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October 13, 2026
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Education
Energy Utility
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RE: Site Management Plan Submittal Well Installation and Groundwater Monitoring Work Plan, June 2026
Former General Motors Assembly Plant
West Parcel Site
50 River Street, Sleepy Hollow, New York 10591
NYSDEC Site No. C360070

Dear Ms. Barry,

On behalf of Lighthouse Landing Communities, LLC (Owner) and Paulus, Sokoloski Engineering, P.C. (PS&S) has prepared the following response to the New York State Department of Environmental Conservation (NYSDEC) letter that PS&S received on September 9, 2026. The following response outlines each of the September 9, 2026 NYSDEC comments and the appropriate Engineer's Response.

1. NYSDEC Comment 1: An additional well is needed along the South-Western side of the site along Westward Drive.

   Engineer's Response to Comment 1: Lighthouse Landing Communities, LLC, and PS&S concur with the above NYSDEC outlined requirements. PS&S has added an additional well (OW-54) on the South-Western side of the site along Westward Drive.

2. NYSDEC Comment 2: Due to the extended length of time that the site has been in construction and without cover, the first round of groundwater monitoring should be for the full suite of parameters, including emerging contaminants.

Engineer's Response to Comment 2: Lighthouse Landing Communities, LLC, and PS&S acknowledge and agree with NYSDEC's recommendation regarding the scope of the initial groundwater monitoring event. The first annual groundwater sampling event will now include the full list of site Contaminant of Concern (COC) parameters (Lead, VOCs, SVOCs, and chromium) at every well. After this first event, the sampling parameters will return to only the COCs specific to the AOC in question unless additional contamination is

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documented in the initial groundwater results. Revisions reflecting these changes have been made to Section 5.0 and Tables 1 and 2 of the Well Installation and Groundwater Monitoring Work Plan.

Please note that the project team does not propose to include emerging contaminants in the analytical program for this monitoring event. Emerging contaminants have not been identified as Site COCs, and the Site has an active Certificate of Completion and is not currently in the Remedial Investigation phase. Accordingly, the proposed groundwater monitoring program remains focused on the established Site COCs unless the initial monitoring results identify conditions warranting further evaluation.

3. NYSDEC Comment 3: The monitoring well locations in Figure GW-01 are difficult to see and should be made bolder or brighter.

   Engineer's Response to Comment 3: Lighthouse Landing Communities, LLC, and PS&S have revised the monitoring well locations in Figure GW-01 to improve visibility and readability. Specifically, the well names have been bolded, and the font color has been adjusted to a more neutral shade to stand out clearly against the figure background.

PS&S recognizes that the Department requires a 7-day advance notice prior to the start of field activities and will provide NYSDEC with a notification letter prior to the anticipated work.

Should you have any questions or require additional information, please call me at .

Very truly yours,

PAULUS, SOKOLOWSKI AND SARTOR ENGINEERING, PC

James Boyer

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Site Management Plan Submittal
Well Installation and Groundwater Monitoring Work Plan

-FOR-

Former General Motors Assembly Plant Site

50 River Street
Sleepy Hollow, NY 10591
NYSDEC Site Number: C360070

Submitted by:

Lighthouse Landing Communities, LLC

50 River Street
Sleepy Hollow, New York 10591

June 2026

Prepared by:

Paulus, Sokolowski, and Sartor Engineering, PC
1 Larkin Plaza, Second Floor
Yonkers, New York 10701

I, Janos M Szeman, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Well Installation and Groundwater Monitoring Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Date: 06/24/2026

Signature: James Boyer, P.E.

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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

2.0 SITE GEOLOGY AND HYDROGEOLOGY 2-1

3.0 GROUNDWATER WELL INSTALLATION 3-1

4.1.1 Quality Assurance/Quality Control 6-4

4.1.2 Health and Safety Program 6-4

4.1.3 Project Team 6-5

4.1.4 Work Zone Air Monitoring 6-6

5.0 INVESTIGATION DERIVED WASTE MANAGEMENT 7-1

6.0 UPCOMING DELIVERABLES AND PROJECT SCHEDULE 8-1

6.1 Field Observation Report and NYSDEC Technical Consultation 8-1

6.2 Annual Groundwater Summary Report 8-1

LIST OF FIGURES

Figure 1 Site Plan
SMP Figure 3 Site Fill History
SMP Figure 15 2011 SMP Groundwater Monitoring Well Location Plan
Figure GW-01 2026 Post Redevelopment Groundwater Monitoring Well Location Plan

LIST OF TABLES

Table 1 Proposed Well Construction Details
Table 2 Sampling Parameters and Frequency
Table 3 2011 SMP Groundwater Well vs 2026 Replacement Well Summary Table

LIST OF ATTACHMENTS

Attachment A Monitoring Well Boring and Construction Logs
Attachment B Health and Safety Plan (HASP)
Attachment C DER-10 / Technical Guidance for Site Investigation and Remediation

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
AMSL	Above Mean Sea Level
BCA	Brownfield Cleanup Agreement
CCR	Construction Completion Report
DEP	Division of Environmental Permits
DUSR	Data Usability Summary Report
ECs	Engineering Controls
ELAP	Environmental Laboratory Approval Program
ERM	Environmental Resources Management
FER	Final Engineering Report
BCP	Brownfield Cleanup Program
bgs	below ground surface
COC	Certificate of Completion
GCS	Grossly Contaminated Soil
HASP	Health and Safety Plan
HSC	Health and Safety Coordinator
ICs	Institutional Controls
IDW	Investigation-Derived Wastes
LNAPL	Light Non-Aqueous Phase Liquid
NAPL	Non-Aqueous Phase Liquid
NAVD88	North American Vertical Datum 1988
ND	non-detectable
NTU	Nephelometric Turbidity Unit
NYSDEC	New York State Department of Environmental Conservation
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PQAM	Project Quality Assurance Manager
PRR	Periodic Review Report
PS&S	Paulus, Sokolowski & Sartor Engineering, PC
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
RA	Remedial Actions
RAO	Remedial Action Objectives
RASR	Remedial Action Selection Report
RAWP	Remedial Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSCOs	Recommended Soil Cleanup Objectives
SCOs	Sediment Cleanup Objectives
SMP	Site Management Plan
SRP	Site Remediation Program
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VMS	Vapor Management System
VOC	Volatile Organic Compound

1.0 INTRODUCTION

On behalf of Lighthouse Landing Communities, LLC[1], the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program Volunteer, Paulus, Sokolowski and Sartor Engineering, PC (PS&S) prepared this Monitoring Well Installation and Groundwater Monitoring Workplan (GW Workplan) to reinstall the 19 previously decommissioned monitoring wells, install 3 new monitoring wells, and then recommence the Site Management Plan (SMP) and the required groundwater monitoring program. This GW Workplan summarizes the proposed monitoring well reinstallation and groundwater monitoring to be performed at the Edge on Hudson Site (Site), at the Former GM Assembly Plant Western Parcel. The Site is in the Village of Sleepy Hollow, Westchester County, New York (Figure 1) and is identified as BCP Site No. C360070.

The Site was previously associated with the General Motors Corporation (GMC), as an automobile manufacturing facility operating from 1914 until its closure in 1996. Following the closing of the GM Assembly Plant, the Site was remediated for metals (chromium, copper, lead, mercury, and zinc) and Volatile Aromatic Hydrocarbons (VAHs) in accordance with Brownfield Cleanup Agreement (BCA), Index # C360070-12-10, which was executed on December 31, 2010, and amended August 20, 2013.

The remediation achieved cleanup levels for restricted residential use, and the Site officially obtained a NYSDEC Certificate of Completion (COC) in April 2014. Consistent with the Department-approved Remedial Action Work Plan (RAWP) and United States Environmental Protection Agency (USEPA) Approval, residual subsurface contamination remained after Site remediation. Institutional and Engineering Controls (ICs and ECs) were incorporated into the NYSDEC-approved remedy to control exposure to remaining contaminants and ensure protection of public health and the environment.

1.1 Purpose of Well Installation

This groundwater monitoring plan has been prepared in accordance with NYSDEC DER-10 and the current SMP to identify the procedures for re-installing 19 replacement monitoring wells and 3 new monitoring wells. The purpose of this monitoring well reinstallation program is to recommence annual groundwater monitoring as required by the SMP. The Site has been in an active period of redevelopment since 2016. The NYSDEC-approved SMP allowed for the temporary suspension of annual groundwater sampling during redevelopment due to the complexities of maintaining a functional groundwater monitoring well network during heavy earthwork and construction activities for redevelopment of the Site. As of 2026, the redevelopment has progressed to a point where semiannual groundwater monitoring can be safely implemented without ongoing concerns about monitoring well damage, integrity and maintenance. The data will be

1 Lighthouse Landing Communities, LLC is the recognized NYSDEC Brownfield Cleanup Program Volunteer. Lighthouse Landing Communities, LLC is supported by Biddle Real Estate Ventures (BREV).

collected on an annual basis to monitor documented Areas of Concern (AOCs) and to evaluate Monitored Natural Attenuation (MNA) of specific analytes that exceed NYSDEC groundwater quality standards.

The data collected from the Annual Groundwater Monitoring Program will be used to:

1. Confirm the previously reported nature and extent of groundwater impacts related to site AOCs;
2. Evaluate trends in groundwater quality and impacts over time;
3. Evaluate post redevelopment hydrogeological conditions; and
4. Evaluate MNA progress and applicability on an AOC basis.

1.2 Site Development Stage

Mixed use redevelopment construction activities began in 2016 and are currently in progress Sitewide. Brownfield Site redevelopment includes a residential use component consisting of townhomes, condominiums, and apartments. Commercial use of the Site will include hotel space, retail center and office space development, and operations (refer to Figure 1).

Construction for the NorthLight Apartments, also known as Block F, began in 2019 and ended in 2023. Construction of the Brownstones at Edge-on-Hudson and Emerson developments by Toll Brothers, also referred to as Blocks E, I, J and part of O began in 2018 and were completed in the summer of 2025. Construction of Decicco & Sons, also known as Block A, began in 2023 and was completed in March 2025.

Construction of The Daymark Condominium, also known as Block H, began in 2021 and is still ongoing. Construction of the One Kingsland townhomes development, also referred to as Blocks N, O and P, began in 2024 and is still ongoing. The construction of the remaining undeveloped Blocks (remainder of) A, M, Q and R is planned to occur over the next 10 years.

2.0 SITE SETTING, HISTORICAL USE, GEOLOGY AND HYDROGEOLOGY

2.1 Physical Setting

The Site is at 50 River Street, in the Village of Sleepy Hollow, Westchester County, New York. The Site is identified on the Town of Mt. Pleasant Tax Map as Tax Section 115.10, Block 1, Lot 1 and Section 115.15, Block 1, Lot 1.

The Site is approximately 66.67 acres and is bonded by Kingsland Point Park to the north; River Street, Horan's Landing Park, Ichabod's Landing and various private and municipal properties to the south. The Metro North Hudson Line rail corridor and Hudson Street to the east, and the Hudson River to the west.

2.2 Historical Site Uses

Prior to commercial or industrial development, the Site was part of the Beekman Farm. In 1801, the Beekman family constructed a dock on what is now known as Kingsland Point (north of the Site). In 1830, a brickyard was established on the southern part of the Site at the foot of Beekman Avenue, on the south side of the Pocantico Bay (which has since been filled). The brickyard closed in 1861.

Between 1885 and 1913, industrial operations on the West Parcel included:

- Rand Drill Company, manufacturing percussion rock drills (south side of the parcel);
  Mobile Company of America, manufacturing steam-powered vehicles (north side of parcel);
- Maxwell Briscoe Company, manufacturing gasoline powered automobiles, with operations including assembly buildings, machine shops, woodworking facilities and painting/varnishing operations; and,
- Small foundry (north and south sides of the parcel).

The Chevrolet Motor Company, which later became a division of GMC, originally acquired the former Maxwell Briscoe Property and automobile manufacturing facility in 1914. Since that time until the assembly plant was closed in 1996, GMC had only assembled automobiles at the Site except for a period during World War II when airplane wings and light military vehicles were assembled at the Site.

Much of the West Parcel land mass (north of Beekman Avenue) was formerly an embayment of the Hudson River. Historic fill material, as defined in NYSDEC DER-10, was initially placed in a north-south strip across the embayment during the 1840s to support the construction of a railway between New York City and Albany. Historic fill material was subsequently placed on the West Parcel during the early 1900s for industrial developments that preceded the arrival of GMC. As GMC operations grew, additional

historic fill material was placed on the West Parcel during several expansion projects between 1924 and 1960.

The final extension of the waterfront to its current configuration was filled with sediments dredged locally from the Hudson River. Historic fill material documented at the Site includes cribbing, former piers, sunken barges, ash and other debris. SMP Figure 3 illustrates the sequence of historic filling within the West Parcel.

The south parcel area of the Site, bounded by Beekman Avenue, Hudson Street and River Street, was developed as a parking lot on former residential land and is currently paved. A former water storage tank and pump house, which supported the operating GMC assembly plant facility north of Beekman Avenue, was also located on the south parcel area and was removed after the assembly plant was demolished.

After the facility closure in 1996, buildings and most above-grade structures were demolished and removed. Most of the concrete floor slabs and foundations from the former Body and Chassis Plants on the West Parcel were not demolished. Large part of the ground-level building slabs from the former Body and Chassis Plants remained on the West Parcel as part of the existing cover system until redevelopment began in 2016.

2.3 Geology and Hydrogeology

The Site is developed on historic fill of varying composition and thickness, ranging from approximately 1 foot to 25 feet beneath the existing cover system(s). As described in the SMP, the historic fill material consists of a variety of dredged materials, soils, ash, rubble, and other debris, as well as filled sunken barges, bulkheads, and foundations.

Within the West Parcel Site, the historic fill material consists of a variety of dredged materials, soils, ash, rubble, and other debris, as well as filled sunken barges, bulkheads and foundations. Various metals, as noted below, and semi-volatile organic compounds (SVOCs), Polycyclic Aromatic Hydrocarbons (PAHs) are the principal COCs. Lead is the most widespread metal detected in soil samples from historic fill on the West Parcel Site. Other metals found at levels above restricted residential Sediment Cleanup Objectives (SCOs) include arsenic, barium, cadmium, chromium, copper, mercury and zinc. PAHs are generally associated with ash or cinder fill in various areas and residual petroleum from reported past spills in localized areas of the Site.

Past operations on the West Parcel Site have also contributed to the presence of residual petroleum and petroleum derived VOCs and SVOCs, as well as localized areas where chlorinated VOCs, primarily trichloroethylene (TCE) were found. Groundwater is present within the historic fill material and contains variable concentrations of metals, VOCs and PAHs.

