limits are generic; QC samples, frequency, and acceptance limits will be updated after laboratory is selected.

QAPP Worksheet #29
Project Documents and Records Table

[Identify the documents and records that will be generated for the project including, but not limited to, sample collection and field measurement, on-site and off-site analysis, and data assessment.]

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
• Site and field logbooks • COC forms • Request forms and associated correspondence	None (no field analyses performed by Earth Tech | AECOM)	• Laboratory SOPs • MDL study results • Internal COC forms • Sample preparation log • Standard traceability logs • Instrument calibration data • Instrument analysis logs • QC summary checklist with all relevant information • Sample analysis data • Instrument/computer printouts • Definition of qualifiers • Cover Letter • Approval form • Final report	• Field inspection checklist(s) • Sample acceptance checklist • PT Sample results • MDL Study results • Training records • Initial DOC/CDOC records • Event-Specific Reports (may include ET review of laboratory data quality, assessment of field activities, quantitative and qualitative assessment of data and comparison oversight agency split data, if any) • Corrective action reports • Internal audit reports • External laboratory assessment (e.g., NELAC)	• Telephone/email logs • Corrective action documentation • Equipment maintenance logs • Validated computer software records • Procurement request forms

QAPP Worksheet #30
Analytical Services Table

[Identify all laboratories or organizations that will provide analytical services for the project, including on-site and off-site laboratories.]

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/ Organization (Name and Address, Contact Person and Telephone Number)
Soil/Water	VOCs/SVOCs	Low	TBD	28 Days*	• TBD	NA
Wastewater	Metals	Low	TBD	28 Days*	• TBD	NA

* Turnaround time includes analytical and internal validation; confirmation, classification, and wastewater data to be released and used prior to submission of full data report.

QAPP Worksheet #31
Planned Project Assessments Table

[Identify the type, frequency, and responsible parties of planned assessment activities that will be performed for the project.]

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Laboratory Technical Systems/ Performance Audits	As per EPA or other certifying agency(s)	External	EPA or other Regulatory Agency (e.g. NYSDEC / NYSDOH; NELAC)	Unknown, EPA or other Regulatory Agency	Laboratory Manager or designee	Unknown, Laboratory TBD	ET QAO or Regulatory Agency
Performance Evaluation Samples	As per EPA or other certifying agency(s)	External	EPA or other Regulatory Agency (e.g., NYSDEC/ NYSDOH)	Unknown, EPA or other Regulatory Agency	Laboratory Manager or designee	Unknown, Laboratory TBD	ET QAO or Regulatory Agency
On-Site Field Inspection	[None]	Internal	NA	NA	NA	NA	NA

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

[For each type of assessment, describe procedures for deficiencies/deviations encountered.]

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Performance Evaluation Samples[1]	Recovery outside warning or control limits	[Name], Project Manager and/or QAO	Immediately to within 24 hours of review	Investigate and correct	Laboratory Manager; QA Manager; Section/ group Manager	Unknown
Laboratory Technical Systems/ Performance Audit[2]	Unknown	Laboratory Manager	Unknown	Unknown	Laboratory Manager or QA manager	Unknown
On-Site Field Inspection	Unknown	ET PM or project engineer; management personnel of affected organization	Unknown	Unknown	Environmental Trust project coordinators; USEPA PM and affected organization	Unknown

1. PE samples not currently planned.

2. May include periodic audits in conjunction with maintaining NELAC certification.

QAPP Worksheet #33
QA Management Reports Table

[Identify the frequency and type of planned QA Management Reports, the project delivery dates, the personnel responsible for report preparation, and the report recipients.]

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Laboratory Data (validated)	As needed and as performed	Up to 30 days after sampling complete for each oversight event.	See Worksheet 35	Keith Decker - Earth Tech | AECOM Project Manager; Allen Burton, Earth Tech | AECOM QAO
Laboratory Technical Systems/ Performance Audits	As per EPA (none planned by Earth Tech | AECOM)	Unknown	EPA or other Regulatory Agency; NELAC	Laboratory
Performance Evaluation Samples	As per EPA (None planned specific to Nepera laboratory)	Unknown	EPA or other Regulatory Agency	Laboratory
Report	One	45 calendar days after completion of sampling.	Keith Decker (PM), Earth Tech | AECOM	EPA PM; others as designated by EPA

QAPP Worksheet #34
Verification (Step I) Process Table

[Describe the processes that will be followed to verify (review for completeness) project data.]

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Site/field logbooks	Field notes will be reviewed by the ET PM to determine completeness, appropriateness, ease of understanding, etc. of information recorded. Upon completion of field work, logbooks will be placed in the project files.	I	TBD, FOL, Earth Tech | AECOM Keith Decker, Project Manager, Earth Tech | AECOM
Chains of custody	COC forms will be reviewed against the samples packed in the specific cooler prior to shipment. An original COC will be sent with the samples to the laboratory, while copies are retained for the project files.	I	TBD, FOL, Earth Tech | AECOM
Sampling Trip Reports (STRs)	Not Applicable (no samples analyzed by CLP RAS laboratory)	NA	NA
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	I	Contract laboratory TBD; See worksheet #35.
Laboratory analytical data package	Data packages will be reviewed as to content and sample information upon receipt by Earth Tech | AECOM.	E	Earth Tech | AECOM
Database	NA. No formal database being implemented for the sampling.	NA	NA

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

[Describe the processes that will be followed to assess project data quality – note: this is not just "data validation" as it is known. Validation inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1).]

Step IIa/IIb	Validation Input	Description	Responsible for Evaluation (Name, Organization)
IIa	Laboratory narrative; SOPs	Verify that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved.	Allen Burton, Earth Tech | AECOM
IIb	Laboratory narrative; SOPs	Determine potential impacts from noted/approved deviations, in regard to PQOs.	Allen Burton, Earth Tech | AECOM
IIa	Chains of custody	Examine COC forms against QAPP and laboratory scope of work (e.g., analytical methods, sample identification, etc.).	Allen Burton, Earth Tech | AECOM
	Chain of Custody	Chain-of-custody forms will be verified against the sample cooler they represent. Sample Acceptance Checklist is completed. Laboratory log-in supervisor utilizes the analyses request information and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form as specified in the laboratory's Quality Management Plan.	Laboratory sample log-in Personnel
IIa	Laboratory data package	Examine packages against QAPP and laboratory scope of work, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.).	Allen Burton, Earth Tech | AECOM or designated reviewer
IIb	Laboratory data package	Determine potential impacts from noted/approved deviations, in regard to PQOs. Examples include PQLs and QC sample limits (precision/accuracy).	Allen Burton, Earth Tech | AECOM; or designated reviewer

Step IIa/IIb	Validation Input	Description	Responsible for Evaluation (Name, Organization)
	Analytical data package/ Final Report	The procedures for data review : 1- Data reduction/review by Primary Analyst. 2- Review complete data package (raw data) by independent Peer Reviewer 3- The laboratory project manager reviews the project documentation for completeness followed by a QA review by the QAO 4- Final review by QAO or laboratory manager prior to release, this review is to verify completeness and general compliance with the objectives of the project. This final review typically does not include a review of raw data. Details can be found in Laboratory Quality Management Plan.	Primary Analyst, Peer Reviewer, Sample Project Coordinator, Laboratory Quality Assurance Officer
IIb	Field duplicates	Evaluate agreement between duplicate pairs; tabulate both sets of data and calculate RPD (or absolute D if result < 5X RL) for each detected analyte.	Allen Burton, Earth Tech | AECOM; or designated reviewer
IIb	Verification analyses	Evaluate agreement between oversight laboratory results and corresponding PRP laboratory results; tabulate both sets of data and calculate RPD (or absolute D if result < 5X RL) for each detected analyte. If discrepancies between the two data sets exist, review historical/previous data as aid in identifying source of the problem.	Allen Burton, Earth Tech | AECOM; or designated reviewer

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

[Identify the matrices, analytical groups, and concentration levels that each entity performing validation will be responsible for, as well as criteria that will be used to assess those data.]

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Evaluation Criteria	Data Reviewer (title and organizational affiliation)
IIa / IIb	Aqueous/Soil	VOCs	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist
IIb	Aqueous/Soil	VOCs	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist
IIa / IIb	Aqueous/Soil	SVOCs	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist
IIb	Aqueous/Soil	SVOCs	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist
IIa / IIb	Aqueous	Metals (ICP)	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist
IIb	Aqueous	Metals (ICP)	Low	Review using EPA SOPs	Earth Tech | AECOM Chemist

EPA SOPs are USEPA Region 2 Data validation SOPs (e.g., HW-24 for VOCs by SW-846 8260; HW-22 for SVOCs by 8270; HW-6 for metals).

QAPP Worksheet #37
Usability Assessment

[Describe the procedures/methods/activities that will be used to determine whether data are of the right type, quality, and quantity to support environmental decision-making for the project. Include information on the following:

- **Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used;**
- **Describe the evaluative procedures used to assess overall measurement error associated with the project;**
- **Identify the personnel responsible for performing the usability assessment; and**
- **Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies.]**

The quality and usability of data obtained during the project will be determined by examining data summary reports and verifying that the sampling procedures and analytical results were obtained following the applicable protocols, are of sufficient quality to satisfy PQOs, and can be relied upon for performing the subsequent activities. This inspection will include checking site/field logbooks, field procedures and logbooks, analyses requested versus analyses performed, summary reports, comparison with historical and PRP data, and QA/QC information. The data assessment will determine possible effects on the data that result from project requirement failures (i.e., data quality), and their actual adequacy to fulfill the site-specific QA/QC requirements (i.e., data usability).

PQOs (and DQOs as applicable) will be compared to the data results from the field investigation to determine if the PQOs were achieved. Efforts to evaluate and verify attainment of PQO statements will enable data users to understand any usability limitations associated with project data. Procedures used to assess QA/QC objectives will be in accordance with the appropriate analytical method, which were originally selected based on ability to meet project goals. For example, to determine the attainment of the sensitivity goals, values for non-detected analytes (i.e., flagged "U") will be reviewed to verify that the sensitivity of the chosen methods (i.e., the SQLs) was adequate to meet the applicable criteria (described in Worksheet #15). Note that elevated reporting limits (i.e., due to dilutions) necessary to keep high concentrations of target analytes within the calibrated range of the method are not considered a non-conformance. PRP and oversight laboratory RLs and dilution factors will be compared for anomalies (e.g., samples analyzed at a DF of 1 by one laboratory and at a higher DF by the other).

The data quality/usability and PQO reconciliation evaluations will be performed by personnel with the appropriate training and/or experience to perform these reviews/evaluations. The results of the data quality/usability evaluation and PQO reconciliation will be included as part of the letter reports for each split sampling event.

Appendix B

Health and Safety Contingency Plan

EARTH TECH | AECOM

DRAFT FINAL
HEALTH AND SAFETY CONTINGENCY PLAN
NEPERA SUPERFUND SITE

Site:
Nepera Chemical Company Superfund Site
Town of Hamptonburgh
Orange County, New York 10916

Submitted to:
United States Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, New York 10007

Prepared for:
Pfizer, Inc.
100 Route 206 North
Peapack, NY 07977

Cambrex Corporation
One Meadowlands Plaza
East Rutherford, NJ 07030

Prepared by:
Earth Tech | AECOM
40 British American Boulevard
Latham, New York 12110

February 2009

Project No. 106559.05

HEALTH AND SAFETY PLAN APPROVAL

This Health and Safety Contingency Plan (HSCP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HSCP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HSCP for the Nepera Chemical Company Superfund Site. This HSCP has been written for the exclusive use of Earth Tech | AECOM, its employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Approved by:

______________________________ __________

Robert M. Poll, CIH, CSP — Date
Health and Safety Coordinator/Northeast District Safety Manager
518-951-2242

______________________________ __________

Keith A. Decker — Date
Project Director
518-951-2229

Written by:

______________________________ __________

Minda Murray — Date
Project Safety Manager
518-951-2302

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1.0 INTRODUCTION

This Health and Safety Contingency Plan (HSCP) (including Attachments A-D) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted at the Nepera Chemical Company Superfund Site, located in Orange County, New York. This HSCP also identifies chemical and physical hazards known to be associated with the Earth Tech-managed activities addressed in this document.

HSCP Supplements will be generated as necessary to address any additional activities or changes in site conditions that may occur during field operations. Once generated, each Supplement will be inserted in Attachment D and reviewed/acknowledged by field personnel prior to initiating the associated work.

1.1 General

The provisions of this HSCP are mandatory for all Earth Tech Northeast, Inc. (Earth Tech | AECOM) personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HSCP, any applicable HSCP Supplements, and the Consolidated U.S. Operations Safety, Health & Environmental Manual shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this HSCP and the applicable Safety, Health, and Environmental (SH&E) Procedures. In the event of a conflict between this HSCP and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

1.2 Policy Statement

The policy of Earth Tech I AECOM is to provide a safe and healthy work environment for all of its employees. Earth Tech I AECOM considers no phase of operations or administration is of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At Earth Tech I AECOM, we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident. This policy is detailed in the Corporate Policy SH&E 001, *Safety, Health and Environmental Policy Statement*.

The practices and procedures presented in this HSCP and any supplemental documents associated with this HSCP are binding on all Earth Tech I AECOM employees while engaged in the subject work. In addition, all site visitors shall abide by these procedures as the minimum acceptable standard for the work site. Operational changes to this HSCP and supplements that could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the Project Manager (PM) and the assigned Safety Professional.

1.3 References

This HSCP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*.
- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.

The requirements in this HSCP also conform to the requirements as specified in Earth Tech I AECOM *Consolidated U.S. Operations Safety, Health, & Environmental Manual,* a copy of which will be maintained on site at all times (hard copy and/or electronic). A copy of the manual's Table of Contents has been included in Attachment D- *Health and Safety Plan Supplements*.

1.3.1 Earth Tech Safety, Health and Environmental Website

Earth Tech I AECOM Safety Website is located on the Earth Tech Corporate Intranet (ETOnline), and is available for all Earth Tech I AECOM employees as a resource for safety information, updates, and procedures. Project management and employees are encouraged to visit the website for key safety items and information, such as:

- The Earth Tech I AECOM Employee Orientation,
- Contact information for Earth Tech I AECOM Safety Department staff,
- Safety Forms,
- The Consolidated U.S. Operations Safety, Health, & Environmental Manual
- Safety Alerts and other communications,
- Accident, Injury, and Near-Miss Reporting Requirements,
- Links to safety and regulatory information,
- Training Resources,
- Ergonomics Information, and
- A feedback link to the Earth Tech I AECOM Safety Director.

The website is located at the following web address:

http://etconnect.earthtech.com/sites/SHE_United_States/default.aspx

Please note the website can only be accessed when connected to Earth Tech I AECOM Wide-Area Network (e.g., via Earth Tech RAS).

1.3.2 Health and Safety Consolidated SH&E Manual

A copy of the Health and Safety Consolidated SH&E Manual (Revised 2006) will be kept on site as a supplement to this HSCP. The table of contents for this manual has been provided in Attachment D for reference.