The historic fill is reportedly underlain in areas by soft organic clay and peat deposits associated with the Hudson and Pocantico Rivers. In other areas, glaciolacustrine deposits (varved silt and clay) underlies the fill. Beneath these peat and organic clay deposits and glaciolacustrine deposits, a layer of dense granular till (silty sand with varying amounts of gravel and occasional cobbles and boulders) overlies the bedrock that ranges in thickness from 1 foot to more than 10 feet. The underlying bedrock is metamorphic gneiss. The depth to bedrock is variable across the Site, ranging from less than 20 feet below ground surface (bgs) on the southern and eastern areas to greater than 100 feet bgs along the Hudson River.

The Site's shallow groundwater regime is tidally influenced. The overall direction of groundwater flow is generally southwest toward the Hudson River with local variations in flow paths. The top of the shallow phreatic groundwater table was depicted in the SMP at approximately 1.5 feet to 6 feet bgs. As discussed in the recent SMP Periodic Review Report (PRR) submission, substantial structural fill material has been placed to raise the Site above the regulatory flood plain elevation and support the Brownfield Redevelopment Project. An average of six feet of fill meeting restricted residential criteria was placed across the Site. As further discussed in Section 2.5, the 19 replacement monitoring wells and the 3 new monitoring wells will require conventional soil borings to be performed to determine the current fill thickness and observed groundwater level to determine placement of the monitoring well screen depth interval.

IRM remedies, implemented in 2007-2008 accomplished the first goal of removing grossly contaminated soil and contributed to the second goal of eliminating the potential for future exposure in the areas addressed. Specifically, these actions included:

- Excavation and off-site disposal of grossly contaminated soil containing elevated concentrations of lead at PAOC 7 and PAOC 29;
- Excavation and off-site disposal of grossly contaminated soil containing elevated concentrations of chromium and TCE above applicable BCP soil;
- Cleanup objectives at PAOC 47; and,
- Excavation and off-site disposal of petroleum-impacted soil from the Former 10,000-gallon Underground Storage Tank (UST) Area.

2.4 Site Groundwater

Groundwater at the Site is primarily impacted by metals, though filtered samples for metals indicated that only sodium, iron, magnesium, and manganese consistently exceed NYS Class GA standards. These reported groundwater concentrations are likely attributed to suspended solids within the historic fill. While the East Parcel has no significant organic contaminants with respect to the NYSDEC DER-10 SCOs, the West Parcel previously exhibited residual petroleum from former fuel oil tanks, which the groundwater has since naturally attenuated.

Between 2007 and 2008, the Site's most significant historical contamination at PAOC 47 was addressed through an IRM that combined source soil removal with an In-Situ Chemical Oxidation (ISCO) program. This ISCO effort involved injecting approximately 40,500 gallons of sodium persulfate and sodium hydroxide through 65 wells, successfully reducing TCE concentrations to comply with Class GA drinking water standards across most of the area, particularly along the downgradient property line. Following three years of post-injection monitoring, the NYSDEC determined in 2011 that the area had been remediated to the extent practicable and issued a "No Further Action" (NFA) letter. While no further active remediation is required, the site remains under strictly enforced Institutional and Engineering Controls (IC/EC), including a prohibition on the use of untreated onsite groundwater and a mandate for municipal water service, to manage residual risks during future redevelopment.

Despite the implementation of multiple IRMs, onsite groundwater still exceeded Class GA drinking water standards in the last groundwater sampling event in 2011. Prior to remediation, TCE, chromium, and petroleum-derived VOCs and SVOCs were the primary COCs identified in Site groundwater. Most monitoring wells, including temporary wells, and the ISCO injection wells, were decommissioned in 2012 in accordance with the NYSDEC-approved plan.

2.5 Site Grades and Elevations

After issuance of the COC in 2011, NYSDEC-approved clean fill was used to raise the EOH Site to an elevation above the FEMA 100-year flood elevation of 12.0 ft amsl. This fill layer varies in thickness from 2 to 10 feet, with a Site-wide average of 6 feet. Several parts of the Site have been brought to final grade and landscaped in accordance with the Site Development Plan (see Figure 1). The following blocks have been restored to final grade with approved installation of a Final Cover System as of 2026:

- Part of Block A – DeCicco's Market building and Retail Building (Partial)
- Block E – Brownstones at Edge-on-Hudson
- Block F – NorthLight Apartments (Hines)
- Block H – LL Parcel H – Daymark Condominium
- Block I – Brownstones at Edge-on-Hudson and Emerson Apartments
- Block J – Brownstones at Edge-on-Hudson
- Block O – Sun Homes Townhomes and Condominiums (Partial, On-Going 2024 and 2025 Construction)
- Block N – Sun Homes Townhomes and Condominiums (Partial, On-Going 2024 and 2025 Construction)
- Block P – Sun Homes Townhomes and Condominiums (Partial, On-Going 2024 and 2025 Construction)
- Public Roadways and Parks: Village of Sleepy Hollow, Ney York

The remaining blocks are still in the process of being brought to final grade and the construction of Final Site Cover will be reported to NYSDEC in future PRR submissions.

3.0 GROUNDWATER WELL INSTALLATION

Between 1996 and 2008, a total of 19 groundwater monitoring wells were installed. By 2012, the monitoring wells were either lost during construction or decommissioned. Because existing monitoring wells in the network were installed prior to redevelopment, it was anticipated that any number of monitoring wells may need to be repaired, replaced and possibly relocated to provide for post- development sampling. Well abandonment was performed in accordance with the 2012 NYSDE approved "Groundwater Monitoring Well Decommissioning Procedures" (Attachment C). Monitoring wells that were decommissioned because they had been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

PS&S will subcontract a NY-licensed well driller to reinstall the 19 monitoring wells described in the SMP and as described on Table 1. In addition, PS&S will request the subcontracted well driller to install the two additional wells described in Section 3.3.1.2 of the SMP. These well locations have been identified in Figure GW-01 with consideration of the current site redevelopment plan (Figure 1). A summary table that correlates the historical 2012 SMP wells to the newly proposed 2026 wells is included as Table 3.

The data collected will be used to:

1. Determine the appropriate screened interval and depth at each proposed well location with the recently changed ground surface elevation due to placement of "clean fill" and prior subsurface geology through conventional soil borings;
2. Install 19 replacement monitoring wells and 3 new monitoring wells after receipt of NYSDEC's concurrence; and,
3. Conduct annual groundwater monitoring to evaluate monitored natural attenuation.

4.0 SOIL BORING/PROBE AND MONITORING WELL DRILLING, RE-INSTALLATION AND DEVELOPMENT

PS&S and the selected drilling subcontractor will perform a NY State One-Call prior to any drilling efforts. Pre-selected areas will then be "pre-cleared" using soft dig methodology to 6 feet below "new" grade ground surface to verify that the location is free of utilities. After the boring/probe location has been cleared, the soil boring/probe can be performed in the utility "cleared" soft dig hole using either Geoprobe or continuous conventional split-spoon soil sampling with hollow stem auger drilling to the depth of the original monitoring well completed at that location, plus the approximate thickness of the of the new surficial fill layer as determined by the soil boring. The soil cores retrieved from the subsurface will be visually and texturally examined by the PS&S Field Representative and compared to the subsurface stratum encountered in the original soil boring for the prior monitoring well installation to assess completion depth for the new monitoring well. Historical boring and well construction logs are included as Attachment 1.

Upon identifying the proposed completion depth for the new monitoring well, the borehole will be enlarged to a minimum of 6-inch diameter using Hollow Stem Auger (HSA) drilling to completion depth. After reaching the appropriate depth with the HSA, the 2-inch diameter, Schedule 40, PVC well materials will be placed through the HSA. The new monitoring wells will be completed with 10 feet of 10-slot well screen with a cap and solid well casing to the ground surface. The borehole annulus around the well screen is to be filled with No. 1 Well Sand to approximately 2 feet above the top of the well screen. The remainder of the borehole is to be tremie grouted to approximately 1-foot bgs and allowed to harden before installing concrete surface pad and completed with flush mount protector. The subcontracted driller will provide a lockable J-Plug and lock.

Each newly constructed well will be developed until the purge water has stabilized or provides consistent turbidity readings below 25 NTU. PS&S will utilize a multi-parameter water quality meter to document the turbidity during well development. Water generated during development will be contained in 55-gallon drums provided by the subcontracted driller. The subcontracted driller will be required to move the 55-gallon drums of development water to the onsite staging area. After development of the monitoring wells are completed, the location and elevation of the monitoring well will be performed by NY licensed land surveyor.

5.0 LONG TERM GROUNDWATER MONITORING PLAN

A long-term groundwater monitoring program will be established as described below following the installation and development of the designated new monitoring wells. This program is designed to track subsurface conditions and evaluate the effectiveness of the implemented remedial actions. The primary objective is to verify the consistent reduction of onsite contaminant concentrations and ensure the continued protection of the surrounding environment.

Groundwater monitoring will occur on an annual basis for 2-5 years following the installation of the wells, until a reduced frequency or termination of the long-term monitoring is proposed and approved by NYSDEC. The first annual groundwater sampling event will now include the full list of site Contaminant of Concern (COC) parameters (Lead, VOCs, SVOCs, and chromium) at every well. After this first event, the sampling parameters will return to only the COCs specific to the AOC in question unless additional contamination is documented in the initial groundwater results.

6.0 Field Investigation Protocols

This section discusses laboratory deliverables and data quality. It also presents a description of the health and safety and air monitoring activities to be conducted during the implementation of the PDIWP delineation activities.

6.1.1 Quality Assurance/Quality Control

Quality assurance/quality control procedures consistent with NYSDEC sampling protocols will be observed for the sampling operations. Analytical data will be provided as New York State Category B Data Deliverables. The data will be submitted to NYSDEC electronically using Equis Data Processor version 5.6.1 or most recent version. QA/QC protocols will be in accordance with DER-10. Upon completion of data validation, a Data Usability Summary Report will be prepared and submitted to the NYSDEC DER Project Manager.

Field evaluation techniques for the determination of the presence/absence of NAPL will be in accordance with DER-10. Such methods include visual identification of sheens or other visible product, measurable thickness of product on the water table, the use of field instruments, ultraviolet fluorescence, soil-water agitation, centrifuging and hydrophobic dye testing.

6.1.2 Health and Safety Program

A Health and Safety Plan (HASP) has been prepared for this project in 2016. A copy of the plan will be provided under separate cover.

Prior to commencing field activities, all onsite personal must have 40-hour HAZWOPER certification and 8-hour HAZWOPER refresher. The Drilling Contractor is tasked with developing a site-specific Health and Safety Plan (HASP) and a Job Hazard Analysis (JHA) tailored to the drilling scope of work. Additionally, the Driller must initiate a New York One-Call for utility marking. Both the HASP and JHA must be submitted to the PS&S Project Manager for review no later than one week before site mobilization.

A project organization has been developed to identify the roles and responsibilities of the various parties involved with this PDI. The organizational structure for this PDI includes NYSDEC, PS&S, and the required contractors. Although the QA/QC responsibilities are principally the responsibility of the PS&S Project Manager and Project Quality Assurance Manager, proper implementation of QA/QC requirements necessitate that the entire project staff be cognizant of all procedures and goals.

6.1.3 Project Team

The PS&S team will consist of the following personnel, with a description of their responsibilities:

- **Project Manager:** James Boyer will have primary responsibility and authority for implementing and executing technical, QA, and administrative aspects of the PDI, including the overall management of the project team. The Project Manager will be accountable for ensuring that the RI Field Program is conducted in accordance with applicable plans and guidelines, including the QAPP and the HASP. In addition, the Project Manager will communicate technical, QA and administrative matters to Lighthouse Landing Communities.
- **Technical Leadership:** In addition to the PS&S Project Manager, engineering support for the delineation will be the responsibility of Janos M. Szeman, the Project Engineer of record, and Don Whitehead, Scientific Leader Hydrogeology. Their duties will include overseeing the preparation of project deliverables.
- **Project Quality Assurance Manager:** Sarah Levine, Senior Project Manager will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements.
- **Lead Qualified Environmental Professional On-Site**: Emily Schmidt, the Lead QEP, will be responsible for the management and supervision of the soil boring and well installation, and for providing consultation and decision-making on day-to-day issues relating to the sampling activities. The Lead QEP will monitor the sampling to determine that operations are consistent with plans and procedures, and that the data acquired meets the data quality needs. When necessary, the Lead QEP will document any deviations from the plans and procedures for approval. In addition, other QEPs may provide support to the Project Manager and the Lead QEP on an as-needed basis. Alexander Charette and Lauren Weikl will be on-Site Field Representatives.
- **Health and Safety Coordinator:** Janos M. Szeman will be responsible for implementation of the HASP. The HSC will advise project staff on health and safety issues, conduct health and safety training sessions, and monitor the effectiveness of the health and safety program conducted in the field.
- **Subcontracted Well Driller**: NYS-certified drillers will be retained to perform intrusive work under this PDIWP and in accordance with the SMP. The drilling contractor will be finalized based on the actual field schedule developed after receipt of NYSDEC approval.
- **Laboratory Services**: The services of an analytical laboratory contractor will be necessary to perform the PDI activities. The Project Manager, with assistance from the QEP, will be the liaison between PS&S and the analytical laboratory contractor. Any laboratory utilized for the analysis of environmental samples will be a NYSDEC-certified laboratory. The laboratory will deal

directly with the consultant about analytical parameters, sample handling, and analytical results reporting. The laboratory will be responsible for providing all materials for sample collection, handling, and transportation in accordance with QA/QC requirements.

6.1.4 Work Zone Air Monitoring

Work zone air monitoring will be performed in accordance with the HASP, SMP and Community Air Monitoring Plan. A PID, or equivalent, will be used to monitor the work zone for the presence of VOCs. If elevated VOCs are observed, then HASP identified actions will be implemented. If prolonged elevated VOCs are observed after the HASP identified actions are implemented, the NYSDEC DER Project Manager will be notified, appropriate actions (i.e., boring or well abandonment) in accordance with NYSDEC DER-10 will be performed, and appropriate delineation boring/well offsets will be identified and discussed with the NYSDEC DER Project Manager prior to implementation.

7.0 INVESTIGATION DERIVED WASTE MANAGEMENT

Investigation Derived Waste (IDW) generated during this scope of work will be contained in 55-gallon steel drums provided by the subcontracted driller. These drums will be staged onsite within a designated area featuring an impermeable bottom liner, bermed edges, and a secure rain tarp. The proposed staging area is in the northern portion of the site, situated near Kingsland Point Park and the railroad tracks. PS&S and associated parties will manage the profiling, characterization sampling, and final disposal of containerized IDW.

8.0 UPCOMING DELIVERABLES AND PROJECT SCHEDULE

PS&S are currently seeking NYSDEC approval to reinstate 19 decommissioned monitoring wells and install two additional monitoring wells. Following installation, we will resume groundwater monitoring as required by the SMP. Phase 1, which includes initial mobilization and well installation, is scheduled to commence on August 3, 2026. Prior to installation, planned earthwork will be conducted in the North Meadow Buffer Park to bring the area to final grade.

Phase 2 is scheduled to begin in the fourth quarter of 2026, during which the remaining well installations will be completed. Following the completion of these wells, we will begin coordinating the initial groundwater monitoring event.

6.1 Field Observation Report and NYSDEC Technical Consultation

After the field investigations are completed and the field observations and analytical laboratory results are tabulated, the project team will prepare a letter report documenting current Site conditions, the observed horizontal and vertical delineation of observed groundwater contamination, and the potential implications of those observations on long term monitoring. A draft Field Observation Report will be shared with the NYSDEC DER Project Manager and a technical consultation with the NYSDEC DER Project Manager will be scheduled. Once the Update is finalized by the project team and the NYSDEC DER Project Manager, the project team will then finalize the long-term groundwater monitoring program.

6.2 Annual Groundwater Summary Report

Forms and any other information generated during regular monitoring events and inspections will be kept on file onsite. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in Section 5.3 on the SMP.

Monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report. A letter report will also be prepared, if required by NYSDEC, subsequent to each sampling event. The letter report will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., groundwater, QA/QC);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, inspection checklists, etc.).

- Summarized tabulated laboratory results in comparison to appropriate standards/criteria.
- Summary of groundwater level measurements and calculated groundwater elevations.
- A figure illustrating sample type and sampling locations and results (Chem Boxes).
- Copies for groundwater monitoring well field sampling forms.
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC identified format).
- Relevant observations, conclusions, or recommendations.
- A determination as to whether groundwater conditions have changed since the last reporting event

Monitoring of the performance of the remedy and overall reduction in contamination onsite will be conducted for the first 2 to 5 years following the construction or installation of engineering controls, unless otherwise specified in Table 2. The frequency thereafter will be determined by NYSDEC. Trends in contaminant levels in the groundwater in the affected areas, will be evaluated to determine if the remedy continues to be effective in achieving remedial goals.

FIGURES

LIST OF FIGURES

Figure 1	Site Plan
SMP Figure 3	Site Fill History
SMP Figure 15	2011 SMP Groundwater Monitoring Well Location Plan
Figure GW-01	2026 Post Redevelopment Groundwater Monitoring Well Location Plan

TABLES

LIST OF TABLES

Table 1 Proposed Well Construction Details
Table 2 Sampling Parameters and Frequency
Table 3 2011 SMP Groundwater Well vs 2026 Replacement Well Summary Table

ATTACHMENTS

LIST OF ATTACHMENTS

Attachment A	Monitoring Well Boring and Construction Logs
Attachment B	Health and Safety Plan (HASP) (to be provided under separate cover)
Attachment C	DER-10 / Technical Guidance for Site Investigation and Remediation

Site Plan

THE NEW RIVER VIEW

COME HOME TO LIFE ON THE EDGE.

Meet contemporary river living like never before, where new luxury residences come with urban amenities. Only 38 minutes from Grand Central and steps from the shore.

EDGE-ON-HUDSON
A New View On The River
edgeonhudson.com

Short distance to Philipse Manor Metro-North
Short distance to Tarrytown Metro-North
Beekman Avenue
River Street
Legend Drive
Legend Drive
Maxwell Drive
Horseman Blvd
Palisades Blvd
Lighthouse Landing
Westward Drive
Hollows Pass
Sleepy Hollow Lighthouse
Hudson River

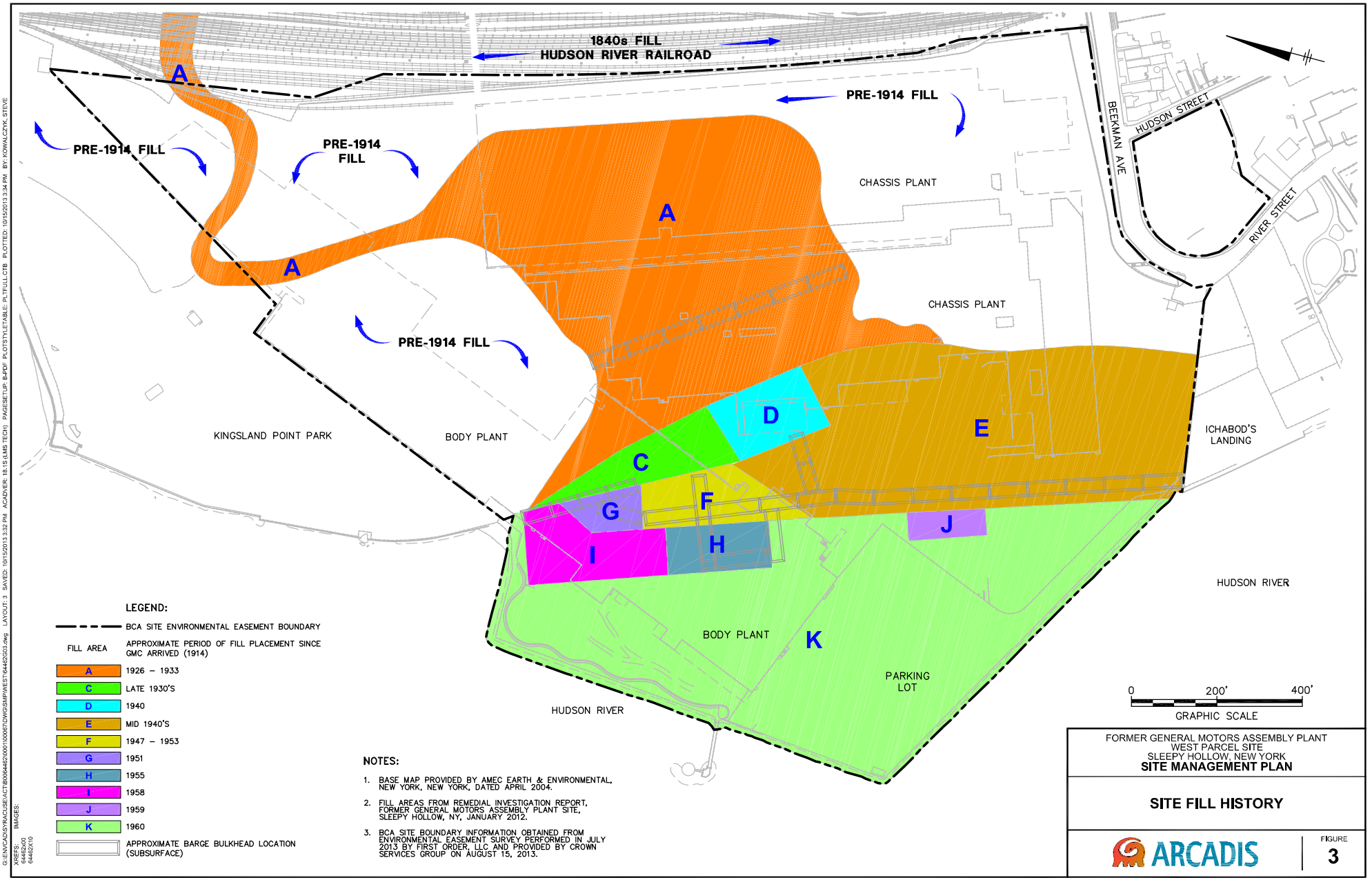
E
N
S
W

LEGEND

1. DeCicco & Sons Gourmet Market
2. The Daymark Sales Gallery
3. The Daymark – *Condominiums*
4. Boat Dock & Fishing Pier
5. Sleepy Hollow RiverWalk
6. Planned 140-Room Boutique Hotel
7. Upcoming Phase 2 Waterfront Promenade
8. Kayak Launch
9. Kingsland Point Park
10. One Kingsland – *Townhomes by Sun Homes*
11. One Kingsland Sales Gallery
12. Metro-North Railroad
13. Emerson – *Apartments*
14. Toll Brothers – *Townhomes & Condos*
15. NorthLight – *Apartments*

Planned Retail and Office
Planned Residential
Planned Restaurant

Site Fill History



LEGEND:

- BCA SITE ENVIRONMENTAL EASEMENT BOUNDARY
- APPROXIMATE BARGE BULKHEAD LOCATION (SUBSURFACE)

FILL AREA	APPROXIMATE PERIOD OF FILL PLACEMENT SINCE GMC ARRIVED (1914)
A	1926 – 1933
C	LATE 1930'S
D	1940
E	MID 1940'S
F	1947 – 1953
G	1951
H	1955
I	1958
J	1959
K	1960

NOTES:

1. BASE MAP PROVIDED BY AMEC EARTH & ENVIRONMENTAL, NEW YORK, NEW YORK, DATED APRIL 2004.
2. FILL AREAS FROM REMEDIAL INVESTIGATION REPORT, FORMER GENERAL MOTORS ASSEMBLY PLANT SITE, SLEEPY HOLLOW, NY, JANUARY 2012.
3. BCA SITE BOUNDARY INFORMATION OBTAINED FROM ENVIRONMENTAL EASEMENT SURVEY PERFORMED IN JULY 2013 BY FIRST ORDER, LLC AND PROVIDED BY CROWN SERVICES GROUP ON AUGUST 15, 2013.

FORMER GENERAL MOTORS ASSEMBLY PLANT
WEST PARCEL SITE
SLEEPY HOLLOW, NEW YORK
SITE MANAGEMENT PLAN

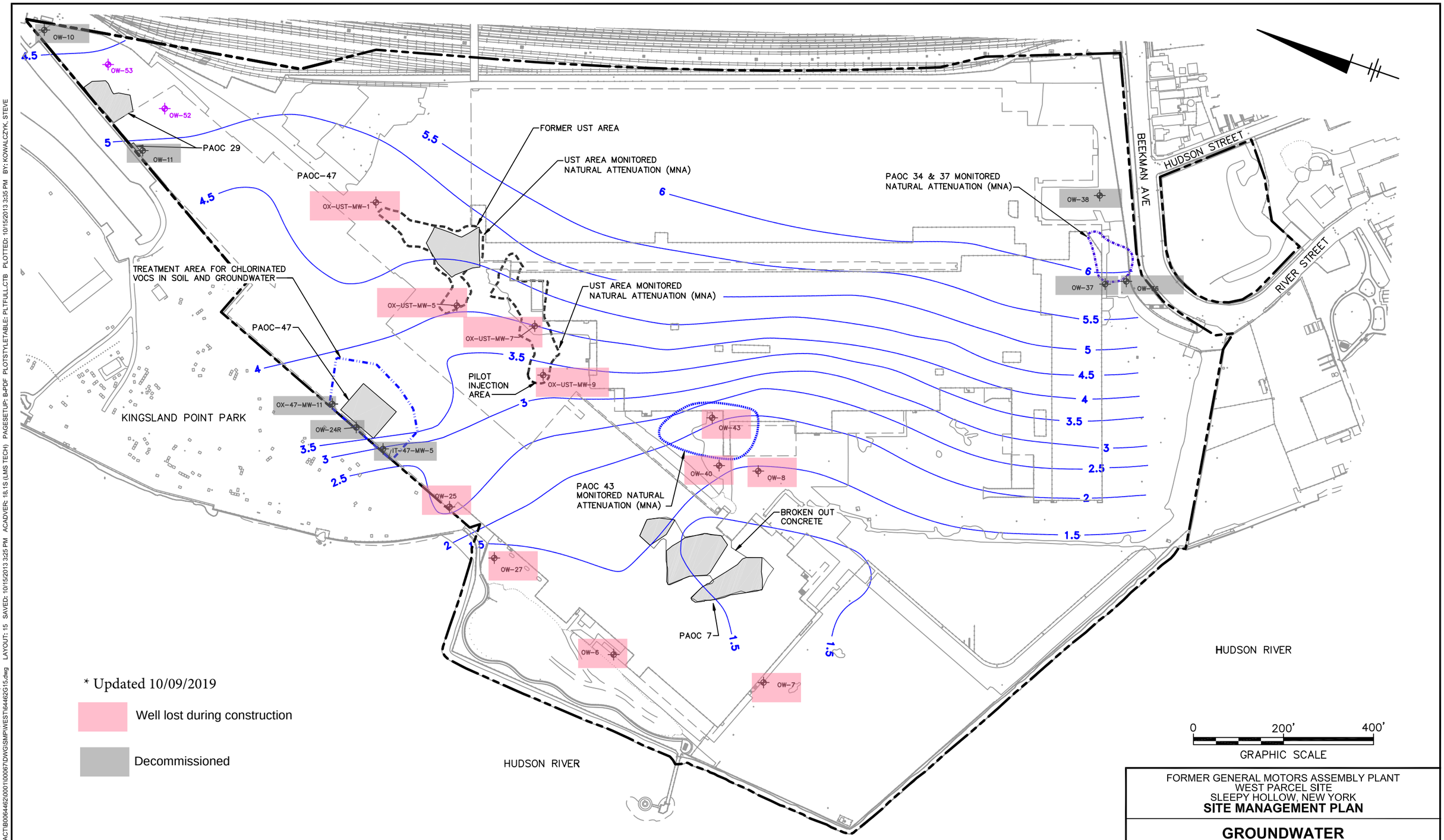
SITE FILL HISTORY

ARCADIS

FIGURE 3

CITY: SYRACUSE DIV/GROUP: ENV CAD DB: B. DECLERCQ LYR: ON="OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACTIB\0844920001\0006\7\DWG\SMP\WEST\844920S03.dwg LAYOUT: 3 SAVED: 10/15/2013 3:32 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/15/2013 3:34 PM BY: KOWALCZYK, STEVE
XREFS:
844920 00
844921 10
IMAGES:

2011 SMP Groundwater Monitoring Well Location Plan



* Updated 10/09/2019

Well lost during construction

Decommissioned

EXISTING MONITORING WELL

NEW FUTURE MONITORING WELL (TENTATIVE)