1.4 Organization of this Document

Work activities to be performed will consist of 3 major groups of activities (see Section 2.0 for details). To maximize the usability of this HSCP for all workers supporting the site activities the document is organized to separately address each of these activity groups. Therefore this HSCP is organized as follows:

- Section 2.0 provides an overall description of the project site, including site history and known environmental conditions. This section also provides a brief overview of the planned work operations addressed in this HSCP.
- Section 3.0 provides the overall project organizational management structure and duties as related to health and safety.
- Section 4.0 provides health and safety requirements of general applicability for all on-site operations.
- Sections 5.0 through 7.0 addresses specific health and safety-related requirements applicable to the individual activity groups of the overall operation. Each section includes a specific description of the work activities, personnel training/qualification requirements, assessment of work hazards and identification of applicable preventive measures, and identification of job-specific personal protective equipment requirements. The work phases are:
    - Site Preparation Activities (Section 5.0)
    - Remediation Activities (Section 6.0)
    - Restoration Activities (Section 7.0)
- Section 8.0 addresses contingency planning requirements and emergency response procedures.

2.0 SITE INFORMATION AND GENERAL SCOPE OF WORK

Earth Tech I AECOM will conduct environmental remediation services at the Nepera Chemical Company Superfund Site located in Orange County, New York. Work will be performed in accordance with the Design/Build work plans developed for the site. Deviations from the approved work plans will require that a Safety Professional review any changes made to this HSCP, to ensure adequate protection of personnel and other property.

2.1 General Site Description

The Site is located in the Town of Hamptonburgh, Orange County, New York on the northern side of Orange County Highway 4. The Site is owned by Nepera, Inc. The Site is located approximately 1.5 miles southwest of the Town of Maybrook, New York. Approximately five acres of the 29.3 acres total property area were affected by historical lagoon operations. The former lagoon area is currently enclosed by a perimeter fence. No buildings or other structures exist at the Site. Access from Orange County Highway 4 is via a gravel road leading past the former lagoon area to an abandoned railway bed. Beaverdam Brook traverses the western edge of the Site flowing north to the Otter Kill just beyond the northern edge of the Site. The Site is bounded on the north by Orange County Highway 4, Beaverdam Brook to the west, Otter Kill to the south and an undeveloped track of land to the east.

Approximately 6,500 people live within three miles of the Site. The closest residences are located approximately 250-ft, 175-ft, and 450-ft to the west, north and northeast, respectively. These residences rely on private supply wells for water. The public water supply wells for the Village of Maybrook are located approximately 800-ft to the east-northeast of the Site. The landuse in vicinity to the Site is residential and agricultural.

The Site was purchased by the Pyridium Corporation in 1952. The Site was used for wastewater disposal between 1953 and 1962 in six constructed lagoons. These lagoons were used to dispose of wastewater generated at the plant site in Harriman, New York. No wastewater disposal has taken place at the Site since December 1967. All of the lagoons were back-filled with clean soil by 1974.

The Site was placed on the National Priority List (NPL) on June 10, 1986. The Site Superfund Identification Number is NY000511451. The original remedial investigation/feasibility study (RI/FS) program was conducted in accordance with the Stipulation Agreement entered into by Nepera, Inc. and Warner-Lambert Company with the New York State Department of Environmental Conservation (NYSDEC) in March 1988. Subsequently a Consent Decree lodged in 1988 by NYSDEC superseded the Stipulation Agreement. A record of decision (ROD) for the Site executed issued by the USEPA on September 28, 2007. The AOC was logged in Federal Court with Cambrex Corporation, Nepera, Inc., Warner-Lambert Company LLC and Pfizer, Inc, on October 3, 2008.

The two lithologic units (overburden and bedrock) at the Site are divided into three hydrogeologic units. The overburden units include a Shallow Aquifer underlain by a localized Overburden Aquitard. The Bedrock Aquifer resides in competent bedrock below the Site. The overburden is absent in several areas and has thicknesses of greater than 20-ft in the southern portion of the Site. The Shallow Aquifer consists of the more permeable outwash sand and gravel deposits and also the highly fractured shale interface directly above the competent bedrock. A high water table typically occurs in the first half of the year with the low water table occurring during the second half of the year with a water table elevation difference of 3-ft to 6-ft between seasons. The lagoon area is located in the south-central portion of the site, making the overburden thickness highly variable in this area.

The Overburden Aquitard unit consists of silt and clay (till) and is discontinuous over the site. Where present, the till acts as a confining unit and results in isolated or perched pockets of groundwater.

The Bedrock Aquifer occurs in the competent portion of the shale bedrock with groundwater traveling through open fractures. The bedrock shale becomes more competent with depth, with beds dipping to the southeast at 40 to 50 degrees below horizontal with a strike 30 degrees to the east.

2.2 Site Contaminants

Extensive sampling identified a number of compounds exceeding the NYSDEC SCOs. The primary COCs are volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The VOCs include benzene, toluene, ethylbenzene and xylene (BTEX), acetone and chlorobenzene. The SVOCs include 2-aminopyridine, 2-picoline, pyridine, aniline, benzoic acid, bis(2-ethylhexyl)phthalate and phenol. The primary groundwater COCs are also VOCs and SVOCs. The VOCs detected in either the Shallow or Bedrock Aquifer include BTEX, acetone and chlorobenzene with the higher concentrations being in the Shallow Aquifer. The SVOCs detected in either the Shallow or Bedrock Aquifer include 2-aminopyridine, 4-choloraniline (1 well) and bis(2-ethylhexylphthalate).

2.3 General Scope of Work

This HSCP is written specifically to cover remedial activities at the Nepera Chemical Company Superfund Site. The major components of the remedial activities, as defined in the Remedial Design Work Plan, will include the following:

- Utility clearance and identification
- Mobilization to the site
- Site preparation
- Erosion and sediment control installation
- Construct biocell water extraction, treatment, and injection system
- Construct air extraction/biovent and treatment system
- Excavating contaminated soils
- Segregating and stockpiling contaminated soils (“stained”) and non-contaminated soils (“unstained”)
- Mechanically screen contaminated soils to remove rock greater than 2” in diameter
- Mechanically amend contaminated soils with bulking agent, nutrients, and pH adjustments
- Construct below grade biocell or biopile
- Operating bioremediation systems
- Backfilling, compacting, and grading excavated areas
- Final work, site cleanup and demobilization

Potentially contaminated media associated with these activities may include site soils, shallow groundwater, components (i.e. filter media, apparatus, etc.) of biocell air extraction treatment system, and water treatment system.

3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

The following is a description of the project's SH&E management organization, including designation of specific duties and responsibilities to the project staff and organizations.

3.1 Organizational Responsibilities

The following organizations will exercise safety management authority on the work site during this Project:

- Earth Tech I AECOM
- Maybrook and Harriman Environmental Trust (Client)
- US Environmental Protection Agency, USEPA (Federal environmental governing agency)

The safety-related responsibilities of each organization are as follows:

3.1.1 Earth Tech I AECOM

Earth Tech I AECOM shall serve as the primary organization responsible for control of the work site and management of work activities being conducted for this project. This includes:

- Development of this HSCP, which shall apply to all operations conducted on the work site.
- Providing personnel to fulfill the safety-related positions described in Section 3.2.
- Ensuring that all on-site employees, site personnel and visitors meet the HSCP-specified training and medical monitoring requirements procedures.
- Performing appropriate occupational exposure and community exposure monitoring.
- Identifying and controlling occupational safety and health exposures associated with site work activities.

Earth Tech I AECOM may employ subcontractor organizations to support its work activities; these organizations shall be managed directly by Earth Tech I AECOM and shall, at a minimum, conform to the requirements of this HSCP.

3.1.2 Maybrook and Harriman Environmental Trust (Client)

Maybrook and Harriman Environmental Trust or its appointed representative shall oversee work being performed by Earth Tech I AECOM and its subcontracted organizations. Maybrook and Harriman Environmental Trust or personnel representing the Client shall not exercise health and safety management authority over Earth Tech I AECOM however; shall exercise health and safety management authority over their own site activities. The Client or personnel representing the Client present on site shall be required to adhere to the training, medical monitoring, personal protective equipment, and other requirements of Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*). Additional requirements, as defined in this HSCP, may be applicable to Client or personnel representing the Client if present within Earth Tech I AECOM controlled work areas.

3.1.3 USEPA (Federal environmental governing agency)

The USEPA or its appointed representative shall oversee work being performed by Earth Tech I AECOM and its subcontracted organizations. The USEPA or personnel representing the USEPA shall not exercise management authority for health and safety over Earth Tech I AECOM however; shall exercise management authority for health and safety over their own site activities. The USEPA or personnel representing the USEPA on site shall be required to adhere to the training, medical monitoring, personal protective equipment, and other requirements of Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*). Additional requirements, as defined in this HSCP, may be applicable to the USEPA or personnel representing the USEPA if present within Earth Tech I AECOM controlled work areas.

3.2 Earth Tech Safety Management Structure

In exercising its responsibility for site safety management, Earth Tech will appoint personnel to fill the following safety-related positions. Figure 3-1 illustrates the working relationships between the various positions. The responsibilities, authority and qualifications for each position are described below.

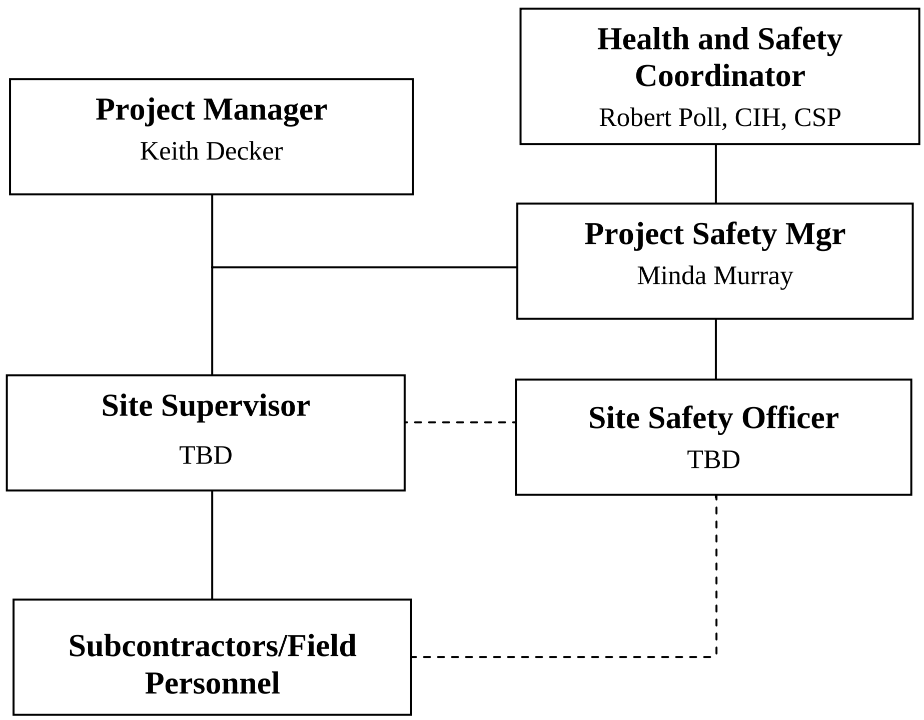
3.2.1 Project Manager – Keith Decker

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The specific safety responsibilities for the PM are listed in Section 4.0 of SH&E 001 *Safety, Health & Environmental Policy Statement*. The PM will provide the Site Supervisor with work plans, staff and budgetary resources that are appropriate to meet the safety needs of the project operations.

3.2.2 Health and Safety Coordinator – Robert M. Poll, CIH, CSP

The Health and Safety Coordinator (HSC) is responsible for overseeing the work performed by the Project Safety Manager, and for reviewing and approving this HSCP and any modifications made to it.

Figure 3-1. Environmental, Safety and Health Management Structure



3.2.3 Project Safety Manager – Minda K. Murray

The Project Safety Manager (PSM) has the overall responsibility to ensure that employees and subcontractors on site are informed and properly implementing all up to date health and safety procedures and requirements per the HSCP. In addition, the Project Safety Manager has the authority to direct work operations on the job site according to the HSCP.

The Project Safety Manager will be the first point of contact for technical support with real-time air monitoring equipment, personnel and perimeter air sampling, and air monitoring documentation. Back-up support will be provided by the HSC.

3.3.3 Site Supervisor – To Be Determined (TBD)

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the Working Supervisor while on site.

Responsibilities

The Site Supervisor is responsible to:

- Discuss deviations from the work plan with the Site Safety Officer (SSO) and PSM.
- Discuss safety issues with the PM, PSM, SSO, and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HSCP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HSCP and applicable SH&Es.

Authority

The Site Supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HSCP, and halt any activity that poses a potential hazard to personnel, property or the environment.
- Temporarily suspend individuals from field activities for infractions against the HSCP pending consideration by the SSO, the PSM, and the PM.

Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified, the Site Supervisor is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

3.3.4 Site Safety Officer – To Be Determined (TBD)

The Site Safety Officer (SSO) will be on site every day executing the site specific HSCP. The SSO will contact the Project Safety Manager with any questions relating to health and safety, real-time air monitoring, and daily air monitoring documentation.

Responsibilities

The Site Safety Officer is responsible to:

- Update the site-specific HSCP (in coordination with the Project Safety Manager) to reflect changes in site conditions or the scope of work. HSCP updates must be reviewed and approved by the Health and Safety Coordinator.
- Be aware of changes in Earth Tech Safety Policy. Changes are posted on the Earth Tech Safety Website (see Section 1.3 of this HSCP).
- Monitor the lost time incidence rate for this project and work toward improving it.
- Inspect the site for compliance with this HSCP and the SH&Es using the appropriate audit inspection checklist provided by the Earth Tech SH&E Department
- Work with the PSM and Site Supervisor to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the PSM for technical advice regarding safety issues.
- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box, etc.).
- Determine emergency evacuation routes (in coordination with the PSM), establishing and posting local emergency telephone numbers, and arranging emergency transportation

- Ensure that all site personnel and visitors have the proper training and medical clearance prior to entering the site
- Establish any necessary controlled work areas (as designated in this HSCP or other safety documentation)
- Present tailgate safety meetings and maintain attendance logs and records
- Discuss potential health and safety hazards with the PSM, Site Supervisor, and the PM.
- Select an alternate SSO by name and inform him/her of their duties, in the event that the SSO must leave or is absent from the site.

Authority

The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HSCP.
- Issue a "Stop Work Order" under the conditions set forth in Section 4.7 of this HSCP.
- Temporarily suspend individuals from field activities for infractions against the HSCP pending consideration by the Project Safety Manager and the PM.

Qualifications

In addition to being HAZWOPER-qualified (see Section 4.3), the SSO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4). The SSO must also have a minimum of 2 years experience in the performance of HAZWOPER site activities and management of site safety activities.

3.3.5 Medical Consultant

Earth Tech retains the services of WorkCare, Inc. to provide all medical monitoring and consulting services for its work operations. WorkCare maintains a staff of medical professionals, including Board-Certified Occupational Physicians, to support this work.

3.3 Safety Responsibilities of Personnel Assigned to the Site

The following requirements pertain to all Earth Tech I AECOM employees, subcontractor(s), and other personnel assigned to perform work at the site or assigned to perform work in conjunction with Earth Tech I AECOM:

Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the HSCP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to health and safety management relating to omissions and modifications in the HSCP or other safety policies.
- Notifying the SSO, in writing, of unsafe conditions and acts.

Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to stop work when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.
- The right to refuse to work on any site or operation where the safety procedures specified in this HSCP or other safety policies is not being followed.

Every employee has the right to contact the SSO, project management, or Health and Safety Coordinator at any time to discuss potential concerns.

3.4 Safety Responsibilities of Subcontractor Organizations

Earth Tech I AECOM requirements for subcontractor selection and subcontractor safety responsibilities are outlined in SH&E 207, *Contractor and Subcontractor SH&E Requirements*. Each Earth Tech I AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE).

Earth Tech I AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. The requirements of this HSCP represent minimum performance standards which must be met by each subcontractor, however each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures. There requirements can be met by each subcontractor either through development of its own unique safety plan (which reflects the requirements of this HSCP), or by the subcontractor's voluntary adoption of this HSCP as its own operations safety plan. Copies of any required safety documentation for a subcontractor's work activities will be provided to Earth Tech I AECOM for review prior to the start of onsite activities, if required.

Hazards not listed in this HSCP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech I AECOM PM, the PSM, and/or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

3.5 Safety Responsibilities of Site Visitors

Authorized visitors (e.g., client representatives, regulators, Earth Tech I AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the PM, PSM, Site Supervisor, and/or SSO on the hazards present at that location. In addition, this HSCP specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times.

Visitors desiring access to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HSCP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter HAZWOPER areas must observe the following procedures:

1. Confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this HSCP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. If necessary, visitor must have own respirator and appropriate filter cartridges for the known contaminants. Confirmation must be received by Earth Tech documenting that the visitor has received the proper training and medical monitoring for donning a respirator.

If the site visitor does require entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Contaminant Reduction Zone or the Exclusion Zone must be suspended and work zone air monitoring is compliant before the visitor can enter. If suspending work activities is not possible due to schedule constraints of the project, entry for the visitor will not be permitted.

4.0 GENERAL SAFETY REQUIREMENTS

The following requirements pertain to all work activities to be conducted at the project site, irrespective of specific work tasks or operations.

4.1 Earth Tech I AECOM Safety Procedures

The following Earth Tech I AECOM safety procedures will be generally applicable to all work to be conducted at the project site:

- *SH&E 101 Injury, Illness, and Near Miss Reporting*
- *SH&E 108 Medical Monitoring and Surveillance*
- *SH&E 109 Hearing Conservation*
- *SH&E 113 Personal Protective Equipment*
- *SH&E 114 Safety Training Programs*
- *SH&E 116 Driver and Vehicle Safety*
- *SH&E 122 Environmental Compliance Program*
- *SH&E 201 General Safety Rules*
- *SH&E 204 Task Hazard Analyses*
- *SH&E 205 Emergency Action Planning and Prevention*
- *SH&E 206 Stop Work Authority*
- *SH&E 208 General Housekeeping – Accountability*
- *SH&E 209 Disciplinary Actions / Accountability*

4.2 Site-Specific Safety Training

At a minimum, personnel performing field activities at the site will be trained in accordance with *SH&E 114, Safety Training Programs*. For this project, training will also include the requirements specified in the following:

- *SH&E 202 Safety Meetings*
- *SH&E 204 Task Hazard Analysis*

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this HSCP and any supplemental health and safety information developed for the tasks to be performed.
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety.
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task and on an as-needed basis thereafter. Training will be conducted by the, PSM, Site Supervisor, and/or SSO (or his/her designee) and will be documented on the form attached to *SH&E 202, Safety Meetings*.

At the start of each work day the SSO, Site Supervisor, or on site designated alternate will conduct a *tailgate safety meeting* at the start of each work day. The tailgate safety meeting will include all on site Earth Tech I AECOM personnel and subcontractors, Client representation, USEPA representation, and any other approved project oversight. This meeting will include a discussion of the work activities planned for that day, discussion of previous experiences/problems performing this work, and other safety requirements pertinent to the work activities (e.g., special PPE requirements). This meeting can also be used for discussion of previous safety difficulties and corrective measures, as well as training on general safety topics. All personnel assigned to work at the site each day are required to attend the tailgate safety meeting. Documentation of each meeting will be provided using Earth Tech's *Tailgate Safety Meeting* form. The SSO will maintain copies of this documentation on site for the duration of the project.

4.3 HAZWOPER Operations

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific THAs or by the SSO), and must meet the medical monitoring and training requirements specified in the following safety procedures:

- *SH&E 108* *Medical Monitoring and Surveillance*
- *SH&E 109* *Hearing Conservation Program*
- *SH&E 111* *Employee Exposure Monitoring Program*
- *SH&E 112* *Respiratory Protection Program*
- *SH&E 113* *Personal Protective Equipment (PPE)*
- *SH&E 115* *Hazard Communication Program*
- *SH&E 301* *Hazardous Waste Operations (HAZWOPER)*

Personnel must have successfully completed training meeting the provisions established in 29 CFR 1910.120 (e)(2) and (e)(3) (40-hour initial training). As appropriate, personnel must also have completed annual refresher training in accordance with 29 CFR 1910.120 (e)(8); each person's most recent training course must have been completed within the previous 365 days. Personnel must also have completed a physical exam in accordance with the requirements of 29 CFR 1910.120 (f), where the medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. These requirements are further discussed in SH&E 301, *Hazardous Waste Operations (HAZWOPER)*.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document specific to the particular materials present (SH&E 108, *Medical Monitoring and Surveillance*).

4.4 Hazard Communication

Section 6.3.2 provides information concerning the materials that may be encountered as environmental contaminants during the work activities. In addition, any hazardous material brought onto any Earth Tech I AECOM-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSO for approval and filing. The SSO will maintain copies of all MSDSs on site. MSDSs may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of *SH&E 115, Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

4.5 Overall Site Control and Security

Site security will be obtained through the maintenance of chain link perimeter fence. The fencing will be utilized to prevent unauthorized access to the construction work area during working and non-working hours. The access gates to the fence will be locked during non-working hours and on site security will be also be provided during non-working hours. A visitor log will be maintained in the office trailer and all visitors will be required to sign in. Earth Tech I AECOM will add temporary fencing where required too secure the site and prevent unwanted access.

All key on-site Project Team Members will have radios and cell phones so that they can be contacted at any time during the project. Primary site communication will be via two-way site radios, Earth Tech I AECOM will maintain enough two-way radios for the entire project team.

Due to contamination being expected in the subsurface soil and groundwater during remediation activities, a “clean” haul road will be established at various locations for access/egress to specific work areas. This stone haul road will be used for equipment/material deliveries, and loading of any contaminated material for on-site treatment or off-site disposal. The stone haul road will also be incorporated into the “clean” zone in order to prevent the trucks from traveling on impacted material. Orange construction fence will be utilized to demarcate the exclusion and clean zones at specific locations of the site.

4.6 General Safety Rules

All site personnel shall adhere to *SH&E 201, General Safety Rules*, during site operations. In addition, the housekeeping and personal hygiene requirements listed below will also be observed.

4.6.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials (*SH&E 208, General Housekeeping, Hygiene, and Sanitation)*.

4.6.2 Smoking, Eating, or Drinking

Signs will be posted throughout the site indicating NO SMOKING in controlled work areas. These non smoking areas will be identified to site personnel and visitors. Designated smoking areas will be provided outside of the limits of controlled work areas and site personnel notified of their location. These designated smoking areas may change based on daily site operations.

Eating and drinking will not be permitted inside any controlled work area at any time. Eating and drinking will be allowed in designated areas only. These areas will be identified prior to the start of work and on site personnel will be notified of their location. Consumption of alcoholic beverages is prohibited at any Earth Tech I AECOM site.

4.6.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

- Potable Water: An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.
- Non-Potable Water: Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex (except where there are less than 5 total personnel on site).

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox or hand wash unit) outside the work location (weather permitting). The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.6.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for Earth Tech I AECOM personnel. Under no circumstances will any employee be present alone in a controlled work area.

4.6.5 Heat and Cold Stress

Heat and cold stress conditions may vary based upon work activities, PPE/clothing selection, geographical locations, weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, refer to *SH&E 124, Heat Stress Prevention Program, and SH&E 125, Cold Stress Prevention Program.*

4.6.6 Mobile Phone Usage

Personal mobile phone usage will not be allowed by Earth Tech I AECOM personnel during work operations. Exceptions can be made if discussed and approved prior to use with Site Supervisor. Mobile phones can be utilized by Earth Tech individuals fulfilling project management roles who are conducting project specific or related business. Mobile phone usage is NOT ALLOWED WHILE OPERATING HEAVY EQUIPMENT on site.

4.7 Stop Work Authority

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected Earth Tech I AECOM employees and subcontractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards. *SH&E 206, Stop Work Authority.*

4.8 Disciplinary Actions

Earth Tech I AECOM employees or subcontractors will be held accountable to the *SH&E 209 Disciplinary Actions/Accountability* policy found in the Earth Tech I AECOM SH&E Corporate Manual. Progressive disciplinary actions will be taken accordingly for anyone violating this HSCP and its supplemental SH&E requirements. The Site Supervisor and SSO will concur and issue disciplinary actions when necessary. If Site Supervisor and SSO do not concur the Project Safety Manager and Project Manager will review violations and issue disciplinary actions if necessary.

4.9 Confined Space Entry

Confined Spaces will be identified by SSO and Site Supervisor during the duration of the project. The SSO and Site Supervisor will identify potential hazards associated with each individual confined space in accordance with *SH&E 118, Confined Space Entry*. All employees will be made aware of confined spaces and their associated hazards. Only trained Earth Tech I ECOM personnel will be allowed to enter a confined space. Confined space entry procedures and training requirements are listed in SH&E 118 and will be followed for any confined space entry.

4.10 Hazardous, Solid, or Municipal Waste

If hazardous, solid and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable federal, state, and/or local regulations and Earth Tech *SH&E 601*, *Hazmat Shipping*.

4.11 General Site Maintenance

The Site will be maintained in a professional manner at all times during construction. Stone roadways for transport vehicles and water spray will prevent dust emissions at the site. The site will be neat, kept clean, and appear organized during construction operations. During off work hours, the site will be secured through a locked perimeter fence with all stockpiles properly covered and clean fill stockpiles neatly graded to prevent odors or dust emissions. A trash dumpster will be placed on-site for collection of trash.

4.12 Client Specific Safety Requirements

No client specific safety requirements otherwise already identified in this HSCP have been requested. If client specific requirements are requested, they will be reviewed, approved, and provided in Attachment C.

5.0 SITE PREPERATION ACTIVITIES

This group of activities will encompass tasks required to prepare the site for remediation and restoration work activities.

5.1 Description of Work Activities

Prior to initiating remediation activities, Earth Tech I AECOM will perform the following site preparation activities. All of these activities are classified as non-HAZWOPER.

5.1.1 Utility Clearance and Identification

The Digsafe ticket number for this site is (to be provided prior to start of activities). Underground and above ground utilities that could affect or be affected by construction activities will be identified prior to the initiation of any construction activities and flagged if necessary. Locations of all subsurface utilities will be marked out by an independent company (UFPO / DIGSAFE). When all utility locations have been identified Earth Tech I AECOM and the Utility Companies will review the locations and determine if any utilities will be in conflict with the proposed construction plans. If any utility conflicts are identified, Earth Tech I AECOM and the appropriate utility company will discuss what actions will need to be taken and remove or relocate utility if necessary. Prior to work activities, the utilities will be re-marked by the appropriate utility companies. Locations of utilities and any other pertinent subsurface features will be surveyed in and marked with appropriate offsets.

5.1.2 Work Area Security

The type of work area security will depend on the type of construction activities being performed and the location of these activities. Security measures will be implemented by Earth Tech I AECOM and will consist of permanent and/or temporary fencing or barriers, locked gates, signage, warning tape, maintenance of sign in / sign out sheets, and practicing safe work procedures.

5.1.3 Erosion and Sedimentation Controls

Erosion and sediment controls are an integral part of the construction sequence and will be in place prior to commencing any intrusive soil activities. Earth Tech will conduct all site activities to minimize the extent of unprotected soil and to protect as much of the natural vegetation as possible. Along with already installed erosion controls, Earth Tech will install silt fence, hay bales, geotextile material, and / or other erosion control devices as specified in the contract plans and as necessary. More details can be found in the Erosion and Sedimentation Controls Plan.

5.1.4 Clearing and Removing of Vegetation and Structures

To facilitate construction activities, existing vegetation, any surface structures and other obstructions may be removed from the site during site preparation activities. Earth Tech I AECOM will minimize disturbance of vegetation and minimize clearing activities outside of remediation areas. Earth Tech I AECOM will also minimize the removal of structures (if necessary) within remediation areas prior to initiating work in these areas. This will limit site disturbance and minimize erosion issues. Any clearing or removing performed within remediation area will be conducted above the ground surface to the greatest extent possible.

5.1.5 Install Mobile Office Trailers

Earth Tech will set-up mobile office trailers within the site limits. Each mobile office trailers will be utilized to provide on-site administrative and storage support. Set-up will include connection of electric, telephone, and fax utility services if necessary.

5.1.6 Establish “Clean” Access Roads

A “clean” access road will be established at various locations for access / egress to specific work areas. The “clean” road will be used for equipment / material deliveries, and loading of any contaminated material for on-site treatment or off-site disposal. The “clean” road will be maintained to prevent vehicle traffic from traveling on impacted material. Orange construction fence will be utilized to clearly demarcate the exclusion zone and “clean” access road at specific locations of the site.

5.1.7 Decontamination Pad

Decontamination stations to decontaminate heavy equipment or parts of heavy equipment (e.g., excavator bucket) will be established within specific work areas during the project. If necessary, a permanent decontamination station will be also be set up at the exit of the site to decontaminate haul vehicles that are transporting impacted soils from the various excavation locations. The decontamination pad will be constructed with liner and stone or a portable steel decontamination pad will be brought to the site. The decontamination pad will also be constructed with a sump to pump decontamination fluids to the on-site water treatment system.

5.1.8 Remediation Water Extraction, Treatment, and Injection System

A water management system will be set up on site to collect any excavation water, decontamination water, and remediation water that may be generated during the course of the project. The system will consist of storage tanks to be used for sediment settling and storage, plus bag filtration, liquid phase carbon adsorption and ultraviolet treatment. Earth Tech I AECOM will provide adequate pumps, process piping, and/or hoses to accomplish dewatering in various work areas as needed per the project work plan. Earth Tech I AECOM's approach will include treatment of this water to meet the site specific discharge requirements or water will be recycled into biocell to maintain optimum moisture content.

All hard wired electrical equipment, wiring and controls associated with the water treatment system will be installed by a NYS licensed electrician in accordance with the National Electric Code (NEC). All water treatment equipment and process piping shall be installed with adequate clearances for maintenance and safe operation of the equipment in conformance with all applicable codes and standards.

The required supply of chemicals and materials used in the water treatment system will be ordered and staged appropriately and according to manufactures recommendations on site prior to use in the processing equipment. MSDS sheets will be maintained on site for all process chemicals and reviewed prior to working with chemical. The proper PPE as called out on MSDS sheets will be maintained on site and utilized during the handling of any chemical. All chemical storage areas will be designated and all storage containers properly labeled.

5.1.9 Air Extraction/Biovent and Treatment System

An air extraction and treatment system will be set up on site to draw air through the biocell. The flow of air into the biocell creates an aerobic condition, in conjunction with nutrients, temperature, and moisture content, that allows for the chemical degradation of volatile and semivolatile organic compounds. The system will consist of three regenerative bioventing blowers, each capable of providing 375 cfm, on of which will be equipped with a variable frequency drive to provide operational flexibility. Earth Tech I AECOM will provide the required components of this system and construct them according to the project work plan.