FORMER GENERAL MOTORS ASSEMBLY PLANT
WEST PARCEL SITE
SLEEPY HOLLOW, NEW YORK
SITE MANAGEMENT PLAN

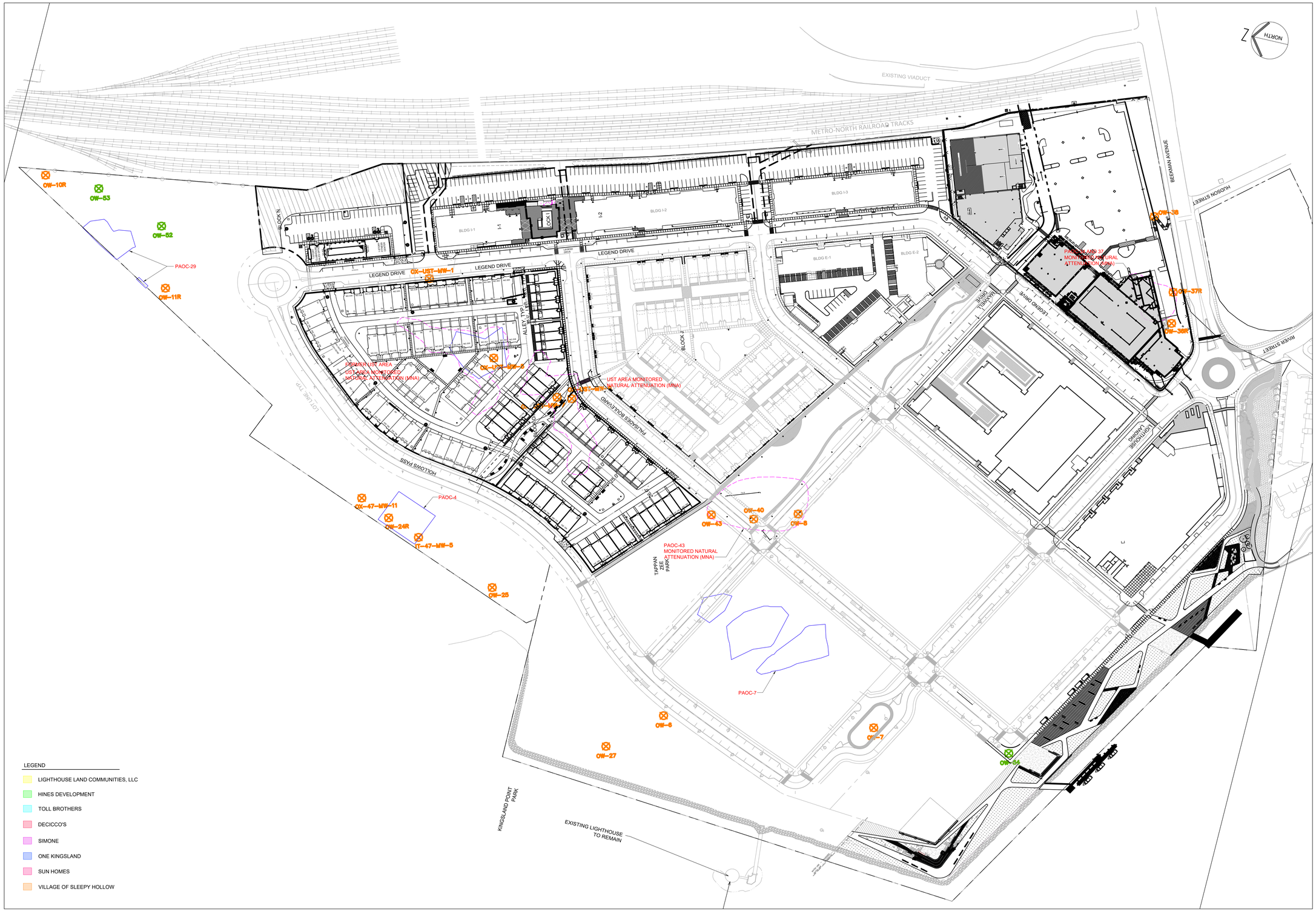
GROUNDWATER MONITORING WELL NETWORK

ARCADIS

FIGURE
15

CITY: SYRACUSE DIV/GROUP: ENV CAD DB: B. DECLERCQ LYR: ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\00644620001\00067\DWG\SMP\WEST\64462G15.dwg LAYOUT: 15 SAVED: 10/15/2013 3:25 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/15/2013 3:35 PM BY: KOWALCZYK, STEVE
XREFS: 64462X08 64462X00
IMAGES:

2026 Post Redevelopment Groundwater Monitoring Location Plan



LEGEND

- LIGHTHOUSE LAND COMMUNITIES, LLC
- HINES DEVELOPMENT
- TOLL BROTHERS
- DECICCO'S
- SIMONE
- ONE KINGSLAND
- SUN HOMES
- VILLAGE OF SLEEPY HOLLOW

LEGEND

- NEW PROPOSED GROUNDWATER WELL
- REPLACEMENT WELL
- PAOC - POTENTIAL AREA OF CONCERN WITH MONITORED NATURAL ATTENUATION
- PAOC - POTENTIAL AREA OF CONCERN

SOURCE NOTES

1. BASE MAP PROVIDED BY DIVNEY, TUNG, SCHWALBE DRAWING NO. BD-1.0, TITLED "PHASE 3 AND 4 BASIS OF DESIGN", DATED 10/31/2019.
2. MONITORING WELL LOCATIONS PROVIDED BY ARCADIS DRAWING TITLED "GROUNDWATER MONITORING WELL NETWORK".

NOTES

1. THE PROPOSED MONITORING WELL LOCATIONS ARE TENTATIVE AND MUST BE FIELD VERIFIED BY PS&S AND THE NYSDEC CERTIFIED WELL DRILLER BASED ON ACTUAL FIELD CONDITIONS AND SITE IMPROVEMENTS/UTILITY INFRASTRUCTURE.
2. THE FINAL WELL LOCATION (X,Y) AND ELEVATION (Z) WILL BE FIELD SURVEYED BY A NYS LICENSED SURVEYOR AND DOCUMENTED FOR THE PROJECT RECORD.
3. FINAL WELL LOCATIONS WILL BE WITHIN MEDIANS OR LANDSCAPED AREAS AS SHOWN. WELLS WILL NOT BE LOCATED WITHIN THE ASPHALT ROAD OR CONCRETE SIDEWALK.
4. DUE TO THE EXTENDED DURATION OF SITE CONSTRUCTION AND THE LENGTHY PERIOD DURING WHICH SOILS HAVE REMAINED EXPOSED WITHOUT COVER, THE FIRST ROUND OF GROUNDWATER SAMPLING SHALL INCLUDE THE FULL ANALYTICAL SUITE, INCLUDING EMERGING CONTAMINANTS.

GRAPHIC SCALE

80 0 40 80 160

(IN FEET)
1 inch = 80 ft.

REV. / ISSUE	DATE	DESCRIPTION
1	2/17/26	REVISED PER CURRENT SITE MASTER PLAN

CONSULTANT

CONSULTANT

ORIENTATION / KEY PLAN



CLIENT

EDGE-ON-HUDSON
RESIDENCES BY TOLL BROTHERS

PAULUS, SOKOLOWSKI AND SARTOR ENGINEERING, P.C.
1 LARKIN PLAZA, 2ND FLOOR, YONKERS, NY 10701
PHONE: (732) 560-9700

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ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

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PROJECT

EDGE ON HUDSON
NYSDEC SITE # C360070
FORMER GENERAL MOTORS (GM) ASSEMBLY PLANT

SLEEPY HOLLOW, WESTCHESTER COUNTY, NY

SHEET TITLE

GROUNDWATER MONITORING WELL LOCATIONS

PROJECT NO.:	05302.0002	DRAWN BY:	YN
SCALE:	AS SHOWN	CHECKED BY:	JMS/ERS
DATE:	03/18/2026	SHEET	1 OF 1

SHEET NO.

GW-01

Proposed Well Construction Details

Tabel 1
Groundwater Monitoring Plan Summary

2011 Site Management Plan Well	2026 Well Designation	Well Type	Parameters	Objective
Upgradient Area				
OW-10	OW-10R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring upgradient quality of groundwater entering the site
PAOC 7				
OW-6	OW-6R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring lead concentrations downgradient of PAOC 7 IRM excavation and outside the low permeability cover system
OW-7	OW-7R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring lead concentrations downgradient of PAOC 7 IRM excavation and outside the low permeability cover system
PAOC 29				
OW-11	OW-11R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring lead concentrations crossgradient/ downgradient of PAOC 29 IRM excavation and within or at edge of low permeability cover system
	OW-52	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring lead concentrations downgradient of PAOC 29 IRM excavation, within or beyond low-permeability cover system.
	OW-53	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring lead concentrations upgradient of PAOC 29 IRM excavation, within or adjacent to low-permeability cover system.
PAOC 47				
IT-47-MW-5	IT-47-MW-5R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring TCE and chromium concentrations at the downgradient property line at edge of IRM treatment area.
OW-24R	OW-24R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring TCE and chromium concentrations at the downgradient property line at edge of IRM treatment area.
OX-47-MW-11	OX-47-MW-11R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring TCE and chromium concentrations at the downgradient property line at edge of IRM treatment area.

Tabel 1
Groundwater Monitoring Plan Summary

2011 Site Management Plan Well	2026 Well Designation	Well Type	Parameters	Objective
PAOC 34/37				
OW-36	OW-36R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents downgradient of natural attenuation area
OW-37	OW-37R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents downgradient of natural attenuation area
OW-38	OW-38R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents upgradient of natural attenuation area.
PAOC 43				
OW-8	OW-8R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents downgradient of natural attenuation area
OW-40	OW-40R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents downgradient of natural attenuation area, and upgradient of PAOC 7
OW-43	OW-43R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents within natural attenuation area.
Former UST Area				
OX-UST-MW-1	OX-UST-MW-1R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents upgradient of natural attenuation area
OX-UST-MW-5	OX-UST-MW-5R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents within natural attenuation area.
OX-UST-MW-7	OX-UST-MW-7R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents within natural attenuation area.
OX-UST-MW-9	OX-UST-MW-9R	Overburden	Lead, chromium, VOCs, and SVOCs	Monitoring petroleum constituents within natural attenuation area.
Property Line - General				
OW-25	OW-25R	Overburden	Lead, chromium, VOCs, and SVOCs	General monitoring along general vicinity of the downgradient property line
OW-27	OW-27R	Overburden	Lead, chromium, VOCs, and SVOCs	General monitoring along general vicinity of the downgradient property line
OW-54	OW-54	Overburden	Lead, chromium, VOCs, and SVOCs	General monitoring along general vicinity of the downgradient property line

Sampling Parameters and Frequency

Table 2
Sampling Parameters and Frequency

AOC	Contaminants of Concern	First Annual Sampling Parameters	AOC Corresponding monitoring Wells	Monitoring Frequency
PAOC 7	Lead	Lead, VOCs, SVOCs, and chromium	OW-6R, OW-7R	Annual *
PAOC 29	Lead	Lead, VOCs, SVOCs, and chromium	OW-11R, OW-52, OW-53	Annual *
PAOC 34/37	VOCs and SVOCs	Lead, VOCs, SVOCs, and chromium	OW-36R, OW-37R, OW-43R	Annual *
PAOC 43	VOCs and SVOCs	Lead, VOCs, SVOCs, and chromium	OW-8R, OW-43R	Annual *
	Lead, VOCs and SVOCs	Lead, VOCs, SVOCs, and chromium	OW-40R	
PAOC 47	VOCs and chromium	Lead, VOCs, SVOCs, and chromium	OW-24R, IT-47-MW-5R, OX-47-MW-11R	Annual *

*The First Annual Groundwater sampling event will include all parameters: Lead, VOCs, SVOCs, and chromium. After the first sampling event the sampling parameters will return to only the Contaminants of concern.

2011 SMP Groundwater Well vs 2026 Replacement Well Summary Table

Table 3
Field Forms for Monitoring Well Installation

Exsiting Well	Exisiting NYSDEC Well permit #	Initial Well Installation Date	Initial Well Installation Driller	Well Abandonment Date	Former Well groundwater elevation	Former Well Ground surface elevation	Former Well Screened Interval	Replacement Well Number	Final Redevelopment Ground surface elevation	Driller/Helper	2026 observed groundwater elevation ATD	2026 observed groundwater elevation AD	Proposed Screened interval	Actual Screened Interval	Well Installation Date	Seal Interval	Materials Used (Bags)	Well Development	Flushmount Well As Built PVC Well casing elevation
Upgradient Area																			
OW-10		12/2/1996	T. Kendrick	11/26/2012	8.31	14.5	4.5-14.5	OW-10R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
PAOC 7																			
OW-6		12/2/1996	T. Kendrick	11/26/2012	8.74	14.5	4.5 - 14.5	OW-6R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-7		11/27/1996	T. Kendrick	11/26/2012	9.59	15	5.0-15.0	OW-7R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
PAOC 29																			
OW-11		12/2/1996	T. Kendrick	11/26/2012	5.46	14	3.0-13.0	OW-11R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
								OW-52					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
								OW-53					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
PAOC 47																			
IT-47-MW-5		9/26/2007	B&B Drilling / HRS Drilling	11/26/2012	13.07	22	10.0-20.0	IT-47-MW-5R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-24R		9/26/2007	B&B Drilling / HRS Drilling	11/26/2012	13	19	9.0-19.0	OW-24R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OX-47-MW-11		3/3/2008	B&B Drilling	11/26/2012	13.13	19.2	8.0-18.0	OX-47-MW-11R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
PAOC 34/37																			
OW-36		4/26/2004	Summit Drilling	11/26/2012	10.46	18	3.0-18.0	OW-36R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-37		4/26/2004	Summit Drilling	11/26/2012	10.76	18	3.0-18.0	OW-37R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-38		4/27/2004	Summit Drilling	11/26/2012	11.03	18	3.0-18.0	OW-38R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
PAOC 43																			
OW-8		11/27/1996	T. Kendrick	11/26/2012	7.43	15	5.0-15.0	OW-8R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-40		4/28/2004	Summit Drilling	11/26/2012	7.62	18	3.0-18.0	OW-40R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-43		4/29/2004	Summit Drilling	11/26/2012	5.81	18	3.0-18.0	OW-43R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
Former UST Area																			
OX-UST-MW-1		2/26/2008	B&B Drilling	11/26/2012	6.55	16	3.0-13.0	OX-UST-MW-1R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OX-UST-MW-5		2/25/2008	B&B Drilling	11/26/2012	8.75	22	3.0-13.0	OX-UST-MW-5R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	

Table 3
Field Forms for Monitoring Well Installation

Exsiting Well	Exisiting NYSDEC Well permit #	Initial Well Installation Date	Initial Well Installation Driller	Well Abandonment Date	Former Well groundwater elevation	Former Well Ground surface elevation	Former Well Screened Interval	Replacement Well Number	Final Redevelopment Ground surface elevation	Driller/Helper	2026 observed groundwater elevation ATD	2026 observed groundwater elevation AD	Proposed Screened interval	Actual Screened Interval	Well Installation Date	Seal Interval	Materials Used (Bags)	Well Development	Flushmount Well As Built PVC Well casing elevation
OX-UST-MW-7		2/26/2008	B&B Drilling	11/26/2012	6.61	14	3.0-13.0	OX-UST-MW-7R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OX-UST-MW-9		2/26/2008	B&B Drilling	11/26/2012	8.79	24	7.0-17.0	OX-UST-MW-9R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
Property Line - General																			
OW-25		10/23/2003	B&B Drilling	11/26/2012	13.95	20	9.0-19.0	OW-25R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	
OW-27		5/3/2004	Summit Drilling	11/26/2012	7.54	17	2.0-17.0	OW-27R					Top: bgs Bottom: bgs	Top: bgs Bottom: bgs		Top: bgs Bottom: bgs	Sand: Bentonite: Cement:	Date: Purged: gals Time: mins	

NOTES: 1. The initial well installation permit numbers are not available as of June 30, 2026; where, the Edge On Hudson Team is coordinating with NYSDEC on these potential historical (circa 2012 and 2013) well installations.

Monitoring Well Boring and Construction Logs

ARCADIS

Appendix J

Monitoring Well Boring and Construction Logs

Table J-1
West Parcel Monitoring Well Details

Site Management Plan
General Motors LLC
Former General Motors Assembly Plant West Parcel Site, Sleepy Hollow, NY

Well ID	Installation Completion Date	Well Type	Total Depth (ft bgs)	Screened Interval (ft bgs)	Easting	Northing	Elevation TIC (ft)
OW-6	12/2/1996	overburden	14.5	4.5 - 14.5	664911.9800	820606.7380	8.74
OW-7	11/27/1996	overburden	15.0	5.0 - 15.0	664959.8310	820271.8470	9.59
OW-8	11/27/1996	overburden	15.0	5.0 - 15.0	665399.7700	820436.4300	7.43
OW-10	12/2/1996	overburden	14.5	4.5 - 14.5	665807.3970	822255.1530	8.31
OW-11	12/2/1996	overburden	14.0	3.0 - 13.0	665625.5490	821961.5140	5.46
OW-24R	9/26/2007	overburden	19.0	9.0 - 19.0	665199.5000	821311.8000	13.00
OW-25	10/23/2003	overburden	20.0	9.0 - 19.0	665100.5164	821058.5182	13.95
OW-27	5/3/2004	overburden	17.0	2.0 - 17.0	665025.6090	820927.3320	7.54
OW-36	4/26/2004	overburden	18.0	3.0 - 18.0	666065.3340	819801.7490	10.46
OW-37	4/26/2004	overburden	18.0	3.0 - 18.0	666044.1200	819844.1010	10.76
OW-38	4/27/2004	overburden	18.0	3.0 - 18.0	666226.2350	819919.9350	11.03
OW-40	4/28/2004	overburden	18.0	3.0 - 18.0	665382.8400	820522.4500	7.62
OW-43	4/29/2004	overburden	18.0	3.0 - 18.0	665478.2200	820571.8150	5.81
IT-47-MW-5	9/26/2007	overburden	22.0	10.0 - 20.0	665173.8756	821240.1088	13.07
OX-47-MW-11	3/3/2008	overburden	19.2	8.0 - 18.0	665231.3000	821379.2000	13.13
OX-UST-MW-1	2/26/2008	overburden	16.0	3.0 - 13.0	665686.3000	821434.0000	6.55
OX-UST-MW-5	2/25/2008	overburden	22.0	3.0 - 13.0	665528.5000	821189.2000	8.75
OX-UST-MW-7	2/27/2008	overburden	14.0	3.0 - 13.0	665542.0000	821010.9000	6.61
OX-UST-MW-9	2/27/2008	overburden	24.0	7.0 - 17.0	665445.2000	820957.6000	8.79

Notes:
1. See Monitoring Well Boring and Construction Logs (attached) for details on well construction.
2. Horizontal Datum is New York State Plane Coordinate System NAD83 NY East 3101
3. Elevations are based on the North American Vertical Datum of 1988.

Acroynms and Abbreviations:
ft bgs - feet below ground surface
TIC - Top of Inner Casing

EMCON

SHEET #. 1

Project: GM Tarrytown	JOB NO. 85849 005 000
Client: General Motors	ELEV. 9.76
BORING CONTRACTOR: Kendrick Drilling	STARTED 12/2/96
GROUNDWATER: 7.5	FINISHED 12/2/96
INSPECTOR B. Melancon	DRILLER T. Kendrick

DATE	TIME	H20 Elev.	SCREEN		CAS.	SAMP	CORE	TUBE
				TYPE	HSA	SS		
12/5/96	800	8.16		DIA.	4"	2"		
12/9/96	825	7.39		WT.		300		
				FALL		30		

GW-6

Well Construction	FT.	NO.	Type	Rec.	Blows per 6 in.	CLASSIFICATION	REMARKS
Bento						asphalt 0.8	air Rotary to 2.0
						M-C GRAVEL 1.4	
						Fill	
		1	SS	10"	9-9	Blk SAND, Some F-C Gravel 3.0	PID = 0ppm
					5-4	light Brwn C-F SAND, little Silt 4.0	
	5	2	SS	12"	5-6	Brwn C-F SAND, and M-C Gravel, tr. Silt	0ppm
					6-6	6.0	
		3	SS	16"	3-2	Brwn C-F SAND, Some F-M Gravel, tr. Silt	Wet at 7.0 0ppm ▽ 7.5
					3-4		
		4	SS	16"	3-4		Sat. at 8.0
	10				4-3	9.2	0ppm
		5	SS	27"	2-1	Brwn SAND, little F-C Gravel little Silt	PID at 11.5' - 0.4 ppm
					1-1	Brwn C-F SAND, Some F-M Gravel, little Silt 11.3	
		6	SS	24"	1-0	Blk Stained C-F SAND, Some F-M Gravel, tr. Shell Frag 12	0ppm
					1-1		
	15					Blk-Brwn C-F SAND, Some F-M Gravel, little Fine Gravel, tr. Shell Frag 14	
						END OF BORING 14.5	
	20						

#1 Sand, 10 Slot Ø, 40, PVC

PVC

Bento

EMCON

SHEET #. 1

Project: GM Tarrytown	JOB NO. 85849 005 000
Client: General Motors	ELEV. 10.67
BORING CONTRACTOR: Kendrick Drilling	STARTED 11/27/96
GROUNDWATER: 9.0	FINISHED 11/27/96
INSPECTOR B. Melancon / J. Krieger	DRILLER T. Kendrick

DATE	TIME	H20 Elev.	SCREEN		CAS.	SAMP	CORE	TUBE
				TYPE	HSA	SS		
12/6/96	830	8.72		DIA.	4"	2"		
12/9/96	945	8.19		WT.		300		
				FALL		30		

OW-7

Well Construction	FT.	NO.	Type	Rec.	Blows per 6 in.	CLASSIFICATION	REMARKS
Bento / PVC / Bento		1	SS	15"	4-2 / 3-1	asphalt 0.6 Fill Gry Brwn F-C SAND, tr. Silt tr. Gravel 2.0	0ppm = PID
		2	SS	20"	3-2 / 1-1	Yell Brwn F-C SAND, little F-M Gravel, tr. Silt, Shell Frag 4.0	Moist at 3.0 0ppm
10 slot Ø40 pvc / #1 Sand	5	3	SS	10"	1-2 / 2-0	Yell Brwn F-C Sand, little F-M Gravel, little silt 7.6	0ppm
		4	SS	17"	1-2 / 1-2	Brwn Gry-white F-C SAND, little F-M Gravel, tr. Silt 8.0	0ppm
	10	5	SS	16"	1-1 / 5-6	Brwn F-C SAND, tr. Fine Gravel, tr. Silt, occ. Gry Clayey silt 9.4 Gry F-M SAND, little silt, tr. Shells 9.7	▽ 9.0 0ppm
		6	SS	19"	5-5 / 3-3	Gry CLAYEY SILT Bed, little F. sand 9.8 Gry C-F SAND, TR. F. Gravel tr. Silt, shells 10	0ppm
		7	SS	20"	3-2 / 3-2	Gry C-F SAND, Some F-M Gravel, tr. Silt, Freq shells 11.6 Gry F-C SAND, Some silt, little F-M Gravel Freq shells 12	0ppm
	15					Gry F-C SAND, Some F-M Gravel, little Silt, Freq Shells 14	
	20					End of Boring 15.0	

EMCON

SHEET #. 1

Project: GM Tarrytown
JOB NO. 85849 005 000
Client: General Motors
ELEV. 8.53
BORING CONTRACTOR: Kendrick Drilling
STARTED 11/27/96
GROUNDWATER: 7.8
FINISHED 11/27/96
INSPECTOR B. Melancon/J. Kreiger
DRILLER T. Kendrick

DATE	TIME	H20 Elev.	SCREEN	TYPE	CAS.	SAMP	CORE	TUBE
12/5/96	915	6.96		DIA.	4"	2"		
12/9/96	1210	5.47		WT.		300		
				FALL		30		

OW-8

Well Construction	FT.	NO.	Type	Rec.	Blows per 6 in.	CLASSIFICATION	REMARKS
Bentonite / PVC / Bentonite						Concrete 1 Ft	air rotary to 2 Ft
						Fill	
		1	SS	24"	30-35	*140 DK Gray F-C SAND, Some C-F Gravel, Little Silt. 3	PID = 0 ppm
					43-60	" Med. Gray C-F SAND, tr. Fine Gravel, tr. Silt, tr. shells. 5	Damp at 3.5
	5	2	SS	16"	17-45	- Blk M-F GRAVEL, tr. C-F Sand tr. Silt. 5.3	0 ppm
					38-20	Yell Brown C-F SAND, Some M-F Gravel, tr. Silt. 5.9	
		3	SS	7"	4-4	Blk M-F GRAVEL, Some C-F Sand, tr. Silt, Slag/Cinders 6.0	0 ppm
					4-3	Gry C-F SAND and F-M Gravel little Silt 8	Sat. at 7.8 ▽
10 Slot #40 PVC / #1 Sand		4	SS	8"	3-3	C-F GRAVEL, Little C-F Sand, tr. Silt	0 ppm
	10				4-4		
		5	SS	9"	8-5		0 ppm
					3-3		
		6	SS	21"		13	
					5-4	Blk CLAYEY SILT, little C-F Sand	
	15				3-2	14.6	0 ppm
						Gry F-C SAND tr. Fine Gravel, tr. Silt 15	
						End of Boring 15	
	20						

EMCON

SHEET #. 1

Project: GM Tarrytown	JOB NO. 85849 005 000
Client: General Motors	ELEV. 9.84
BORING CONTRACTOR: Kendrick Drilling	STARTED 12/2/96
GROUNDWATER: 7.0	FINISHED 12/2/96
INSPECTOR B. Melancon	DRILLER T. Kendrick

DATE	TIME	H20 Elev.	SCREEN	TYPE	CAS.	SAMP	CORE	TUBE
12/5/96	1230	5.35		DIA.	4"	2"		
12/10/96	930	4.82		WT.		300		
				FALL		30		

OW-10

Well Construction	FT.	NO.	Type	Rec.	Blows per 6 in.	CLASSIFICATION	REMARKS
Bento / Bento / PVC / #1 Sand / 10 Slot Ø40 PVC / #1 Sand						asphalt 0.7	
						C. GRAVEL 1.2	air Rotary to 2.0
						Fill CINDERS, Debris, Sand	
		1	SS	14"	9-10		at 3.0 - 60.4 ppm
					10-10		
	5	2	SS	6	8-3		Damp at 5.0 / 1.8 ppm
					3-4		
		3	SS	0"	1-1		Zero Recovery
					1-1	8.0	6-8 Sat. V
		4	SS	16"	1-0	Brwn CLAYEY SILT, little Sand tr. F-C Gravel	25 ppm / petro. odor
	10				1-1	10.0	
		5	SS	10"	1-5	F-C GRAVEL, C-F Sand, tr. silt 11.2	0 ppm
					8-1	F-C SAND, little silt, organic Material 12.2	0 ppm
		6	SS	8"	1-1	Peat	0 ppm
					1-1	F-C SAND and organic Material, little silt, dense	
	15					END OF BORING 14.5	
	20						

EMCON

SHEET #. 1

Project: GM Tarrytown	JOB NO. 85849 005 000
Client: General Motors	ELEV. 6.84
BORING CONTRACTOR: Kendrick Drilling	STARTED 12/2/96
GROUNDWATER: 4.5	FINISHED 12/2/96
INSPECTOR B. Melancon	DRILLER T. Kendrick

DATE	TIME	H20 Elev.	SCREEN	TYPE	CAS.	SAMP	CORE	TUBE
12/5/96	1310	3.55		DIA.	4"	2"		
12/10/96	1045	2.75		WT.		300		
				FALL		30		

OW-11

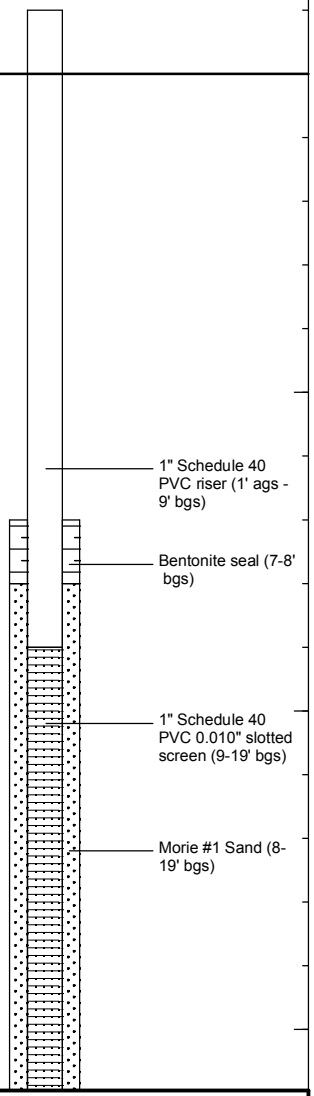
Well Construction	FT.	NO.	Type	Rec.	Blows per 6 in.	CLASSIFICATION	REMARKS
						Concrete 1.0	air Rotary to 2.0
						C. GRAVEL 1.7	
		1	SS	10"	14-9	Fill BLK CINDERS and Sand, tr. F-C Gravel 3.0	PID: 3.0 - 30 ppm
					5-4	Brwn F-C SAND 3.2	
	5	2	SS	14"	4-5	BLK CINDERS and Sand, tr. F-C Gravel 4.0	Damp at 3.5 Sat at 4.5 - ▽
					4-13	C-M SAND and Cinders, little Silt, tr. F-M Gravel 5.5	152 ppm @ 5.5-6'
		3	SS	0"	4-2	BLK F-M SAND and Silt	
					2-2	8.0	
		4	SS	1"	1-0	CINDERS, very dense	0 ppm
	10				1-0	10.4	
		5	SS	5"	0-1	Brwn SILT, some sand organic Material	0 ppm
					1-0	12.0	
		6	SS	3"	0-1	Peat Organic Material, Some F-M Sand.	0 ppm
					1-1	Brwn Clayey silt lenses	
	15					End of Boring 14.0	
	20						

#1 Sand, PVC, 10 Slot @ 40, PVC, #1 Sand

Date Start/Finish:	9/26/07	**Borehole Depth:**	19' bgs	**Well/Boring ID:** OW-24R
Drilling Company:	B&BDrilling/HRS Drilling	**Surface Elevation:**	NA	**Client:** General Motors
Driller's Name:	Gordon Blewett	**Casing Elevation:**	NA	**Location:** Former General Motors Assembly Plant Site, Sleepy Hollow, NY
Drilling Method:	Geoprobe 4-foot Macrocore Sampler	**Geologist:**	Jennifer Sandorf	

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
0 / 0	1	0-4	2.9	0 0 0 0		Brown TOPSOIL, loose, dry. CONCRETE fragments. Light brown fine to coarse SAND, little fine to coarse Gravel, dense, dry, crumbly.
5 / -5	2	4-8	4.0	0 0 0 0		Light gray to tan SILT, little fine Sand, stiff, hard, dry. Reddish brown SILT, little fine Sand, stiff, hard, dry. Pinkish tan very fine SAND, moderately dense, dry.
10 / -10	3	8-12	3.0	0 0 0 0		Brown SILT, trace medium coarse Gravel, medium stiff, nonplastic, moist. Brown to reddish brown very fine SAND, trace coarse Sand, medium dense, moist to wet.
15 / -15	4	12-16	4.0	0 0 0 0		Reddish brown fine to medium SAND, some Silt, trace fine Gravel, moderately loose, wet. Brown fine to medium SAND, little fine to coarse Gravel, moderately loose, wet.