All hard wired electrical equipment, wiring and controls associated with the water treatment system will be installed by a NYS licensed electrician in accordance with the National Electric Code (NEC). All water treatment equipment and process piping shall be installed with adequate clearances for maintenance and safe operation of the equipment in conformance with all applicable codes and standards.

5.2 Worker Qualifications And Training

The above activities are all non-HAZWOPER, no special worker qualifications or certifications is required.

5.3 Task Identification And Hazard Assessment

Task Identification

The following tasks are associated with the above activities:

1. Utility clearance and identification

2. Install trailers
3. Install fencing and visual barrier
4. Non-excavation construction activities (clearing and removing vegetation and/or structures)
5. Install access roads
6. Install decontamination pad
7. Construct remediation water extraction, treatment, and injection system
8. Construct air extraction/biovent and treatment system
9. General labor activities

A task hazard analysis (THA) has been prepared for each of these tasks, and can be found in Attachment A-1. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures) specific to the work being performed.

Hazard Assessment

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

Exposure to Environmental Contaminants

The presence of surface contamination is limited. Since these activities are non-intrusive there is no significant potential for exposure to environmental contaminants.

Exposure to Physical Hazards

The work activities above present the following physical hazards to personnel:

1. Vehicle strike hazards (heavy equipment operations, haul vehicles)
2. Falling/flying objects
3. Electrical safety
4. Welding, cutting, hot work
5. Manual lifting
6. Operation of powered hand tools
7. Manual hand tools
8. Pinch and crushing hazards
9. Slip, trip, and fall hazards
10. Hazardous noise exposure
11. Cuts, scraps, and lacerations
12. Fire hazards
13. Overhead / underground utilities

Protective measures for the hazards associated with each work task are described in the individual THAs.

Biological Hazards

Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies).

Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). If bitten by insects, see a doctor if there is any question of an allergic reaction.

Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

5.4 Task-Specific Operational Safety Procedures

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

5.4.1 Earth Tech I AECOM Safety Procedures

The following Earth Tech I AECOM Safety Procedures are applicable to the work activities addressed in this Section:

- *SH&E 109* *Hearing Conservation*
- *SH&E 113* *Personal Protective Equipment (PPE)*
- *SH&E 116* *Driver and Vehicle Safety*
- *SH&E 119* *Lock Out & Tag Out*
- *SH&E 121* *Electrical Safety Program*
- *SH&E 122* *Environmental Compliance*
- *SH&E 123* *Ergonomics Program*
- *SH&E 124* *Heat Stress Prevention Program*
- *SH&E 125* *Cold Stress Prevention Program*
- *SH&E 202* *Safety Meetings*
- *SH&E 204* *Task Hazard Analyses*
- *SH&E 205* *Emergency Action Planning and Prevention*
- *SH&E 206* *Stop Work Authority*
- *SH&E 207* *Contractor and Subcontractor SH&E Requirements*
- *SH&E 208* *General Housekeeping, Hygiene, and Sanitation*
- *SH&E 209* *Disciplinary Actions / Accountability*
- *SH&E 210* *Walking-Working Surfaces Protection*
- *SH&E 310* *Overhead Electrical Lines*
- *SH&E 401* *Clearing and Grubbing*
- *SH&E 404* *Manual Lifting*
- *SH&E 411* *Welding, Cutting and Other Hot Work*
- *SH&E 501* *Ladders*
- *SH&E 505* *Powered Hand Tools*
- *SH&E 506* *Manual Hand Tools*
- *SH&E 508* *Fire Extinguishers*
- *SH&E 513* *Heavy Equipment*
- *SH&E 516* *Equipment Safety Cards*

- *SH&E 517* *Traffic Safety*
- *SH&E 606* *Flammable and Combustible Materials*
- *SH&E 608* *Blood-borne Pathogens*
- NED 002 Tics

5.4.2 Supplemental Safety Procedures

Hazardous Noise Environments

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

5.5 Work Area Control

In addition to the general controls specified in Section 4.5, the following work area controls will be implemented as needed:

Clean Soil Working Areas: An area 25 feet from accessible sides of clean non-intrusive or clean intrusive work will be classified as a controlled work area. Only authorized personnel engaged in the work activity will be permitted entry to these areas. Control of the area can be accomplished using a visual barrier (cones, tape, etc.).

Clean Soil Staging Areas: An area 20 feet from accessible sides of the staging area will be classified as a controlled work area whenever soil handling is occurring. Only authorized personnel engaged in the work activity will be permitted entry to these areas. Control of the area does not require the use of any barrier materials, the equipment operator and assistant will be jointly responsible for visually assessing the area to ensure that unauthorized personnel are clear.

Hot Work Areas: Any welding, cutting, and other hot work operations performed by Earth Tech I AECOM or its subcontractors will require notification to the Site Supervisor and SSO prior to the start of the work. A hot work permit may also be required (See *SH&E 411 Welding, Cutting, and Other Hot Work.*).

5.6 Personal Protective Equipment

All work activities associated with the scope of activities addressed in this Section can be performed using the non-HAZWOPER or Level D work ensemble, consisting of:

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Reflective high visibility safety vest or T-shirt
- Work clothing or coveralls
- Hearing protection (type specific when required)
- Leg protection and Arm protection (type specific when required)
- Work gloves (type specific when required)
- Inspect repellent

5.7 Decontamination

5.7.1 Decontamination of Personnel

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for personnel performing the work activities addressed in this Section.

5.7.2 Decontamination of Equipment

Contact with site contamination will not be significant, therefore decontamination procedures are unnecessary for equipment and materials used during the work activities addressed in this Section.

6.0 REMEDIATION ACTIVITIES

Remediation activities will involve work activities where potential contact with site specific contaminants is possible. These activities include erosion and sediment control install, excavation of contaminated soils, dewatering of excavations, remediation water management/treatment, groundwater collection and treatment system decommissioning and removal, loading of impacted materials into transport trucks, and equipment decontamination.

6.1 Description of Work Activities

This section describes the various work activities associated with the remedial efforts of the project. All of these work activities are classified as HAZWOPER.

6.1.1 Excavation and Segregation of Contaminated Soils

It has been determine by laboratory analysis of site soils through previous site investigations and the treatability study that the presence of black staining indicates contamination and the absence of black staining typically reflects non-impacted soils. Earth Tech will excavate former lagoon material based on visual observations of staining or non-staining and segregate these soils into stockpiles accordingly. Visually stained soils will be assumed contaminated screened and stockpiled requiring treatment in the biocell. Unstained soils will initially be assumed to be uncontaminated, but will be segregated, stockpiled and sampled to verify this assumption.

There are a total of 6 lagoons to be excavated and excavation depths are proposed to competent rock. The depth to competent rock beneath each lagoon varies considerably. On average, depth to competent rock ranges from approximately 4 ft to 15 ft. All excavations will be sloped or benched according to the type of soils encountered. Soil types will be classified by the designated site competent person (typically the Site Supervisor and/or Lead Operator). Type A soils (hard glacial till, bedrock) will be sloped or benched at a ¾:1, Type B soils (gravel soils) will be sloped or benched at a 1:1, and Type C soils (sand) will be sloped or benched at a 1½ :1. The competent person must make daily inspections of the excavation areas. See Attachment A-2 for Excavation and Segregation Task Hazard Analysis (THA). Provided with this THA is a copy of the Daily Excavation Inspection Checklist as found in the Earth Tech I AECOM safety procedure *SH&E 402 Excavation and Trenching*. Daily inspections shall be performed before work starts or as needed, after a rainstorm, high winds, or other occurrences that may increase hazards, and when it is suspected an employee could be exposed to additional hazards., It is not anticipated that excavation depths will exceed 20ft however; any excavation greater than 20ft will require sidewall protection to be designed and singed off by a PE.

Excavations less than 4ft deep (at its deepest point) do not require benching, sloping, or sidewall support. A stairway, ladder, or ramp must be present within excavations that are 4 or more feet deep and located within 25 feet of employee. Ladders must extent a minimum of three feet above the top of the excavation.

Maintenance of sloping requirements and employee access should be ongoing and identified during daily inspections by the competent person trained in excavation safety prior to employee entry into any excavation.

Excavations greater than 4 feet deep will be barricaded with orange construction fence and/or yellow caution tape. Any excavation shall be barricaded if left overnight when fencing is not present at the perimeter of the site.

If necessary, material or soil must be staged a minimum a 2 feet from edge of excavation. Work should not be performed on slopes or stockpiles above workers. Groundwater infiltration will be controlled by pumping water from excavations to maintain a dry state. Soil berms or trenches can be constructed to control surface water running into exaction areas.

Heavy equipment has the right of way. Anyone approaching working heavy equipment must make eye contact with the operator and confirm it is OK to move into the working space of that equipment.

Locate and be aware of all overhead and underground utilities before digging. Maintain a safe working distance from all utilities. If work must approach or uncover marked underground utilities a spotter must be used and hand digging performed. Utilities should be deactivated, protected, supported, and/or removed. Overhead utilities should be flagged, deactivated, isolated, and/or administrative controls implemented to minimize potential contact.

6.1.2 Dewatering of Excavations

In order to maintain reduce groundwater infiltration into excavation areas, 2 inch submersible pumps will be utilized. If necessary, sumps consisting of perforated pipes placed vertically in an excavated pit and backfilled with crushed stone will be constructed to assist in dewatering and filtering. Dewatering sumps will be installed as needed and conditions will be monitored to determine if more sumps are needed to maintain a dewatered condition. Due to the nature of the materials contained in the excavation area the material should readily drain. Excavation or remediation water collected in storage tanks will then be pumped to the exiting on site water treatment system.

To the greatest extent possible, water as a result of precipitation will be prevented from entering open excavations by constructing temporary berms to divert water away from the excavations. Any water that enters an open excavation will be handled as contaminated water requiring treatment prior to discharge.

6.1.3 Screening Contaminated Soils

Contaminated soils will be mechanically screened to remove rock greater than 2 inch in diameter. A small soil screening plant will be mobilized to the site. Stained or contaminated soils will be placed with heavy equipment into the screening plant. Separated rock will be removed from the base of the screener with heavy equipment and used as a foundation layer in the construction of the biocell. Screened soils will also be moved with heavy equipment to construct biocell.

It is unknown at this time the exact type or the manufacturer of the screen plant that will be mobilized to the site. Once this information is known, the manufacturer's operators manual must be received and reviewed prior to the equipment arriving on site. A formal review of this manual will be conducted by the PSM with the Site Supervisor. Other individuals who may be identified to operator and/or maintain the screening unit will also receive a formal review and site specific training with the screener unit by the PSM and/or the Site Supervisor. Only individuals who receive this training will be allowed to operate and/or maintain the screener.

The following are some of the basic topics that need to be reviewed with any individual operating and/or maintaining the screener:

- Operation and maintenance hazards and ways to avoid these hazards
- Proper PPE
- Basic construction, names of components and the purpose and use of all controls and gauges
- Use of the operator's handbook, etc
- Pre-use and running checks
- Set the machine for work
- Operate the screener to produce stockpiles
- Place the machine in an out-of-service condition
- Explain the de-rigging and preparation for transportation procedure (applicable to mobile units only)

6.1.4 Amending Contaminated Soils

Prior to being placed in a biocell, contaminated soils will be amended with a bulking agent (saw dust, composts, or other organic material) to increase air flow within the biocell. In addition, nutrients (fertilizer) to increase nitrogen and phosphorus and lime to stabilize the pH of the soil will be added.

Any chemical amendments used on site must be accompanied by an MSDS and filed at the site. The MSDS must be reviewed with individuals on site to ensure proper storage, handling, PPE, labeling, fire fighting and prevention. Individuals must also be aware of potential health risks associated with any chemicals brought on site.

Soils will be amended mechanically utilizing a pug mill capable of mixing up to 1000 cubic yards per day. It is unknown at this time the exact type or the manufacturer of the pug mill that will be mobilized to the site. Once this information is known, the manufacturer's operators manual must be received and reviewed prior to the equipment arriving on site. A formal review of this manual will be conducted by the PSM with the Site Supervisor. Other individuals who may be identified to operator and/or maintain pug mill will also receive a formal review and site specific training with the pug mill unit by the PSM and/or the Site Supervisor. Only individuals who receive this training will be allowed to operate and/or maintain the pug mill.

The following are some of the basic topics that need to be reviewed with any individual operating and/or maintaining the pug mill:

- Operation and maintenance hazards and ways to avoid these hazards
- Proper PPE
- Basic construction, names of components and the purpose and use of all controls and gauges
- Use of the operator's handbook, etc
- Pre-use and running checks
- Set the machine for work
- Operate the screener to produce stockpiles
- Place the machine in an out-of-service condition
- Explain the de-rigging and preparation for transportation procedure (applicable to mobile units only)

6.1.5 Constructing Biocell

The biocell will be constructed over the former lagoon locations. Once areas have been excavated, a field determination based on competent rock depths will be made as to the actual placement of the biocell. It is anticipated that the biocell will be located over lagoons 3,4, and 5. The biocell area will be sloped and subsurface brought to an elevation just above groundwater approximately 9 feet bgs. Rock screened from soils will be used to line the base of the biocell approximately 7 to 9 feet bgs. The stone will act as a permeable layer that collects groundwater and any water that potentially migrates through the biocell. A filter fabric will be placed on top of the underlying drainage layer to prevent soil transport. The amended soil mixture will be placed in 1 foot lifts for a total thickness of up to 7 feet. Two series of perforated pipes will be installed at depths of 3 feet and 5 feet in alternate directions to ensure uniform distribution of air. A 6 inch layer of coarse sand (from clean material screened on site) will be placed on top another layer of filter fabric covering the contaminated soil. Perforated piping will be placed in this layer for the application of water or other liquids amendments. Finally, the entire biocell will be capped with a 20 mil HDPE liner to prevent the infiltration of rain into the cell and will be graded to transport stormwater away from the biocell and towards downgradient surface water bodies. The intent is to leave the biocell permanently on site though all extraneous treatment equipment will be removed once cleanup objectives have been met.

Geotextile fabrics can be very heavy and cumbersome. Moving and placing these fabrics should be done with the assistance of heavy equipment as much as possible. Manual movement and placement of fabrics should never be attempted alone.

Any PVC piping used in air ventilation system should be joined with appropriate cleaners, softeners, and cements. Application of these products should be conducted according to manufacture's instructions and precautions.

6.1.6 Operating Bioremediation Treatment Systems

Both bioremediation systems, air extraction and water extraction treatment systems, will be comprised of filter media that may become impacted with site contaminants. During the operation of these systems, periodic maintenance may be necessary and change out of filter media. Filter media should be handled with the proper PPE and disposed of or recycled according to the requirements of the project.

6.2 Worker Qualifications And Training

The above activities represent HAZWOPER activities and all personnel will be required to be HAZWOPER qualified per Section 4.3 unless specifically exempted in the individual THAs (non-HAZWOPER tasks only).

6.3 Task Identification And Hazard Assessment

6.3.1 Task Identification

The following tasks are associated with the above activities:

1. Excavation and segregation of contaminated soils
2. Dewatering and treatment of contaminated water
3. Screening contaminated soils
4. Amending contaminated soils
5. Constructing biocell
6. Operating bioremediation treatment system

A task hazard analysis (THA) has been prepared for each of these tasks, and can be found in Attachment A-3. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures, PPE) specific to the work being performed.