Well/Boring Construction



ARCADIS BBL
Infrastructure, environment, facilities

Remarks: a/bgs = above/below ground surface; NA = Not Applicable/Available;
ft AMSL = feet above mean sea level.
Vertical datum is NAVD 88.
Set temporary well at 19' bgs.

Client:
General Motors

Site Location:
Former General Motors Assembly Plant Site

Well/Boring ID: OW-24R

Borehole Depth: 19' bgs

DEPTH ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
	5	16-19	2.7	0 0 0 0		Brown fine to coarse SAND, little fine to medium Gravel, trace Silt, moderately loose, wet,	Morie #1 Sand (8-19' bgs) 1" Schedule 40 PVC 0.010" slotted screen (9-19' bgs)
						Refusal; grade located 7" below concrete slab.	
20-20							
25-25							
30-30							
35-35							

ARCADIS BBL
Infrastructure, environment, facilities

Remarks: a/bgs = above/below ground surface; NA = Not Applicable/Available;
ft AMSL = feet above mean sea level.
Vertical datum is NAVD 88.
Set temporary well at 19' bgs.

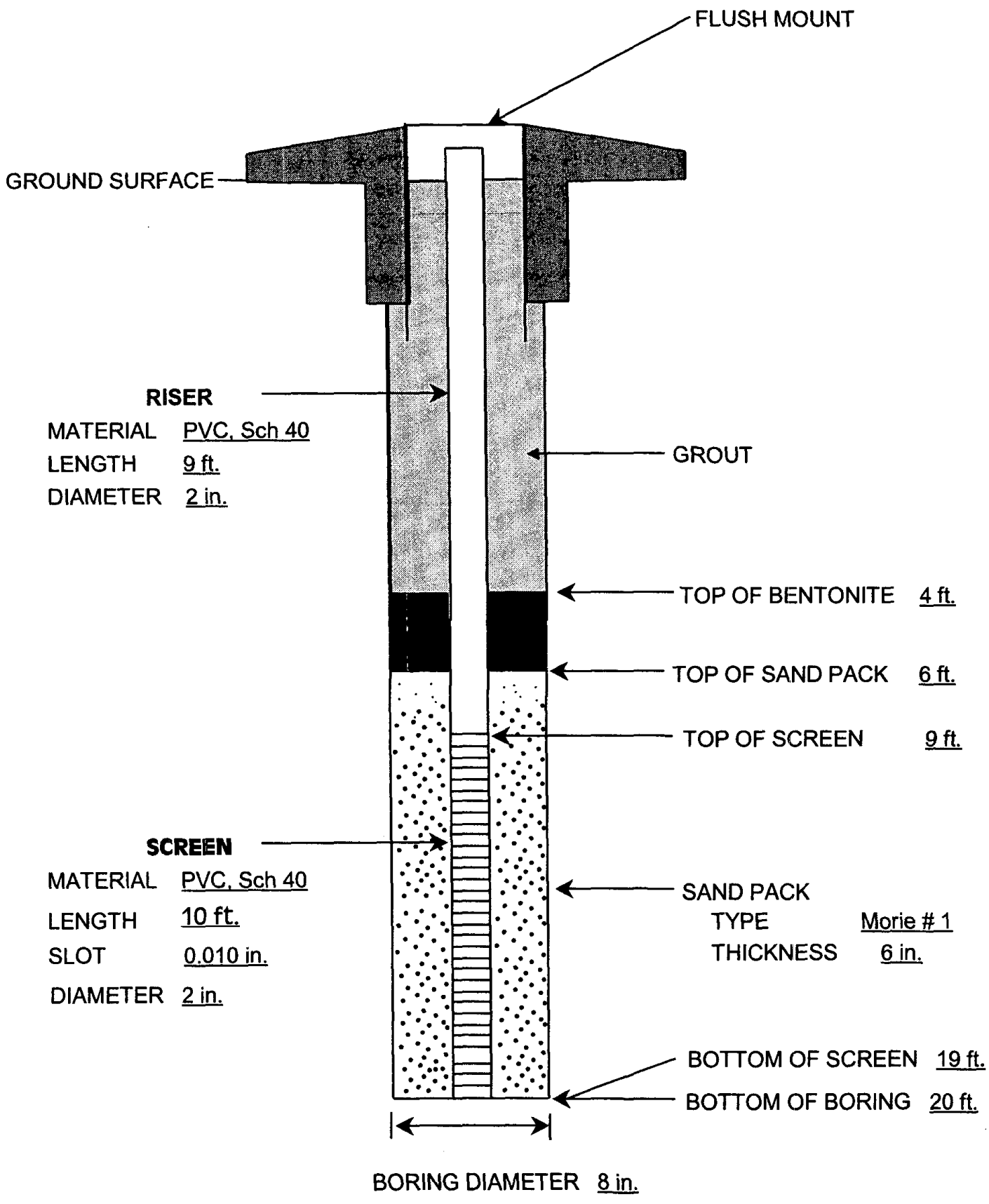
WELL CONSTRUCTION DIAGRAM

amec

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 10/23/03 WELL NUMBER: OW-25

PROJECT NUMBER: 276360000 DRILLING COMPANY: B&B, Inc. METHOD: H. S. Auger

REMARKS: Geoprobe Hollow Stem Rig INSPECTOR: M. Patel



NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

SOIL BORING LOG

amec

PROJECT NUMBER: 276030000 (36)	**PROJECT NAME:** Former General Motors, Sleepy Hollow, New York		
BORING NUMBER: OW-25	**COORDINATES:**	**DATE:** 10|23|03	
ELEVATION:	**GWL:** Depth: Date/Time:	**DATE STARTED:** 10|23|03	
ENGINEER/GEOLOGIST: Madhu Patel	Depth: Date/Time:	**DATE COMPLETED:** 10|23|03	
DRILLING METHODS: Geoprob Rig		**PAGE:** 1 OF 2	

DEPTH (FT.)	SAMPLE	BLOWS ON SAMPLER (6 IN.)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY	WELL CONSTRUCTION	REMARKS
1					6" Concrete Slab Brown cmf SAND, little Silt, trace clay w/ pieces of Rock, wood	F			
2			67		Black & Brown cmf SAND, little Silt, trace clay & mf Gravel w/ Rock, wood;	F			
3					pieces of Concrete w/ mf Gravel, pieces of Rock				
4					Brown and Yellow SILT, little mf Sand, trace clay trace f Gravel	F			
5									
6			75		Gray	F			
7					Brownish yellow SAND and SILT, trace clay				
8									
9					Yellowish Brown SILT, some mf Sand, little clay, trace mf Gravel	ML SM			
10			67						
11									
12									

NOTES:

Screen - 9-19'. Scl 40 (2") PVC 0.010" Slot
Risers 0-9'. Scl 40 (2") PVC
Sand pack. 6-20'
Bentonite. 4-6.
Grout. 0-4

SOIL BORING LOG

amec

PROJECT NUMBER: 276030000	**PROJECT NAME:** Former General Motors, Sleepy Hollow, New York		
BORING NUMBER: OW-25	**COORDINATES:**	**DATE:** 10/23/03	
ELEVATION:	**GWL:** Depth: Date/Time:	**DATE STARTED:** 10/23/03	
ENGINEER/GEOLOGIST: Madhu Patel	Depth: Date/Time:	**DATE COMPLETED:** 10/23/03	
DRILLING METHODS: Geoprob Rig		**PAGE:** 2 OF 2	

DEPTH (FT.)	SAMPLE	BLOWS ON SAMPLER (6 IN.)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY	WELL CONSTRUCTION	REMARKS
									PID (ppm)
13					Reddish Brown SILT, little mf Sand, trace mf Gravel	ML SM			0.0
14			80		Yellowish Brown and Black cmf SAND, trace silt, trace mf Gravel	SP			0.0
15					(14.8-15.0') SILT & CLAY Reddish Brown and Gray cmf SAND, little silt, trace clay	SM			0.0
16					Dark Gray mf SAND, little Silt, trace f Gravel	SM			
17									
18			85		Dark Gray cmf SAND, Some cmf Gravel, trace Silt	SP			0.0
19					Yellowish Brown SILT, little mf Sand, little clay & Root	ML/CL			0.0
20					End of the Boring at 20.0'				
21									
22									
23									
24									

NOTES:

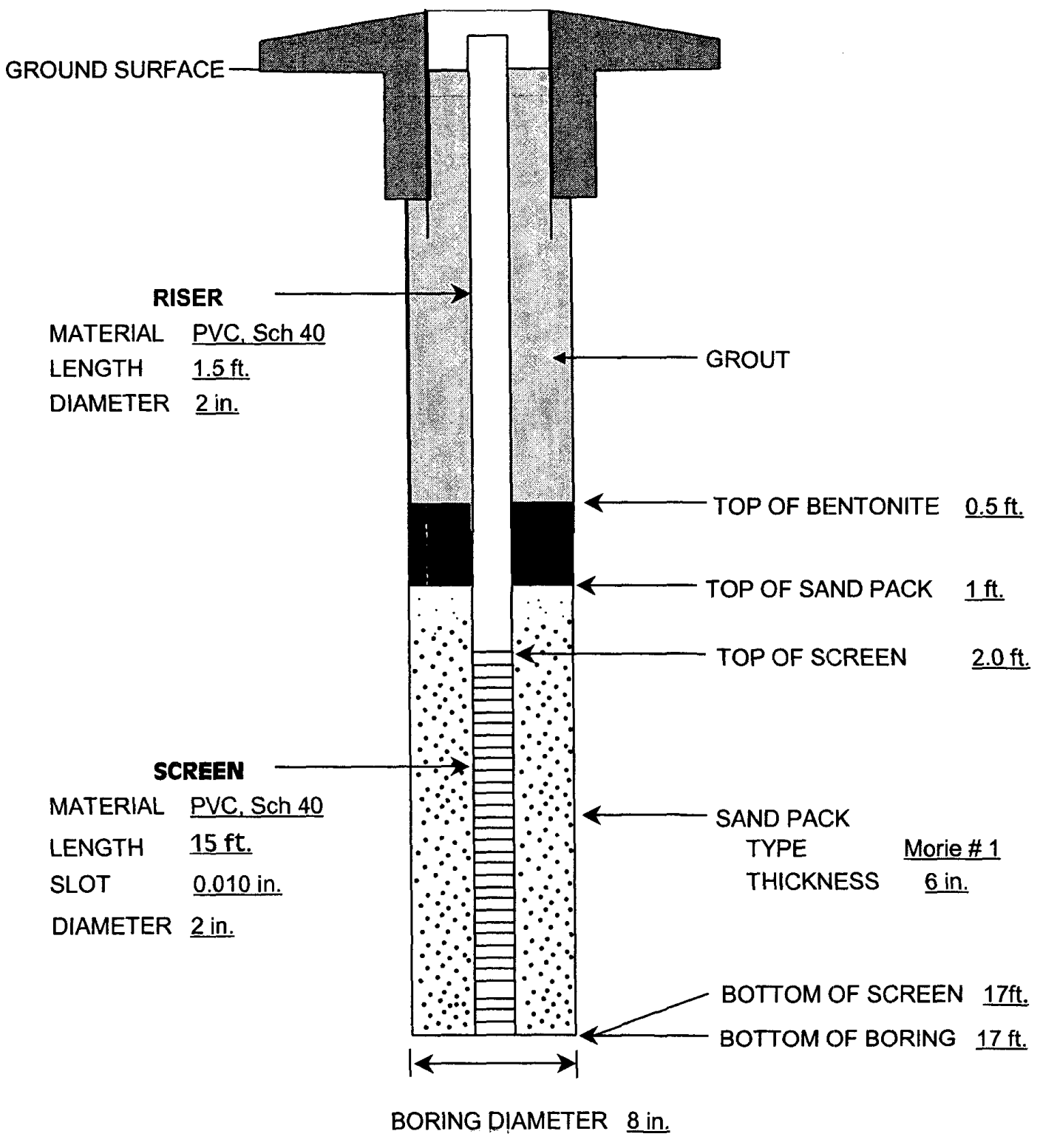
WELL CONSTRUCTION DIAGRAM

amec

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 05/03/04 WELL NUMBER: OW-27

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

SOIL BORING LOG

amec

PROJECT NUMBER: 276030000	**PROJECT NAME:** Former General Motors, Sleepy Hollow, New York		
BORING NUMBER: OW-27	**COORDINATES:**	**DATE:** 05/03/04	
ELEVATION:	**GWL:** Depth: Date/Time:	**DATE STARTED:** 05/03/04	
ENGINEER/GEOLOGIST: Madhu Patel	Depth: Date/Time:	**DATE COMPLETED:** 05/03/04	
DRILLING METHODS: Geoprob Rig		**PAGE:** 1 OF 1	

DEPTH (FT.)	SAMPLE	BLOWS ON SAMPLER (6 IN.)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY	WELL CONSRUCTION	REMARKS
					Concrete slab				
1					Brown and Gray cmf SAND, little Silt, trace clay by Pieces of Rock				
2					Dark Gray cmf SAND, little Silt, trace clay by Pieces of Rock. Shell	F			
3			67						
4					Red and Brown mf SAND, trace mf Gravel, trace Silt trace clay by Pieces of shell	F			
5									
6			75		Dark Gray cmf SAND, little mf Gravel, trace Silt by Pieces of Rock, Brick,				
7					↓				
8					Dark Gray cmf SAND, little Silt, trace mf Gravel, by Pieces of shell. Rock	F			
9					↓				
10			46		by Piece of shell	F			
11					Refusal at 11.0'				
12									

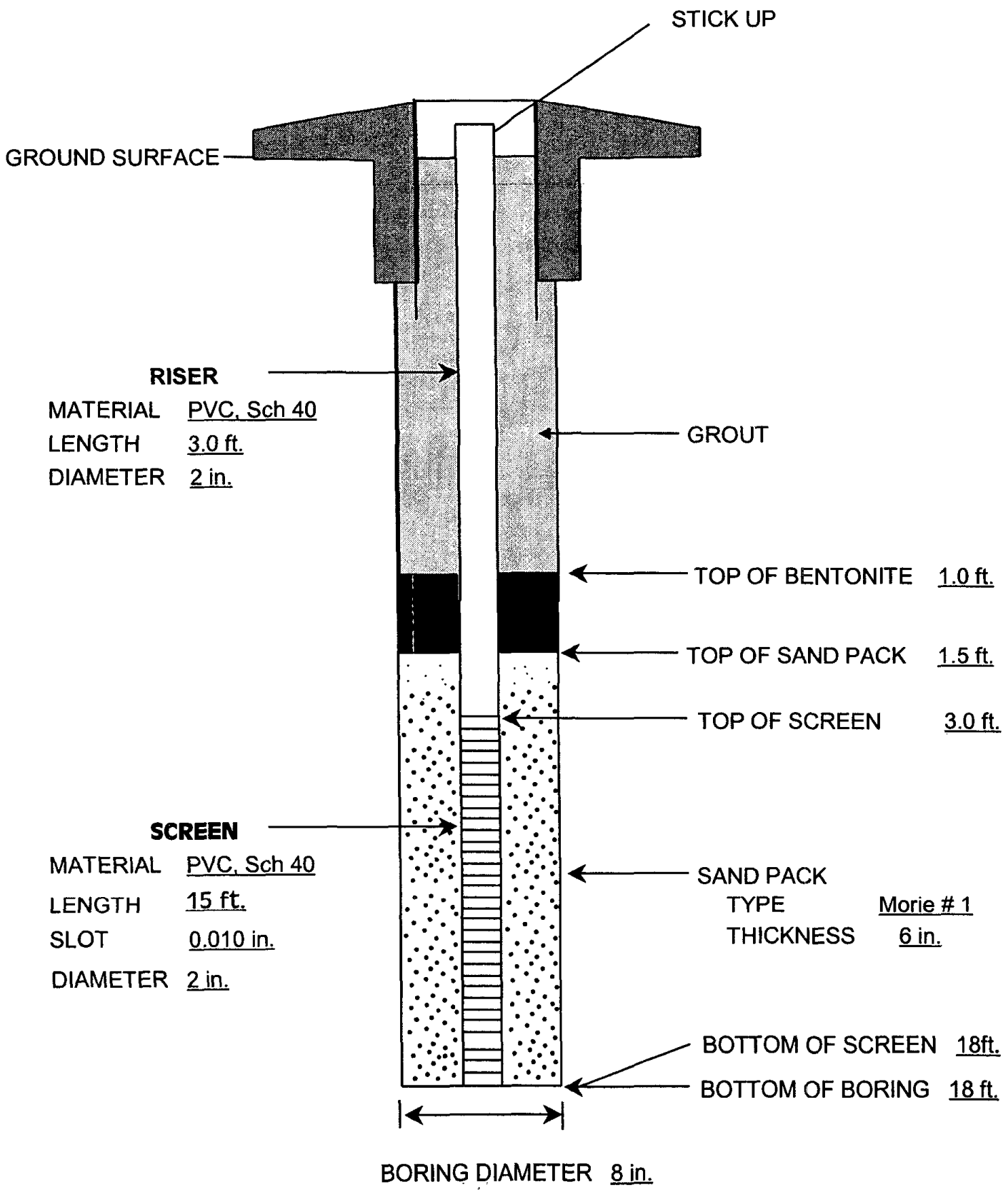
NOTES:

WELL CONSTRUCTION DIAGRAM

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 04/26/04 WELL NUMBER: OW-36

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



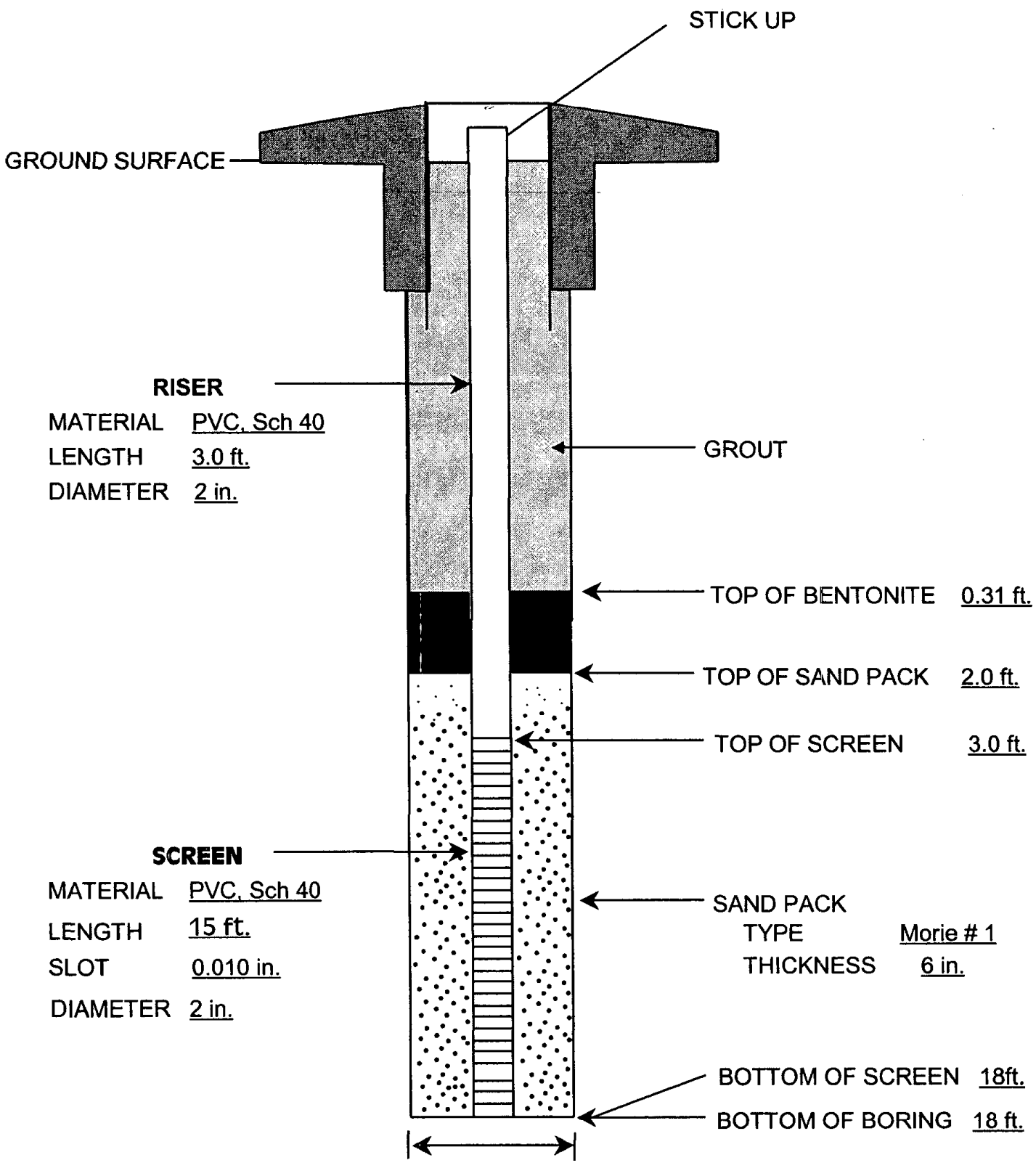
NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

WELL CONSTRUCTION DIAGRAM

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 04/26/04 WELL NUMBER: OW-37

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

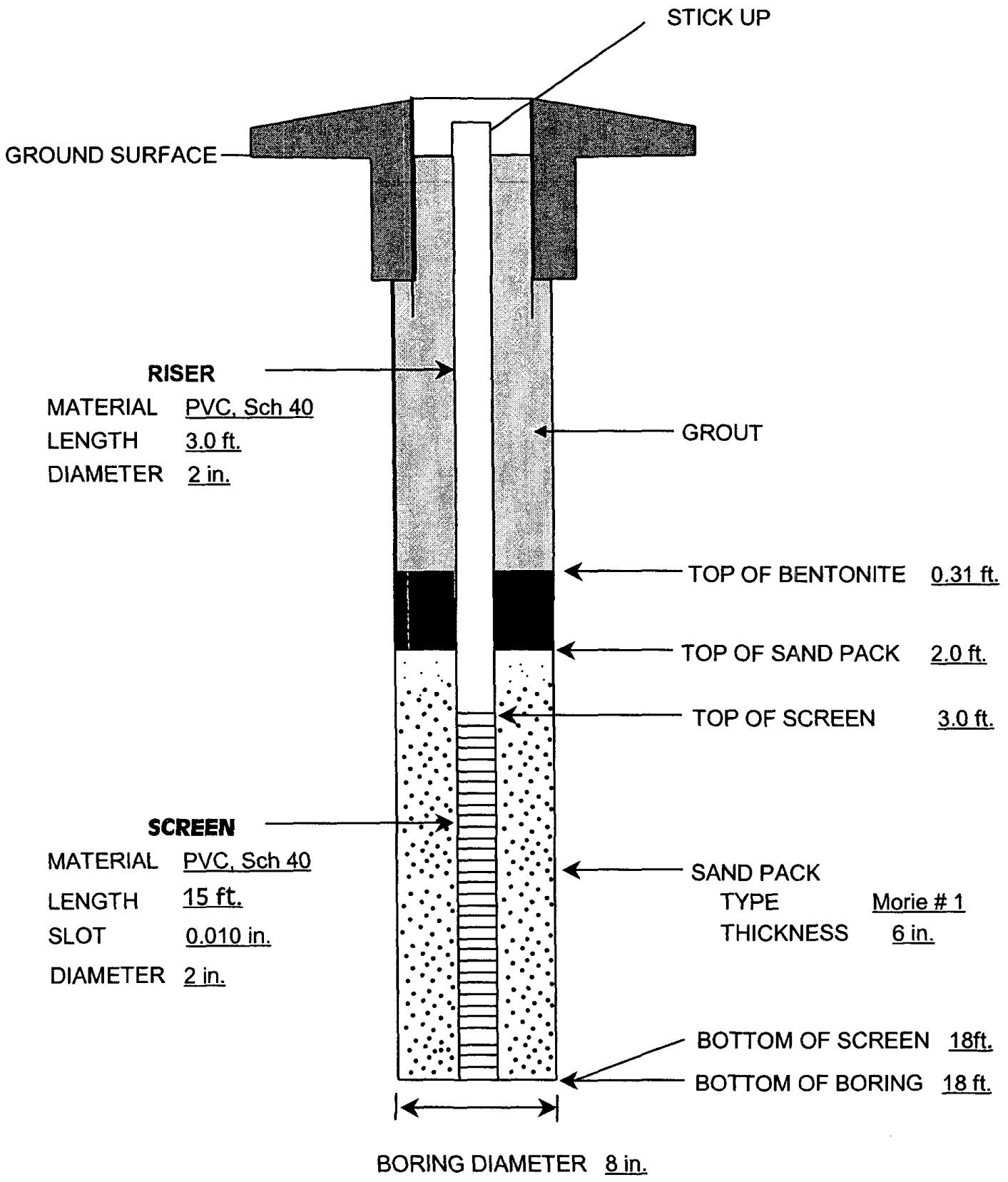
WELL CONSTRUCTION DIAGRAM

amec

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 04/27/04 WELL NUMBER: OW-38

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



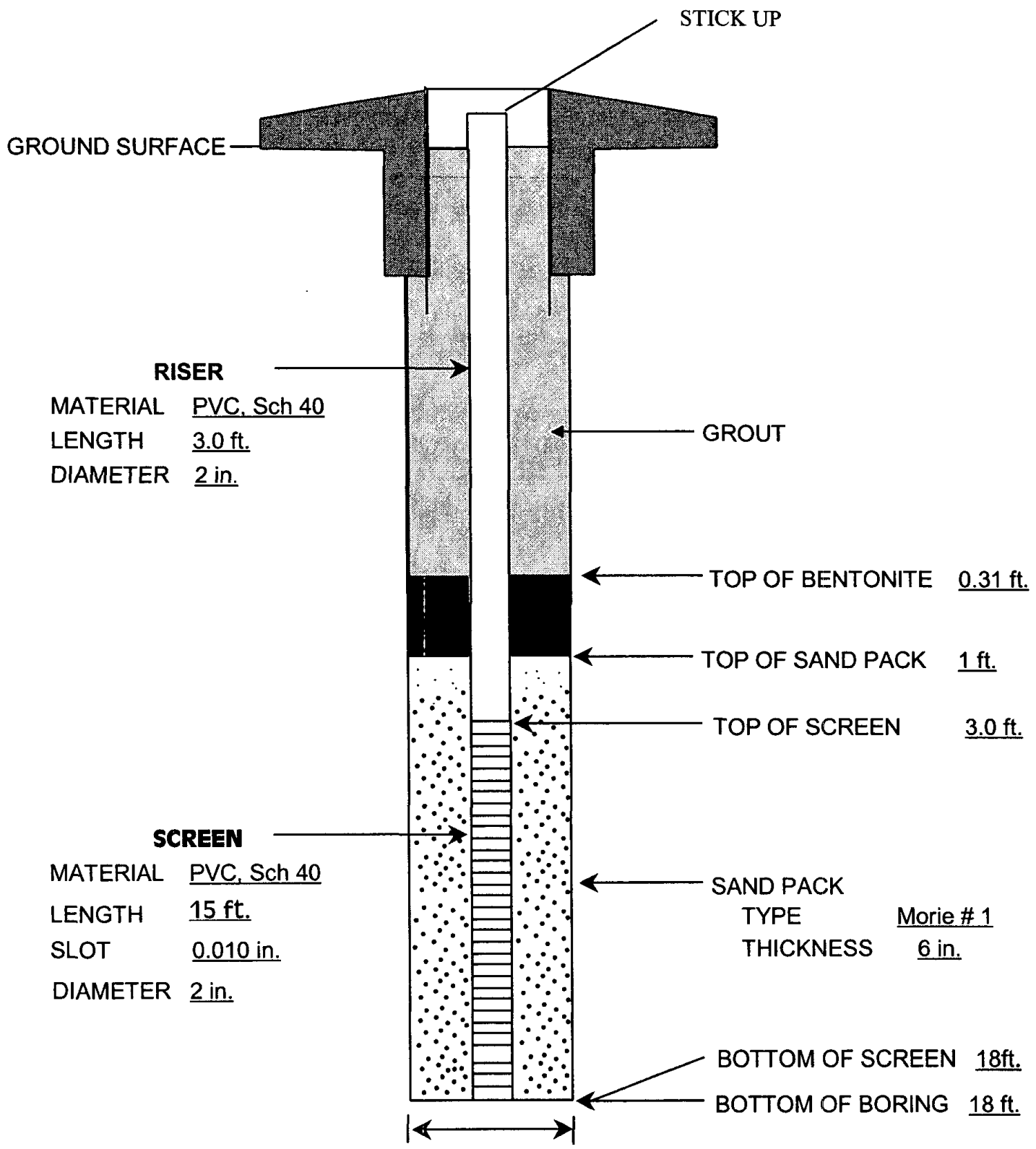
NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

WELL CONSTRUCTION DIAGRAM

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 04/28/04 WELL NUMBER: OW-40