6.3.2 Hazard Assessment

The following is a summary of the hazards associated with the above work activities. The hazards associated with individual tasks are specified in each THA.

<u>Exposure to Chemical Hazards</u>

The following environmental contaminants may be encountered during the activities addressed in this Section:

Volatile Organic Compounds – *BTEX*

Due to their high vapor pressure and the range and severity of their health effects, they are considered to present a significant worker exposure hazard during planned remedial operations. Mitigation measures for these compounds include the use of chemically-protective gloves and clothing, and air-purifying respirators equipped with organic vapor cartridges.

Benzene. Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, with an action level of 0.5 ppm and a short-term exposure limit of 5.0 ppm. The ACGIH Threshold Limit Value is 0.5 ppm.

Toluene. Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and in severe cases may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor.

Chronic overexposure to toluene may cause irreversible liver and kidney injury. The OSHA PEL is 200 ppm; the ACGIH TLV is 50 ppm.

Ethylbenzene. Ethylbenzene vapors are severely irritating to the eyes and the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethylbenzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethylbenzene is low; however, ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, disagreeable skin and eye irritation. The established PEL is set well below this intolerable level. The OSHA PEL and ACGIH TLV are all 100 ppm.

Xylene. Liquid xylene is a skin irritant and causes itching, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylenes can depress the CNS, and ingesting it can result in gastrointestinal disturbance and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and ACGIH TLV are 100 ppm.

Chlorobenzene

Chlorobenzene is a colorless, flammable liquid with an aromatic, almond-like odor. Some of it will dissolve in water, but it readily evaporates into air. It does not occur naturally in the environment. Workers exposed to high levels of chlorobenzene in the air complained of headaches, nausea, sleepiness, numbness, and vomiting. We cannot be certain that all of these effects were due to chlorobenzene exposure because the workers may have been exposed to other chemicals.

Animal studies indicate that the liver, kidney, and central nervous system are affected by exposure to chlorobenzene. Effects on the central nervous system from breathing chlorobenzene include unconsciousness, tremors, restlessness, and death. Longer exposure has caused liver and kidney damage. The limited data available indicate that chlorobenzene does not cause birth defects or infertility. The Occupational Safety and Health Administration (OSHA) has set a workplace air concentration limit of 75 ppm over an 8-hour workday, 40-hour workweek.

Acetone

Acetone is a chemical that is found naturally in the environment and is also produced by industries. Low levels of acetone are normally present in the body from the breakdown of fat; the body can use it in normal processes that make sugar and fat. Acetone is a colorless liquid with a distinct smell and taste. People begin to smell acetone in air at 100 to 140 parts of acetone in a million parts of air (ppm), though some can smell it at much lower levels. Most people begin to detect the presence of acetone in water at 20 ppm. Acetone evaporates readily into the air and mixes well with water. Most acetone produced is used to make other chemicals that make plastics, fibers, and drugs. Acetone is also used to dissolve other substances.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set a legal limit of 750 ppm of acetone in workroom air. The regulation means that the workroom air should contain no more than an average of 750 ppm of acetone over an 8-hour working shift or over a 40-hour workweek.

2-Aminopyridine

Pyridine

Pyridine is a colorless liquid with an unpleasant smell. It can be made from crude coal tar or from other chemicals.

Pyridine is used to dissolve other substances. It is also used to make many different products such as medicines, vitamins, food flavorings, paints, dyes, rubber products, adhesives, insecticides, and herbicides. Pyridine can also be formed from the breakdown of many natural materials in the environment.

Very little information is available on the health effects of pyridine. Animal studies and some limited case reports in people have noted liver damage from exposure to pyridine. Headaches, giddiness, a desire to sleep, quickening of the pulse, and rapid breathing occurred in adults who breathed an unknown amount of pyridine for an unknown length of time. Mild skin irritation and eye irritation were seen in rabbits when pyridine was placed on their skin or in their eyes. We do not know whether pyridine affects the ability of men and women to have children or whether it causes birth defects. The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 5 parts of pyridine per million parts of workplace air (5 ppm) for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental and Industrial Hygienists (ACGIH) have established the same guidelines as OSHA for pyridine exposure levels in the workplace. NIOSH has recommended that 1,000 ppm be considered immediately dangerous to life and health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Alpha Picoline

Aniline

Aniline is a clear to slightly yellow liquid with a characteristic odor. It does not readily evaporate at room temperature. Aniline is slightly soluble in water and mixes readily with most organic solvents.

Aniline is used to make a wide variety of products such as polyurethane foam, agricultural chemicals, synthetic dyes, antioxidants, stabilizers for the rubber industry, herbicides, varnishes and explosives.

Aniline can be toxic if ingested, inhaled, or by skin contact. Aniline damages hemoglobin, a protein that normally transports oxygen in the blood. The damaged hemoglobin can not carry oxygen. This condition is known as methemoglobinemia and its severity depends on how much you are exposed to and for how long. Methemoglobinemia is the most prominent symptom of aniline poisoning in humans, resulting in cyanosis (a purplish blue skin color) following acute high exposure to aniline. Dizziness, headaches, irregular heart beat, convulsions, coma, and death may also occur. Direct contact with aniline can also produce skin and eye irritation. Long-term exposure to lower levels of aniline may cause symptoms similar to those experienced in acute high-level exposure. There is no reliable information on whether aniline has adverse reproductive effects in humans. Studies in animals have not demonstrated reproductive toxicity for aniline.

The Occupational Safety and Health Administration (OSHA) sets a limit of 5 parts of aniline per million parts of air (5 ppm) in workplace air in any 8-hour shift, 40-hour workweek.

<u>Exposure to Physical Hazards</u>

Intrusive activities involving contact with contaminated materials has the potential to cause significant exposures to site personnel through inhalation, skin contact, and ingestion to the contaminants found in the soils and water. Exposure can exceed permissible exposure limits for any or all contaminants and have the potential to produce significant harm to individuals who are not adequately protected (use of proper PPE) and do not perform proper decontamination when leaving Exclusion Zones.

The HAZWOPER work activities above present the following physical hazards to personnel:

1. Vehicle strike hazards (heavy equipment operations, haul vehicles)
2. Falling/flying objects
3. Excavation and trenching safety
4. Electrical safety
5. Welding, cutting, hot work
6. Manual lifting
7. Operation of powered hand tools
8. Manual hand tools
9. Pinch and crushing hazards
10. Slip, trip, and fall hazards
11. Hazardous noise exposure
12. Chemical exposure (HAZCOM)
13. Cuts, scraps, and lacerations
14. Fire hazards
15. Overhead / underground utilities

Protective measures for the hazards associated with each work task are described in the individual THAs.

Exposure to Biological Hazards

Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies).

Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). If bitten by insects, report incident immediately to supervisor and see a doctor if there is any question of an allergic reaction. Use insect repellent and wear long pants and sleeves to help prevent insect bites. Check yourself for insect bites after working outside.

Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants and sleeves, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

6.4 Task-Specific Operational Safety Procedures

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

6.4.1 Earth Tech Safety Procedures

The following Earth Tech Safety Procedures are applicable to the work activities addressed in this Section:

- *SH&E 109* *Hearing Conservation*
- *SH&E 112* *Respiratory Protection*
- *SH&E 113* *Personal Protective Equipment*
- *SH&E 115* *Hazard Communication*
- *SH&E 116* *Driver and Vehicle Safety*
- *SH&E 118* *Confined Space Entry Program*
- *SH&E 119* *Lock Out & Tag Out*
- *SH&E 120* *Fall Protection Program*
- *SH&E 121* *Electrical Safety Program*
- *SH&E 122* *Environmental Compliance*
- *SH&E 123* *Ergonomics Program*
- *SH&E 124* *Heat Stress Prevention Program*
- *SH&E 125* *Cold Stress Prevention Program*
- *SH&E 132* *Competent Person*
- *SH&E 202* *Safety Meetings*
- *SH&E 204* *Task Hazard Analysis*
- *SH&E 205* *Emergency Action Planning and Prevention*
- *SH&E 206* *Stop Work Authority*
- *SH&E 207* *Contractor and Subcontractor SH&E Requirements*
- *SH&E 208* *General Housekeeping, Hygiene, and Sanitation*
- *SH&E 209* *Disciplinary Actions / Accountability*
- *SH&E 210* *Walking-Working Surfaces Protection*
- *SH&E 301* *Hazardous Waste Operations*

- *SH&E 305 Demolition Operations*
- *SH&E 310 Overhead Electrical Lines*
- *SH&E 402 Excavation and Trenching*
- *SH&E 405 Handling Drums and Large Containers*
- *SH&E 403 Drilling*
- *SH&E 404 Manual Lifting*
- *SH&E 411 Welding, Cutting and Other Hot Work*
- *SH&E 414 Pile Driving*
- *SH&E 501 Ladders*
- *SH&E 505 Powered Hand Tools*
- *SH&E 506 Manual Hand Tools*
- *SH&E 508 Fire Extinguishers*
- *SH&E 510 High Pressure Washers*
- *SH&E 513 Heavy Equipment*
- *SH&E 515 Cranes, Lifting Devices & Rigging Requirements*
- *SH&E 516 Equipment Safety Cards*
- *SH&E 517 Traffic Safety*
- *SH&E 601 Hazardous Materials Shipping*
- *SH&E 604 Decontamination*
- *SH&E 606 Flammable & Combustible Materials*
- *SH&E 608 Blood-borne Pathogens*
- *NED 002 Tics*

6.4.2 Supplemental Safety Procedures

Hazardous Noise Environments

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech I AECOM has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

Heavy Equipment Operators Training

Earth Tech I AECOM, Latham, NY Remediation Services Group has implemented a Heavy Equipment Operators Training Program. New hires and current employees seeking equipment operator status will comply with the requirements of the training program. Earth Tech I AECOM project management will determine which employees are eligible for the program and will also administer the program. Additional information regarding the program can be obtained from the Remediation Services Group Project Safety Manager.

6.5 Work Area Control

In addition to the general controls specified in Section 4.5, the following work area controls will be implemented:

Impacted Soil Working Areas: The excavation area within the identified limits will be classified as a HAZWOPER Exclusion Zone. Entry of the Exclusion Zone is permissible only by personnel meeting the HAZWOPER requirements found in Section 4.3. Control of the area can be accomplished using a visual barrier (temporary chain link fence, orange construction fence, cones, caution tape, etc.). Figure 6-1 provides a visual representation of the set-up for this Exclusion Zone.

Impacted Soil Staging Areas: If impacted soils need to be staged outside of the excavation area, a staging area will be installed close to the excavation the area. Any impacted staging area will also be classified as a HAZWOPER Exclusion Zone. Entry of the Exclusion Zone is permissible only by personnel meeting the HAZWOPER requirements found in Section 4.3. Control of the area can be accomplished using a visual barrier (temporary chain link fence, orange construction fence, cones, caution tape, etc.). Figure 6-1 provides a visual representation of the set-up for this Exclusion Zone.

Clean Soil Working Areas: An area 25 feet beyond the Exclusion Zone set up or what is site appropriate will be classified as a controlled work area. Only authorized personnel engaged in the work activity will be permitted entry to these areas. Control of the area can be accomplished using a visual barrier (orange construction fences, cones, caution tape, etc.).

Hot Work Areas: Any welding, cutting, and other hot work operations performed by Earth Tech I AECOM or its subcontractors will require notification to the Site Supervisor and SSO prior to the start of the work. A hot work permit may also be required (See *SH&E 411 Welding, Cutting, and Other Hot Work.*). Any hot work performed for metal cutting will be done using an oxygen and acetylene set up. Using this cutting technique, phosgene is not a concern. If however electric arc welding is performed, the work will be performed in a well ventilated area, solvents will not be used to clean the metal prior to welding, and the immediate atmosphere will be checked to insure that VOCs are not present in the area prior to the start of work. This will be done to ensure the work area is free of the compounds that could potentially generate phosgene.

6.6 Personal Protective Equipment

The THAs for each individual work activity will define the specific PPE needs for the work task. These requirements will be based on the following guidelines:

HAZWOPER Activities: Requirements for PPE use will vary based on activity, and results of the on-going work zone monitoring. The primary HAZWOPER ensembles anticipated for use will be the Modified Level D ensemble, and the Level C ensemble. Specific equipment requirements for each of these ensembles can be found in SH&E 301, *Hazardous Waste Operations*.

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Reflective high visibility safety vest or T-shirt
- Work clothing or coveralls
- Hearing protection (type specific when required)
- Leg protection and Arm protection (type specific when required)
- Work gloves (leather or chemically-protective when required)

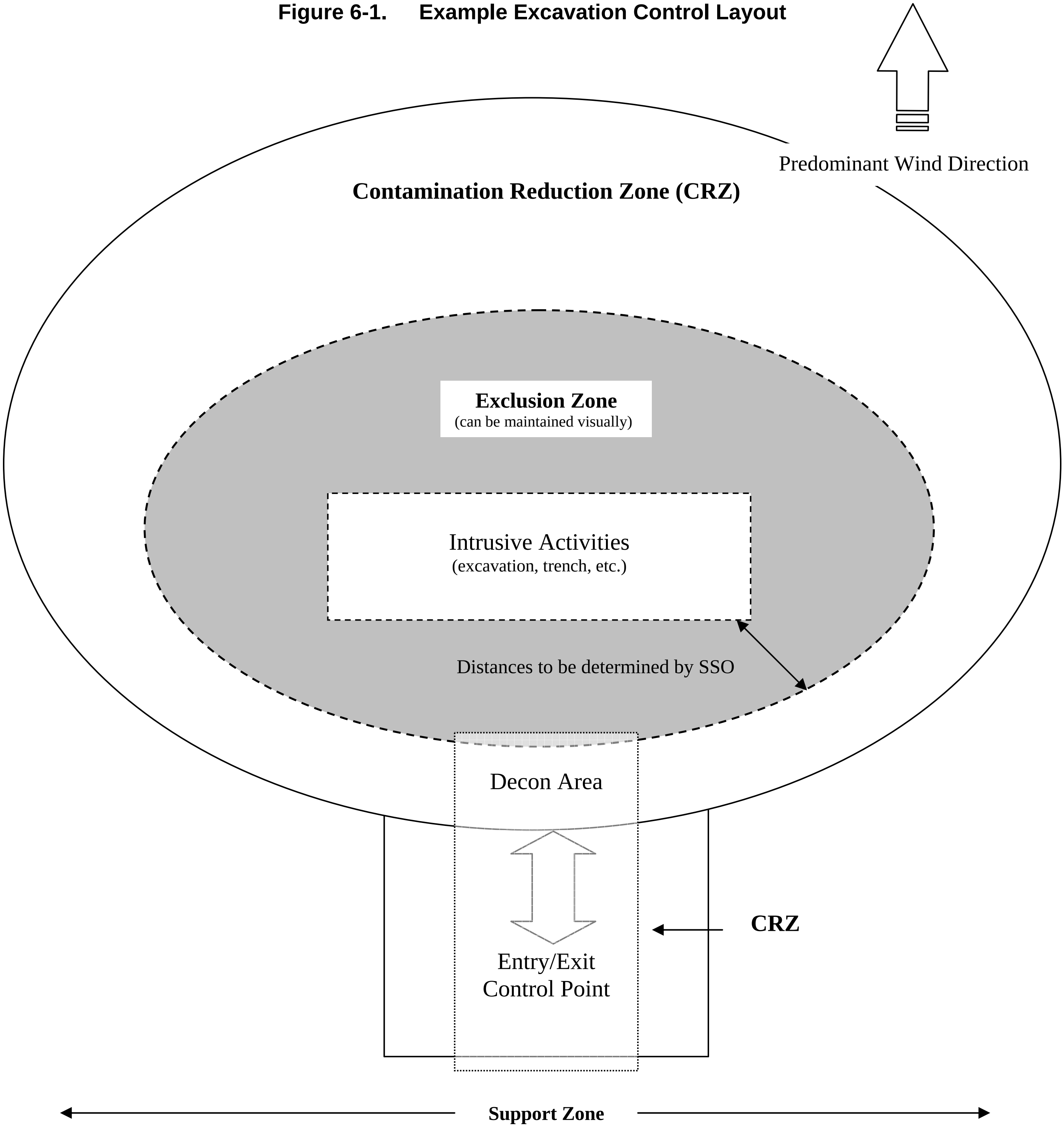
  Where chemically-protective gloves are specified, the following types will be used:

  Inner gloves: Best Safety N-DEX or equivalent

  Outer gloves: Ansell-Edmont SOL-VEX or equivalent
- Tyvex protective coveralls or splash resistant coveralls (within trenches and excavations and other work areas when warranted)
- Protective cover boots (within trenches and excavations and other work areas when warranted)

- Half or Full Face Respirator with dust and chemically specific cartridges (if work zone monitoring warrant)
- Full face shield (worn during equipment decontamination)

Figure 6-1. Example Excavation Control Layout



6.7 Decontamination

6.7.1 Decontamination of Personnel

Personal decontamination stations will be erected at the designated entry/exit points of each HAZWOPER Exclusion Zone. Requirements for these decontamination stations are specified in SH&E 604, *Decontamination*.

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.
- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

6.7.2 Decontamination of Equipment

All heavy equipment exiting any HAZWOPER Exclusion Zone will be decontaminated prior to leaving the area and before it is used for restoration activities. In general, heavy soils will be removed over contaminated soil areas or material will be retained on plastic sheeting to prevent cross contamination and for proper disposal. Heavy soils may be removed with shovels, picks, air hammer, hammer, chisels, and/or brooms. Once heavy soils are removed, equipment may then be brought to the decontamination pad for additional cleaning with a high pressure washer and detergent. Water and soil will be retained in the decontamination pad for proper disposal and/or on site treatment.

6.8 Occupational Exposure Monitoring

Monitoring shall be performed within each HAZWOPER work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA as work is performed.

6.8.1 General Requirements

Table 6-1 specifies the real-time monitoring equipment which will be used in HAZWOPER work areas for this project.

Table 6-1: Remediation Monitoring Parameters and Equipment

Instrument	Manufacturer/Model*	Substances Detected
Photo Ionization Detector (PID)	RAE Systems MiniRAE 2000 (min. 10.6 eV bulb)	Volatile Organic Compounds
Colorimetric Detector Tubes	Draeger	Benzene

6.8.2 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions, the concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area. Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.
- Monitoring information

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.
- Monitoring information

6.8.3 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

6.8.4 Personal Sampling

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by Earth Tech I AECOM employees, the SSO, under the direction of the Project Health and Safety Manager and the Earth Tech CIH, be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files. Any personal sampling will be performed according to *SH&E 111, Employee Exposure Monitoring Program*.

Should site activities warrant, Earth Tech I AECOM subcontractor(s) may also need to implement employee exposure monitoring measure per their own monitoring program requirements. The subcontractor is to notify Earth Tech I AECOM that personal sampling is needed prior to commencing sampling.

6.8.5 Work Zone Exposure Monitoring

Specific work zone air monitoring will be conducted where intrusive operations are occurring. Monitoring will be accomplished using the instrumentation presented in Table 6-1.

<u>Work Zone Air Quality Monitoring Stations</u>

Work zone air monitoring will be accomplished using both fixed-location air monitoring stations and hand held air monitoring by the SSO, each of which will be equipped with:

- A continuous data-logging device
- An audible alarm and programmed LOW and HIGH alarm settings (established for each parameter as shown in Table 6-3).

Work Zone Monitoring Procedure

1. At the start of each work day monitors will be inspected and calibrated. Calibration results will be logged on the instrument's *AQ Instrument Calibration Log Form*.
2. Monitors will be set-up at each monitoring station location and proper operation verified.
3. Monitors will be in automated, continuous operation throughout the work day.

Monitoring will be conducted in accordance with the requirements in Table 6-3. Table 6-3 also specifies response actions/PPE upgrade criteria for use in determining response to breathing zone readings. Monitoring results will be recorded on the *Air Monitoring Results* Form.

Table 6-2. Remediation Monitoring Action Levels

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Continuous (fixed location) within work zone.	< 1 ppm	Continue to work in Level D and continue monitoring.
		1 – 10 ppm	Monitor for Benzene using Drager Tubes. If Benzene is present see below for response actions. If Benzene is not present, continue to work in Level D and continue monitoring.
		10 – 50 ppm (5 minute average)	Contact the SSO. Monitor for Benzene using Drager Tubes. If Benzene is present see below for response actions. If Benzene is not present, implement mitigation measures and upgrade PPE to Level C (respirator with organic vapor cartridge) if concentrations persist for more than 5 minutes.
		> 50 ppm	Contact the SSO. Monitor for Benzene using Drager Tubes. If Benzene is present see below for response actions. If Benzene is not present, cease work and leave area until VOC concentrations decrease. Initiate alternative and/or additional mitigation measures.
Benzene (By Colorimetric Tube)	30-mnute intervals where indicted by VOC readings	< 1 ppm (No color change)	Continue work in Level D and continue monitoring.
		1 – 10 ppm	Contact the SSO, implement mitigation measures, and upgrade PPE to Level C (organic vapor cartridge).
		> 10 ppm	Cease work and leave area until concentrations decrease.

7.0 SITE RESTORATION ACTIVITIES

7.1 Description of Work Activities

This section describes the various work activities associated with the restoration activities of the project.

7.1.1 Backfilling and Compaction

Prior to backfilling, the excavations will be inspected for standing water. Standing water will be pumped off and treated in groundwater treatment system. Backfill will be on site soil that has been sampled and confirmed acceptable for re-use. Backfilling operations will follow the excavation and bottom conformational sampling schedule. Backfill of an area will be completed after a post excavation field survey of an area has been performed. Backfill operations are expected to occur promptly upon the completion of excavation to minimize open excavations and prevent both run on and run off.

7.1.2 Site Restoration

Site restoration activities will include simple grading, seeding, and mulching.

The erosion control measures will be maintained until growth of the vegetation has been established or site has been restored to original surface cover. Equipment decontamination pads will be removed after all equipment and materials requiring decontamination are complete.

A final as-built survey will be performed along with a photographic log to be submitted as part of the Project Closeout.

7.1.4 Final Work, Site Cleanup and Demobilization

Following completion of restoration activities, the site will be picked up and garbage taken off-site. Materials, supplies, tools, personnel and equipment will be demobilized. Components of the bioremediation treatment systems will be decontaminated also before complete demobilization. Temporary fencing and barricades, signage, and mobile office trailers will be removed from site. Temporary utilities supporting remediation efforts will be disconnected and removed from site.

7.2 Worker Qualifications and Training

The above activities represent a mixture of HAZWOPER and non-HAZWOPER (as identified for each task, below). Since a single workforce will perform the majority of these activities, all Earth Tech personnel will be required to be HAZWOPER qualified per Section 4.3 unless specifically exempted in the individual THAs (non-HAZWOPER tasks only).

7.3 Task Identification And Hazard Assessment

7.3.1 Task Identification

The following tasks are associated with the above activities:

1. Backfilling and grading – non- HAZWOPER
2. Decontamination of bioremediation treatment systems – HAZWOPER
3. Removal of temporary facilities and utility disconnect – non-HAZWOPER
4. Trash pick up and removal – non-HAZWOPER
5. Personnel and equipment demobilization – non-HAZWOPER

A THA has been prepared for each of these tasks, and can be found in Attachment A-3. Each THA specifies the scope of activities, identifies the related hazards and specifies appropriate health and safety procedures and mitigation measures, as well as any additional requirements (e.g., monitoring procedures, PPE) specific to the work being performed.

7.3.2 Hazard Assessment

The following is a summary of the hazards associated with HAZWOPER work activities described above. The hazards associated with individual tasks are specified in each THA.

HAZWOPER Tasks: Site restoration activities mostly involving decontamination has the potential to cause significant exposures to site personnel through inhalation, skin contact, and ingestion to the contaminants found in the soils and water. Exposure can exceed permissible exposure limits for any or all contaminants and have the potential to produce significant harm to individuals who are not adequately protected (use of proper PPE) and do not perform proper decontamination when leaving Exclusion Zones.

Non-HAZWOPER Tasks: Site restoration activities involving the excavation/handling of clean soils and water have no significant potential for exposure to site contaminants by any of the exposure routes.

Exposure to Physical Hazards

The HAZWOPER and non-HAZWOPER work activities above present the following physical hazards to personnel:

1. Vehicle strike hazards (heavy equipment operations, haul vehicles)
2. Falling/flying objects
3. Excavation and trenching safety
4. Electrical safety
5. Welding, cutting, hot work
6. Manual lifting
7. Operation of powered hand tools
8. Manual hand tools
9. Pinch and crushing hazards
10. Slip, trip, and fall hazards
11. Eye injury
12. Hazardous noise exposure
13. Chemical exposure (HAZCOM)
14. Cuts, scraps, and lacerations
15. Fire hazards

Protective measures for the hazards associated with each work task are described in the individual THAs.

Exposure to Biological Hazards

Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies).

Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). If bitten by insects, report incident immediately to supervisor and see a doctor if there is any question of an allergic reaction. Use insect repellent and wear long pants and sleeves to help prevent insect bites. Check yourself for insect bites after working outside.

Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants and sleeves, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water.

7.4 Task-Specific Operational Safety Procedures

The following safety procedures are applicable to the work activities described in this Section. The specific procedures applicable to each work task are specified in each THA.

7.4.1 Earth Tech Safety Procedures

The following Earth Tech Safety Procedures are applicable to the work activities addressed in this Section:

- *SH&E 109 Hearing Conservation*
- *SH&E 112 Respiratory Protection*
- *SH&E 113 Personal Protective Equipment*
- *SH&E 115 Hazard Communication*
- *SH&E 116 Driver and Vehicle Safety*
- *SH&E 118 Confined Space Entry Program*
- *SH&E 119 Lock Out & Tag Out*
- *SH&E 120 Fall Protection Program*
- *SH&E 121 Electrical Safety Program*
- *SH&E 122 Environmental Compliance*
- *SH&E 123 Ergonomics Program*
- *SH&E 124 Heat Stress Prevention Program*
- *SH&E 125 Cold Stress Prevention Program*
- *SH&E 202 Safety Meetings*
- *SH&E 204 Task Hazard Analysis*
- *SH&E 205 Emergency Action Planning and Prevention*
- *SH&E 206 Stop Work Authority*
- *SH&E 207 Contractor and Subcontractor SH&E Requirements*
- *SH&E 208 General Housekeeping, Hygiene, and Sanitation*
- *SH&E 209 Disciplinary Actions / Accountability*
- *SH&E 210 Walking-Working Surfaces Protection*
- *SH&E 301 Hazardous Waste Operations*
- *SH&E 310 Overhead Electrical Lines*
- *SH&E 404 Manual Lifting*
- *SH&E 405 Handling Drums and Large Containers*
- *SH&E 409 Tank Cleaning*
- *SH&E 411 Welding, Cutting and Other Hot Work*
- *SH&E 501 Ladders*
- *SH&E 505 Powered Hand Tools*
- *SH&E 506 Manual Hand Tools*
- *SH&E 508 Fire Extinguishers*

- *SH&E 510* *High Pressure Washers*
- *SH&E 513* *Heavy Equipment*
- *SH&E 515* *Cranes, Lifting Devices & Rigging Requirements*
- *SH&E 516* *Equipment Safety Cards*
- *SH&E 517* *Traffic Safety*
- *SH&E 604* *Decontamination*
- *SH&E 606* *Flammable & Combustible Materials*
- *SH&E 608* *Blood-borne Pathogens*
- *NED 002* *Tics*

7.4.2 Supplemental Safety Procedures

Hazardous Noise Environments

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs, minimum noise reduction rating of 25 dB) within 25 feet of any operating piece of heavy equipment.

7.5 Work Area Control

In addition to the general controls specified in Section 4.5, the following work area controls will be implemented:

Impacted Soil Working Areas: The excavation area within the identified limits will be classified as a HAZWOPER Exclusion Zone. Entry of the Exclusion Zone is permissible only by personnel meeting the HAZWOPER requirements found in Section 4.3. Control of the area can be accomplished using a visual barrier (temporary chain link fence, orange construction fence, cones, caution tape, etc.). Figure 6-1 provides a visual representation of the set-up for this Exclusion Zone.

Impacted Soil Staging Areas: If impacted soils need to be staged outside of the excavation area, a staging area constructed in accordance with the RD/RA work plan will be installed close to the excavation the area. Any impacted staging area will also be classified as a HAZWOPER Exclusion Zone. Entry of the Exclusion Zone is permissible only by personnel meeting the HAZWOPER requirements found in Section 4.3. Control of the area can be accomplished using a visual barrier (temporary chain link fence, orange construction fence, cones, caution tape, etc.). Figure 6-1 provides a visual representation of the set-up for this Exclusion Zone.

Clean Soil Working Areas: An area 25 feet beyond the Exclusion Zone set up or what is site appropriate will be classified as a controlled work area. Only authorized personnel engaged in the work activity will be permitted entry to these areas. Control of the area can be accomplished using a visual barrier (orange construction fences, cones, caution tape, etc.).

Hot Work Areas: Any welding, cutting, and other hot work operations performed by Earth Tech or its subcontractors will require notification to the Site Supervisor and SSO prior to the start of the work. A hot work permit may also be required (See *SH&E 411 Welding, Cutting, and Other Hot Work.*). Any hot work performed for metal cutting will be done using an oxygen and acetylene set up. Using this cutting technique, phosgene is not a concern. If however electric arc welding is performed, the work will be performed in a well ventilated area, solvents will not be used to clean the metal prior to welding, and the immediate atmosphere will be checked to insure that VOCs are not present in the area prior to the start of work. This will be done to ensure the work area is free of the compounds that could potentially generate phosgene.

7.6 Personal Protective Equipment

The THAs for each individual work activity will define the specific PPE needs for the work task. These requirements will be based on the following guidelines:

HAZWOPER Activities: Requirements for PPE use will vary based on activity, and results of the on-going occupational exposure monitoring. The primary HAZWOPER ensembles anticipated for use will be the Modified Level D ensemble, and the Level C ensemble. Specific equipment requirements for each of these ensembles can be found in *SH&E 301, Hazardous Waste Operations*.

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Reflective high visibility safety vest or T-shirt
- Work clothing or coveralls
- Hearing protection (type specific when required)
- Leg protection (type specific when required)
- Work gloves (leather or chemically-protective when required)

  Where chemically-protective gloves are specified, the following types will be used:

  Inner gloves: Best Safety N-DEX or equivalent

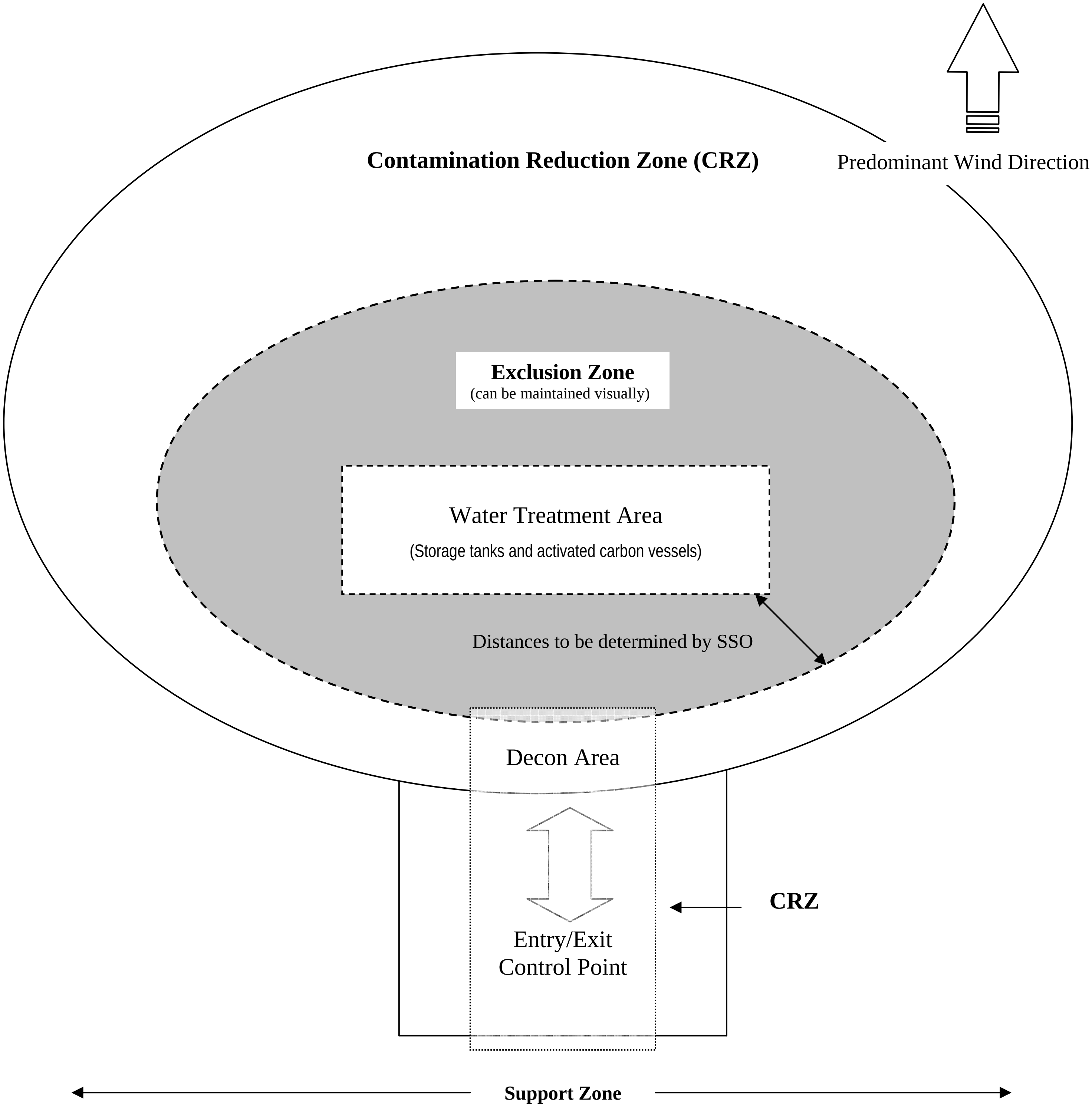
  Outer gloves: Ansell-Edmont SOL-VEX or equivalent

- Tyvex protective coveralls or splash resistant coveralls (within trenches and excavations and other work areas when warranted)
- Protective cover boots (within trenches and excavations and other work areas when warranted)
- Half or Full Face Respirator with dust and chemically specific cartridges (if work zone monitoring warrant)
- Full face shield (worn during equipment decontamination)

Non-HAZWOPER Activities: For non-HAZWOPER activities can be performed using the non-HAZWOPER or Level D work ensemble, consisting of:

- Hardhat
- Safety glasses w/sideshields (ANSI-compliant)
- Safety-toed work boots (ANSI-compliant)
- Reflective high visibility safety vest or T-shirt
- Work clothing or coveralls
- Hearing protection (type specific when required)
- Leg protection (type specific when required)
- Work gloves (leather or chemically-protective when required)

Figure 7-1. Example Temporary Water Treatment System Dismantle and Decontamination Site Control Layout



7.7 Decontamination

7.7.1 Decontamination of Personnel

Personal decontamination stations will be erected at the designated entry/exit points of each HAZWOPER Exclusion Zone. Requirements for these decontamination stations are specified in *SH&E 604, Decontamination*.

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.
- Have a “buddy” check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

7.7.2 Decontamination of Equipment

All heavy equipment exiting any HAZWOPER Exclusion Zone and necessary components of the bioremediation systems will be decontaminated prior to leaving the area and before it is demobilized from the site. In general, heavy soils will be removed over contaminated soil areas or material will be retained on plastic sheeting to prevent cross contamination and for proper disposal. Heavy soils may be removed with shovels, picks, air hammer, hammer, chisels, and/or brooms. Once heavy soils are removed, equipment or components may then be brought to the decontamination pad for additional cleaning with a high pressure washer and detergent. Water and soil will be retained in the decontamination pad for proper disposal and/or on site treatment.

7.8 Occupational Exposure Monitoring

Monitoring shall be performed within each HAZWOPER work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA (Attachment A-3) as work is performed.

7.8.1 General Requirements

Table 7-1 specifies the real-time monitoring equipment which will be used for this project.

Table 7-1: Restoration Monitoring Parameters and Equipment

Instrument	Manufacturer/Model*	Substances Detected
Photo Ionization Detector (PID)	RAE Systems MultiRAE RAE Systems MiniRAE 2000 (min. 10.6 eV bulb)	Volatile Organic Compounds
Colorimetric Detector Tubes	Draeger	Benzene

7.8.2 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions, the concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area. Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.
- Monitoring information

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.
- Monitoring information

7.8.3 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

Table 7-2. Restoration Monitoring Action Levels

PARAMETER	MONITORING INTERVAL	RESPONSE LEVEL (above background)	RESPONSE
VOCs	Continuous (fixed location) within work zone.	1-10 ppm	Continue to work in Level D and continue monitoring.
		10 – 50 ppm	Monitor for Vinyl Chloride using Drager Tubes. If Vinyl Chloride is present see below for response actions. If Vinyl Chloride is not present, continue to work in Level D and continue monitoring.
		50-200 ppm (Sustained for 5 minutes)	Contact the SSO. Monitor for Vinyl Chloride using Drager Tubes. If Vinyl Chloride is present see below for response actions. If Vinyl Chloride is not present, implement mitigation measures and upgrade PPE to Level C (respirator with organic vapor cartridge) if concentrations persist for more than 5 minutes.
		> 200 ppm	Contact the SSO.
Vinyl Chloride	Using Draeger Tubes on an as needed bases in accordance with PID readings for VOCs	0 – 0.5 ppm	Continue work in Modified Level D and continue monitoring.
		>0.5 ppm (Sustained for 5 minutes)	Stop Work Activities. Contact the SSO. Project management Health and Safety Coordinator to determine alternative work approach to reduce concentrations or shut down until concentrations decrease to below response level.

8.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the Earth Tech I AECOM Health and Safety Plan for the Nepera Chemical Company Superfund Site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE

Attachment A-1

Task Hazard Analyses – Site Preparation Activities

Attachment A-2

Task Hazard Analyses – Remediation Activities

Attachment A-3

Task Hazard Analyses – Restoration Activities

ATTACHMENT B

Hazards of Environmental Contaminants

ATTACHMENT C

Client Specific Safety Requirements

(Nothing provided at this time)

ATTACHMENT D

Health and Safety Plan Supplements

Earth Tech I AECOM Health and Safety Consolidated SH&E Manual Table of Contents

Real-time Air Monitoring Logs

Tailgate Sign In

Site Sign In

Daily Excavation Checklist

Appendix C

Air Monitoring Plan

EARTH TECH | AECOM

DRAFT FINAL
AIR MONITORING PLAN
NEPERA SUPERFUND SITE

Site:
Nepera Chemical Company Superfund Site
Town of Hamptonburgh
Orange County, New York 10916

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February 2009

Project No. 106559.03

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List of Acronyms and Abbreviations

CFR	Code of Federal Regulations
COCs	Contaminants of Concern
HSCP	Health and Safety Contingency Plan
gCAMP	Generic Community Air Monitoring Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PID	Photo ionization Detector
ppm	parts per million
TAGM	Technical and Administrative Guidance Memorandum
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 AIR-QUALITY MONITORING PLAN

The objective of this Air-Quality Monitoring Program is to provide direct measurement of contaminants of concern (COCs) that could potentially be released during any activities at the site where contaminated or potentially contaminated soil is disturbed, including, but not limited to excavation, handling, or screening of soil. The air-quality monitoring program consists of (1) Exclusion Zone air-monitoring for evaluating construction worker health and safety; and (2) community air-monitoring to determine the levels of COCs at the perimeter of the work site.

This Air-Quality Monitoring Program meets or exceeds all criteria and guidance provided in the New York State Department of Health (NYSDOH) Generic Community Air-monitoring Plan (NYSDOH gCAMP rev 1 06/00). The provisions include real-time air-monitoring for total volatile organic compounds (VOCs) and total suspended particulates (i.e., dust) at the upwind and downwind perimeter of the work site to provide a measure of protection for the surrounding community. Real-time air-monitoring will be used to guide appropriate action to reduce/minimize air emissions to acceptable levels. The NYSDOH gCAMP is not intended for use in establishing action levels within Exclusion Zones or for worker respiratory protection. Exclusion Zone air monitoring for worker protection will be conducted in accordance with the site-specific HSCP.

2.0 EXCLUSION ZONE AIR-MONITORING PROGRAM

The air quality within the Exclusion Zone will be monitored to ensure worker health and safety in accordance with requirements specified in 29 Code of Federal Regulations (CFR) 1910.120 as described in the site-specific HSCP. Real-time monitoring for total VOCs and particulate will be conducted within active Exclusion Zones. Chemical specific monitoring will be conducted for Benzene when real-time total VOC concentrations dictate per the site specific HSCP.

3.0 COMMUNITY AIR-MONITORING PROGRAM

3.1 Overview

A community air-monitoring program will be undertaken in accordance with the NYSDOH gCAMP for the duration of the project to provide direct measurement of total VOCs and total suspended particulate that may be released during excavation and handling of soils.

The air-monitoring program was established to address the following objectives:

- To insure concentrations of total VOCs and total suspended particulates are minimized to protect human health and the environment;
- To provide an early warning system so engineering controls can be enacted to prevent unnecessary exposure of emissions resulting from project activities; and
- To measure and document the concentrations of total VOCs and total suspended particulates for determining compliance with the established air-monitoring limits.

The community air-monitoring is intended to be a discrete program, which will be operated in conjunction with the Exclusion Zone air-monitoring program. The Exclusion Zone monitoring is established to protect worker health and safety during construction and materials handling. The community air-monitoring will include real time air quality data that will be collected throughout the duration of all excavation activities and will include upwind and downwind measurements. Wind direction will be determined using a weather station located on site or equivalent device such as a wind sock

3.2 Real-Time Air-monitoring – Volatile Organic Compounds

The total volatile organic compounds (VOCs) monitoring will be accomplished using total volatile organic monitors each equipped with a photo ionization detector (PID) using a 10.2 eV lamp. Each day the monitors will be calibrated with a 100 parts per million (ppm) isobutylene air standard. The volatile organic monitors will be capable of analyzing instantaneous total VOC concentrations. The VOC monitors will also be capable of integrating and logging a 15-minute running average of the measured total VOC concentrations. The instantaneous and 15-minute logged averages will be used to quantify air quality at the perimeter of the work site. .

The total VOCs monitoring will operate continuously during intrusive and soil handling activities at one upwind monitoring location and three downwind monitoring locations. Readings at each location will be accomplished by pointing the intake tube of the monitor toward the likely emission source, generally at the height of 3 to 5 feet above grade. The monitors will measure concentrations continuously and calculate four 15-minute averages per hour throughout the day. Monitors will be equipped with an audible alarm to indicate compliance with perimeter action levels. Equivalent back-up real-time air-monitoring equipment will be available on-site in the event of an equipment malfunction.

A daily total VOC log sheet will be maintained with the monitor IDs/serial numbers, date, time, sampling locations, wind direction, weather conditions, and site activities. These daily total VOC log sheets will also maintain the instantaneous and maximum 15-minute average recorded for each monitor. These daily VOC log sheets will be filed in the on-site project trailer and copies submitted in electronic format at the end of each week. The weekly VOC data will be downloaded from each instrument and submitted at the end of each week in an electronic format to the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA).

The 15-minute averages will be compared to the action levels dictated in the NYSDOH gCAMP. These action levels are as follows:

- If the ambient air concentration for total VOCs at the downwind perimeter of the work site exceeds 5 parts per million (ppm) above the upwind or “background” 15-minute average, work activities must be temporarily halted and monitoring continued. If the total VOC concentration readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total VOC levels at the downwind perimeter of the work site persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of the vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total VOC level 200 feet downwind of the site or half the distance to the nearest receptor is less than 5 ppm over background for the 15-minute average.

- If the total VOC level is greater than 25 ppm at the downwind perimeter of the site, activities must be shut down. If total VOCs levels persist above the 25 ppm (above background), the construction supervisor, the Project Health & Safety Coordinator, and the Trust project coordinator will consult with each other and the Emergency Response agencies to determine the appropriate actions to be implemented. Trust project management personnel have ultimate authority. Work shall not resume without approval of the Trust and USPEA, NYSDEC, NYSDOH and local authorities.

3.3 Speciated Real-Time Air-monitoring – Benzene

Because benzene has been identified as one of the site specific contaminants and due to its low OSHA Permissible Exposure Limit (PEL) of 1 ppm, it is essential to specifically monitor for this compound and its potential migrations off site into the surrounding community. To supplement the real-time VOCs air-monitoring for the community air-monitoring program, a portable PID unit specific for the measurement of benzene will be used. The PID will be an UltraRae PID (or equivalent unit) that can accurately determine benzene with detection limits in the low ppb (parts per billion) range. The purpose in generating this data will be to (1) supplement the real time VOCs readings, and (2) monitor benzene emissions to the surrounding community during construction activities.

If total VOC levels are detected at the downwind perimeter of the site at 5 ppm (instantaneous), benzene specific monitoring will commence. If benzene levels exceed 0.5 ppm at the downwind perimeter of the work site, then the following actions will be immediately taken:

- Halt work activities and continue to monitor for benzene. If benzene levels readily decrease (per instantaneous readings) at the downwind perimeter below 0.5 ppm, work activities can resume with continued monitoring.

- If benzene levels at the downwind perimeter persist above 0.5 ppm up to 2.5 ppm, corrective actions will be taken immediately to abate emissions and monitoring continued. After these steps, work activities can resume if abatement measures succeed in controlling downwind perimeter benzene levels below 0.5 ppm.

- If benzene levels at the downwind perimeter exceed 2.5 ppm, work activities must be halted, abatement measures immediately implemented, and notification to the local Police Department, Orange County Emergency Services; the Project Coordinator; USEPA, NYSDEC and NYSDOH will me made immediately. The construction supervisor, the Project Health & Safety Coordinator, and the Trust project coordinator will consult with each other and the Emergency Response agencies to determine the appropriate actions to be implemented. Trust project management personnel have ultimate authority. Work shall not resume without approval of the Trust and USPEA, NYSDEC, NYSDOH and local authorities.

3.4 Real-Time Air-monitoring – Total Suspended Particulates

In conjunction with the real-time VOC monitoring, real-time monitoring equipment for total suspended particulate will be used at the site perimeter. The instrument to be used for this sampling operates on the principle of light scattering and responds to particles in the size range of 0.1 to 10 micrometers in the concentration range of 0.01 to 400 mg/M3. Total suspended particulate measurements will be instantaneous and integrated over a 15-minute running average. The real-time total suspended particulate monitor will be calibrated or “zeroed” on a daily basis with the manufacturers zero bag and filter. The instantaneous and 15-minute logged averages will be used to quantify air quality at the perimeter of the work site.

The total suspended particulate monitoring will operate continuously during intrusive and soil handling activities at one upwind monitoring location and three downwind monitoring locations. Readings at each location will be accomplished by facing the monitor toward the likely emission source, generally at the height of 3 to 5 feet above grade. The monitors will measure concentrations continuously and calculate four 15-minute averages per hour throughout the day. Monitors will be equipped with an audible alarm to indicated compliance with perimeter action levels. Equivalent back-up real-time air-monitoring equipment will be available on-site in the event of an equipment malfunction.

A daily total suspended particulate log sheet will be maintained with the monitor IDs/serial numbers, date, time, sampling locations, wind direction, weather conditions, and site activities. These daily total suspended particulate log sheets will also maintain the instantaneous and maximum 15-minute average recorded for each monitor. These daily total suspended particulate log sheets will be filed in the on-site project trailer and copies submitted in electronic format at the end of each week. The weekly particulate data will be downloaded from each instrument and submitted at the end of each week in an electronic format to the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA)..

The 15-minute averages will be compared to the action levels dictated in the NYSDOH CAMP. These action levels are as follows:

- If the downwind total suspended particulate level is 100 µg/m^3 greater than upwind or “background” for a 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression provided that downwind particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression, downwind particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

If total suspended particulate concentrations exceed the 150 µg/m^3 15-minute average action level as described above, the on-site representatives and the Earth Tech | AECOM project manager will be notified. The Earth Tech | AECOM project manager will also notify the Division of Air Resources in writing within five working days in accordance with NYSDEC Technical and Administrative Guidance Memorandum (TAGM): Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 1989.

3.5 Vapor, Particulate, and Odor Control

In order to control vapor, particulate, and odors during excavation and material handling activities, Earth Tech | AECOM is proposing the use of various site control measures. Earth Tech | AECOM fully understands the ramifications of public perception if vapors, particulate, and/or odors are released to the local community.

The control of vapors, particulate, and odors during excavation and material handling activities requires various types of control measures however; each measure can be used to control all three components simultaneously or independently. The nature of the site specific contaminants, specifically the semi-volatile organic compounds and pyridine based compounds, pose a concern regarding the generation of nuisance odors during excavation and material handling. Pyridine and the pyridine based compounds have a relatively low odor threshold (approximately 0.25 ppm) and an odor described as pungent malodorous.   Olfactory fatigue occurs quickly with these types of compounds.

As such, vapors, particulate, and odors will be controlled at the point of excavation and handling activities using one or more of the various control systems discussed below.
One of the control measures utilized will consist of the application of a non-toxic odor suppressing biosurfactant (i.e., Bio-Solve). Bio-Solve will be diligently applied with a pressure washer during excavation activities to both the excavated face and the active soil handling areas. It can be applied

where any vapor, particulate, or odor source has been identified. Another control measure will either be cover excavation areas and/or soil handling areas with a commercial long duration foam (i.e. Rusmar foam) or tarps, depending on the length of time of inactivity and current weather conditions. At the completion of the day's activities, the soil stockpiles and the excavation face will be covered with tarps or foam depending on the next days anticipated operations and current weather conditions.

Another control measures, which may be implemented to reduce vapor, particulate, and odor levels, include excavation of smaller areas. Earth Tech | AECOM can modify and reduce excavation production rates by working in smaller manageable areas to reduce the amount of exposed surfaces and size of stockpiles to minimize odors being generated and make the current odor controls (Bio-Solve, foam, and tarps) more effective. As Earth Tech | AECOM removes the "Hot Spots", production rates will be increased if the odor control measures are deemed effective and adequate. In addition to the above odor control measures, both onsite workers (not desensitized to Pyridine odors) and or other site representation will conduct periodic offsite odor surveys, to ensure that odors are not migrating offsite.

If the site personnel detect odor or a complaint is received, controls measures will be implemented to reduce odor-causing emissions. Once odors become non-discernable, normal operations may resume. This determination will be subject to the approval of the on-site USEPA representative. If in the opinion of USEPA on-site representative the concentration of the site related odors are unacceptable, the USEPA on-site representative will instruct the project coordinator to implement odor control measures.

Appendix D

Sampling and Analysis Plan

EARTH TECH | AECOM

DRAFT FINAL
SAMPLING AND ANALYSIS PLAN
NEPERA SUPERFUND SITE

Site:
Nepera Chemical Company Superfund Site
Town of Hamptonburgh
Orange County, New York 10916

Submitted to:
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February 2009

Project No. 106559.03

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List of Acronyms and Abbreviations

ASP	Analytical Services Protocol
CLP	Contract Laboratory Protocol
deg C	degrees Centigrade
deg F	degrees Fahrenheit
ELAP	Environmental Laboratory Approval Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PID	Photo ionization Detector
QAPP	Quality Assurance Project Plan
SVOCs	Semi-Volatile Organic Compounds
TCL	Target Compound List
TICs	Tentatively Identified Compounds
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan has been developed to describe the objectives and procedures for the sampling and analyses of site residues, soil, and waste water that will be produced during this project. In addition, the Quality Assurance Project Plan (QAPP) should be consulted where specific sampling and analysis procedures and methods are referenced.

The environmental media to be sampled during the project, and the purpose for collecting and analyzing environmental samples, includes the following:

<u>Soil</u>
Characterization Samples: To characterize soil for exclusion or inclusion into biocell and to document chemical concentrations in post excavation soils.
Waste Characterization Samples: To characterize any soil that may be unacceptable to be placed within the biocell (e.g., soils containing nonaqeuous phase liquids).
Confirmation Samples: *In situ* samples collected along the excavation sidewalls and excavation bottom to delineate the extent of excavation.

<u>Water</u>
Wastewater: All water generated during construction activities (i.e., dewatering excavations, groundwater entering open excavations, stormwater runoff from contaminated areas and decontamination water) will be pumped into storage tanks located on-site. Samples will be collected of the stored water to determine disposal options. Disposal options will be evaluated during the RD, but options include off-site disposal at a regulated facility, on-site treatment with off-site disposal (e.g., a publicly owned treatment works), or on-site treatment with on-site discharge.

The following sections of this Sampling and Analysis Plan provide specific information regarding the rationale and methods for sampling and analyzing site residues, soil, and wastewater.

2.0 QUALITY ASSURANCE REQUIREMENTS/DATA QUALITY OBJECTIVES

Quality assurance requirements are specified throughout the data quality objectives are also delineated in the QAPP.

3.0 SOIL SAMPLING AND ANALYSES PLAN

3.1 Soil Sampling Field Protocols

Samples will be placed into the appropriate containers specified in the QAPP using decontaminated stainless steel trowels or spoons. Organic debris (i.e., leaves, twigs, bark) along with large pieces of gravel will be avoided. Sampling containers will be filled completely to avoid creating a headspace where volatiles may escape. After each jar is filled, the threads will be wiped clean so the cap can be threaded on without creating an air gap.

All filled jars will be labeled with the following information as a minimum:

- Project Number;
- Sampling time and date;
- Sample Number;
- Sample Location;
- Analysis; and
- Collector's Initials.

The location, depth of sample, sample type, time of sample, and other associated data (e.g., color of the soil, odors, texture) will be documented in the field notebook when the sample is taken. Once all the soil samples are collected, the samples will be maintained at 4 deg C until the samples are delivered off-site for analysis.

All used sampling devices will be kept together, separate from clean tools, so that they can be cleaned according to appropriate decontamination and cleaning procedure as specified in the QAPP. In no event will a sampling device but used without complete decontamination between sample locations.

The following items constitute a minimum listing of required field equipment for collecting soil samples.

- Chemical resistant boots, latex gloves, chemical resistant gloves and the appropriate level of personal protection for working conditions as described in site-specific Health and Safety Plan.
- Sample containers: glass jars with Teflon-line caps:
- Teflon-coated or stainless steel sample spoons and bowls:
- Wooden stakes and spray paint (highly visible):
- Field Notebooks:
- Sample bottle labels:
- Water resistant tape: and
- Ice cooler for sample storage.

3.2 Confirmation Soil Sampling and Analysis Plan

A confirmation soil sampling and analyses plan will be implemented to determine the concentration of compounds remaining on the site following excavation. This data will be used to determine if additional excavation is warranted.

Confirmation soil samples will be analyzed for volatile organic compounds (VOCs) – benzene, chlorobenzene, ethylbenzene, toluene, xylenes and acetone – and semivolatile organic compounds (SVOCs) – pyridine, 2-aminopyridine, alpha-picoline, aniline and pyridine-related tentatively identified compounds (TICs) – by Environmental Protection Agency (EPA) Laboratory Methods 8260 and 8270, respectively. Samples collected to verify conformance with the cleanup objectives will be subject to New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) Category B deliverables. Target compound list (TCL) volatile and semi-volatile compounds for post remediation confirmatory samples will be determined at a minimum rate of one per every group of ten confirmatory samples or portion thereof. The turnaround time for confirmation sample analytical results will be five business days.

The laboratory chosen for the project will be certified, and maintain certification, under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) and NYSDOH ELAP Contract Laboratory Protocol (CLP) for analyses of solid and hazardous waste.

Confirmation samples will also be collected at the bottom of the excavation at an interval of one for every 900 square feet (30 feet by 30 feet grid). If the excavation reaches bedrock, no bottom confirmation samples will be collected. Along the sidewalls of the excavation, confirmation samples will be collected at an interval of one every 50 linear feet. Sidewall samples will be collected at a depth of 1-ft above the base of the excavation.

A sample representing the first 3 to 6 inches of soil encountered will be collected from each sampling point. This means that in the case of a sidewall sample, the first 3 inches of a sample point in the sidewall will be discarded and the remaining soil at that point, to a lateral depth of approximately 6 inches, will be collected. In the case of a bottom sample, the first 3 inches of a sample point in the excavation floor will be discarded and the remaining soil at that point, to a vertical depth of approximately 6 inches, will be collected. The first 3 inches are discarded to avoid collecting soil sample at the surface of the excavation because volatile compounds at the excavation surface may have been released. Discarding the first 3 inches of soil will help to ensure that a sample representing the volatile compounds present in the excavation are more accurately profiled. The sample will be representative of the area soil based upon visual and olfactory observations and photo ionization detector (PID) readings.

Confirmation samples obtained from excavations extending beyond 4 feet below grade may be collected via a stainless steel remote sampler or a hydraulically activated sampling device. A drawing depicting confirmation sample locations along with information concerning sample identifications, depth below original ground surface and dates of collection will be maintained by the field sampling technician throughout the project.

3.3 Sampling and Analysis for Soil Handling and Characterization

A soil characterization sampling and analyses plan will be implemented to determine the concentrations of compounds in unstained soils stockpiled on-site.

Soil characterization soil samples will be analyzed for VOCs – benzene, chlorobenzene, ethylbenzene, toluene, xylenes and acetone – and SVOCs – pyridine, 2-aminopyridine, alpha-picoline, aniline and pyridine-related TICs – by EPA Laboratory Methods 8260 and 8270, respectively. Samples collected to verify conformance with the cleanup objectives will be subject to NYSDEC ASP Category B deliverables. The turnaround time for waste characterization sample analytical results will be two to five business days depending on site activities.

Soil characterization samples will be collected at a frequency of one five-point composite sample per 500 cubic yard stockpile. A sample representing the first 3 to 6 inches of soil will be taken from each sampling point. This means that the first 3 inches of a sample point will be discarded and the remaining soil at that point, to a lateral depth of approximately 6 inches, will be collected. Approximately 200 grams of soil will be collected and placed in a single 1-gallon ziplock bag from each of five composite locations. The soil within the ziplock bag will then be thoroughly and carefully mixed to minimize volatilization. Once mixed, the soil will then be placed into the appropriate sized container for each analysis as specified in the QAPP. Jars for volatile analyses will be filled completely to minimize headspace.

4.0 WASTEWATER SAMPLING AND ANALYSES PLAN

4.1 Sampling Plan Rationale

All water generated during construction activities (i.e., dewatering excavations, groundwater entering open excavations, stormwater runoff from contaminated areas and decontamination water) will be pumped into storage tanks located on-site. Samples will be collected of the stored water to determine disposal options. Disposal options will be evaluated during the RD, but options include off-site disposal at a regulated facility, on-site treatment with off-site disposal (e.g., a publicly owned treatment works), or on-site treatment with on-site discharge. As part of the remedial action, this sampling and analysis plan will be updated prior to initiating construction activities.

4.2 Laboratory Analytical Protocols

Analytical requirements will be determined by the selected disposal option.

4.3 Wastewater Sampling Protocols

Samples will be collected and analyzed for parameters specified by the selected disposal option.

4.4 Wastewater Field Sampling Procedures

Wastewater will be sampled directly from the effluent line as required by the selected disposal option. Nitrile gloves will be worn to protect the sampling person and to avoid cross contamination through handling. Wastewater will be sampled by opening a sample port installed on the effluent line and filling the appropriate sized container for each analysis as specified in the QAPP. Vials for volatile analyses will be filled completely so as to avoid creating a headspace where volatiles may escape, and must be checked to ensure that no air bubbles are present.

All filled jars must be labeled with the following information as a minimum:

- Project Number;
- Sampling Time and Date;
- Sample Number;
- Analysis; and
- Collector's Initials.

The sample chain-of-custody form will then be immediately filled out and maintained with the sample. The sample will be maintained at 4 deg C until delivered to the off-site analytical laboratory.

4.5 Wastewater Sampling Field Equipment List

The following items constitute a minimum listing of required field equipment for collecting wastewater samples:

- Chemical resistant gloves and appropriate level of personal protection for working conditions as described in the site-specific Health and Safety Plan for sampling;
- two 40-ml Volatile Organic Analysis vials;
- two one-liter amber containers;
- Stainless steel or disposable polyethylene bailer;
- Field notebook;
- Sample bottle labels; and
- Chain-of-custody forms.