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



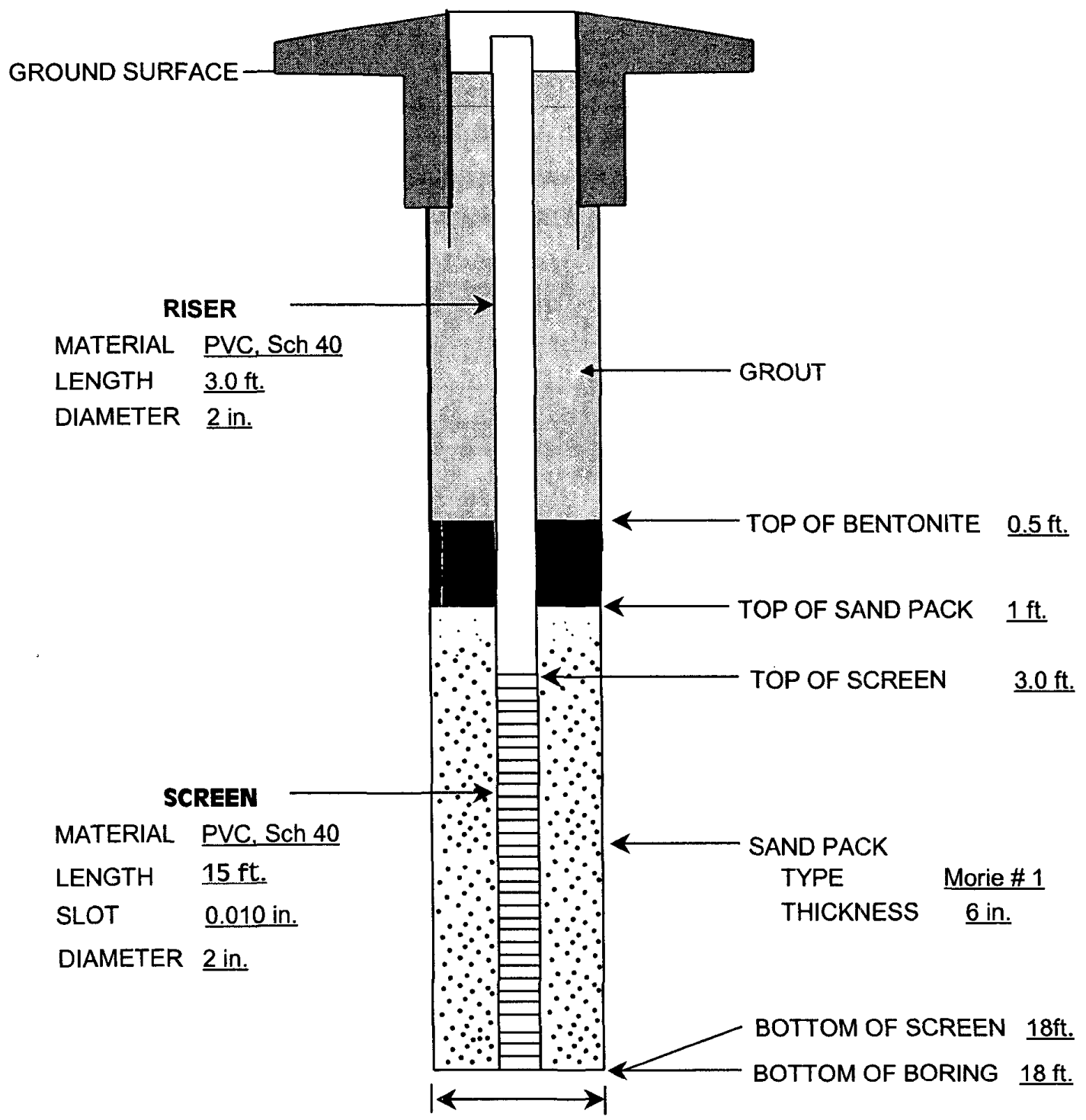
NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

WELL CONSTRUCTION DIAGRAM

PROJECT NAME: GM, Sleepy Hollow, NY DATE INSTALLED: 04/29/04 WELL NUMBER: OW-43

PROJECT NUMBER: 276360000 DRILLING COMPANY: Summit Drilling METHOD: H. S. Auger

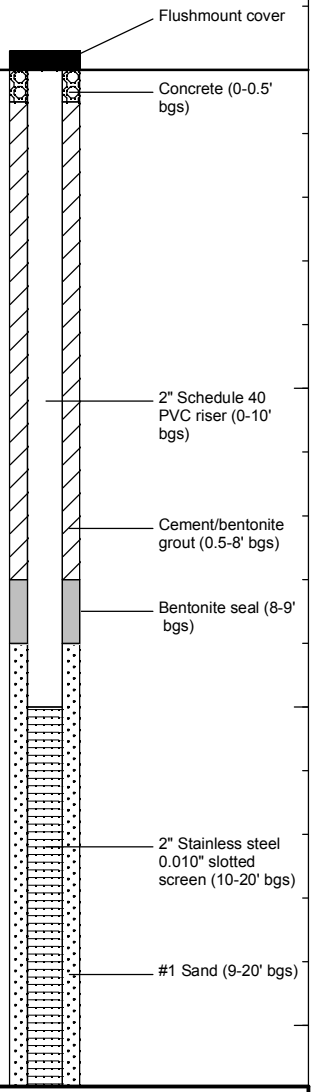
REMARKS: Hollow Stem Rig - Monitor Well INSPECTOR: C. Schrader



NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE

Date Start/Finish:	9/26/07	**Borehole Depth:**	22' bgs	**Well/Boring ID:** IT-47-MW-5
Drilling Company:	B&BDrilling/HRS Drilling	**Surface Elevation:**	13.25 ft AMSL	**Client:** General Motors
Driller's Name:	Gordon Blewett	**Casing Elevation:**	12.93 ft AMSL	**Location:** Former General Motors Assembly Plant Site, Sleepy Hollow, NY
Drilling Method:	Geoprobe 4-foot Macrocore Sampler	**Geologist:**	Jennifer Sandorf	

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
15 / 0						Concrete.
						Dark brown to black CINDERS, moderately loose, dry.
						Brown fine SAND, moderately loose, dry.
10 / 5	1	0-4	2.6	0 0 0 0		
						4': Trace fine to coarse Gravel.
5 / 10	2	4-8	3.7	0 0 0 0		Tan to pinkish tan SILT, trace fine to coarse Gravel, hard, nonplastic, crumbly, dry.
						Pinkish brown SILT, little fine Sand, medium stiff, moist.
						Tan fine SAND, moderately loose, moist.
0 / 15	3	8-12	2.7	0 0 0 0		Pinkish brown fine SAND and SILT, little coarse Gravel, medium stiff, moist to wet.
						Brown fine to medium SAND, trace Silt, moderately loose, wet.
	4	12-16	3.1	0 0 0 0		



Well/Boring Construction

Remarks: bgs = below ground surface; NA = Not Applicable/Available; ft AMSL = feet above mean sea level. Vertical datum is NAVD 88.

ARCADIS BBL
Infrastructure, environment, facilities

Client:
General Motors

Site Location:
Former General Motors Assembly Plant Site

Well/Boring ID: IT-47-MW-5

Borehole Depth: 22' bgs

DEPTH ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-5	5	16-20	2.7	0 0 0 0		Brown fine to medium SAND, some Silt, trace medium to coarse Gravel and black Cinders, medium dense, wet. 17.2' bgs- Trace orange color. Gray brown SILT, little fine to coarse Gravel and fine Sand, stiff, hard, wet.	#1 Sand (9-20' bgs) 2" Stainless steel 0.010" slotted screen (10-20' bgs)
20	6	20-22	2.6	0 0 0 0			Natural collapse (20-22' bgs)
-10						22' bgs- Refusal.	
25							
-15							
30							
-20							
35							

ARCADIS BBL
Infrastructure, environment, facilities

Remarks: bgs = below ground surface; NA = Not Applicable/Available;
ft AMSL = feet above mean sea level.
Vertical datum is NAVD 88.

ARCADIS

Soil Boring Log

Boring No.: OX-47-MW-11

Sheet: 1 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 03/03/2008
Date Completed: 03/03/2008

Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1–4			24		0		ORGANICS (decomposed leaf littef); with Sand, Fine; with Silt; Medium brown, loose, moist.	
4–8			30		0		ORGANICS (decomposed leaf littef); with Sand, Fine; with Silt; Medium brown, loose, moist. GRAVEL, Medium to Fine, subangular; some Silt; some Sand, Fine to Medium; Wet (perched). GRAVEL; tan to light yellow (broken concrete). GRAVEL, subrounded (broken concrete); and Sand, Medium to Coarse; Dry, white to light gray. SAND, Coarse to very Coarse; Light yellow, loose, well sorted. SAND, Medium to Fine; some Silt; Compact, reddish brown, moist, medium plasticity. SAND, Medium ; Very loose, light brown to yellow, moist. GRAVEL; and Sand, Medium to Coarse (broken concrete):.	
8–12			48		0		SAND, Fine to Very Fine; some Silt; trace Clay; Reddish brown, moist; well sorted. SAND, Fine to Medium; trace Gravel, Fine, subrounded, moist, to wet, well sorted. SAND, Medium to Coarse; well sorted, light brown, wet. SAND, Medium to Coarse; well sorted, black, wet. SAND, Medium to Coarse; well sorted, light brown, wet. SAND, Medium to Coarse; well sorted, black, wet.	
12–15			30		0		SAND, Fine to Medium; trace Gravel, Fine, subrounded, very wet, loose, light brown. COBBLE (broken up as Gravel, biotite included). SAND, Very Coarse to Very Fine; trace Gravel, Fine, subrounded; trace Silt; Well graded light brown, loose.	

Drilling Co.: B & B
Driller: Doug
Drilling Method: Geoprobe and Hollow Stem Auger
Drilling Fluid: None
Remarks: Refusal at 16.5 feet (bedrock). 2 inch PVC 10 slot screen.

Sampling Method: Geoprobe
Sampling Interval: 4 feet
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-47-MW-11

Sheet: 2 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 03/03/2008
Date Completed: 03/03/2008

Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
16	X						SAND, Very Coarse to Very Fine; trace Gravel, Fine, subrounded; trace Silt; Well graded light brown, loose.	
	X						No recovery.	
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

Remarks:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-47-MW-11/Attempt 2

Sheet: 1 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 03/03/2008
Date Completed: 03/03/2008

Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			24		0		GRAVEL (broken concrete); light gray to white, dry.	
							GRAVEL (broken red brick remnants); and Sand, Medium to Coarse; trace Silt; light brown.	
2							SAND, Medium to Coarse; trace Silt; with Gravel, subangular (broken concrete); trace red brick remnants.	
3							GRAVEL (broken concrete), White and light gray, dry.	
4							SAND, Medium to Fine; well sorted, light brown, moist.	
5			48		0		SILT; and Clay; trace Sand, Fine; Compact, tan to light brown, high plasticity.	
							SAND, Medium to Fine; some Silt; Reddish brown, slightly compact, low plasticity, moist.	
6								
7								
8							SAND, Fine to Medium; trace Silt; trave Gravel, Fine, subrounded; Reddish brown.	
9			36		0		SAND, Fine to Medium; trace Silt; trave Gravel, Fine, subrounded; Reddish brown.	
							SAND, Fine; some Silt; well sorted, smooth, wet, brownish red.	
10							SAND, Fine to Medium; trace Gravel, subrounded; Moist, brownish red.	
11							GRAVEL; and Sand, Medium to Coarse; Loose, dry (crushed black cobble).	
12							SAND, Fine to Medium; trace Gravel, subrounded; Moist, reddish brown.	
13			24		0		SAND, Fine to Medium; some Silt; Wet, brown, well sorted, loose.	
14								
15								

Drilling Co.: B & B
Driller: Doug
Drilling Method: Geoprobe and Hollow Stem Auger
Drilling Fluid: None
Remarks: Refusal at 19.2 feet (bedrock). Location moved 5 feet, due to a catch basin observed (and sampled through) during first attempt.
2 inch PVC 10 slot screen.

Sampling Method: Geoprobe
Sampling Interval: 4 feet
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-47-MW-11/Attempt 2

Sheet: 2 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 03/03/2008
Date Completed: 03/03/2008

Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
16							SAND, Medium to Coarse; trace Gravel, Fine, subrounded; Loose, wet, medium to light brown.	
17			42		0		SAND, Fine; some Sand, Medium; Well sorted, wet, light brown.	
18							SAND, Fine; some Sand, Medium; Well sorted, wet, light brown mixed with black Sand, Medium to Fine.	
19							Sand, Fine to Medium; trace Silt; Compact, light brown.	
							Sand, Coarse to Very Coarse; light brown loose, moist.	
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

Remarks:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-1

Sheet: 1 of 1

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/26/2008
Date Completed: 02/26/2008

Logger: M Nini
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							Black to gray fine to coarse SAND and fine to medium subangular GRAVEL, dry; reworked, fill.	
2			41		0		Yellowish brown fine to medium SAND, little fine gravel and silt, moist; reworked, fill.	
3							Yellowish brown fine to medium SAND, trace fine gravel and silt, wet; reworked, fill.	
4								
5					0.1 0.2		Black fine to coarse SAND and fine subangular GRAVEL, little silt, wet; reworked, fill.	
6			48		0.2			
7							Gray fine to medium SAND, little silt, trace fine gravel, wet; reworked, fill.	
8					0.2			
9							Concrete like layer of medium to coarse sand and fine to medium gravel, dry; reworked, fill.	
10			29		0			
11								
12								
13							Brown to black SILT and ORGANICS, some clay, wet; peat.	
14			0.6		0			
15								
16								

Drilling Co.: B & B
Driller: Gordon
Drilling Method: Direct Push
Drilling Fluid: None
Remarks: 2 inch PVC 10 slot screen.

Sampling Method: Geoprobe
Sampling Interval:
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-5

Sheet: 1 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/25/2008
Date Completed: 02/25/2008
Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1		19-19-16-16 (35)	12		0		SAND, Medium to Coarse; little Fines; trace Gravel, Fine, subangular to subrounded; Medium brown, wet (from snow melt).	
2							SAND, Medium to Fine; some Gravel, Fine, subrounded to subangular; trace Coarse Sand, angular; Medium brown, dry.	
3		9-9-13-12 (22)	12		0		SAND, Fine to Medium; trace Gravel, subangular; Black.	
							Sand, Fine to Medium; trace Sand, Coarse; Loose., black with tan pieces.	
							White and black cinder-like material; Gravel-sized, subangular to subrounded. Hard.	
4							Sand, Medium to Coarse, subangular to subrounded; Black, red, yellow, orange, Loose.	
5		5-10-14-12 (24)	14		0		SAND, Medium to Coarse; trace Gravel, subangular; Moist, black, loose.	
							SAND, Medium to Coarse; with Gravel, Fine, subangular, shiny gray porous material; trace Debris (copper wires with blue casing); Moist. Black.	
6							SAND, Medium; trace Fines; Moist, black.	
							SAND, Medium to Coarse; trace Gravel ,angular; trace Gravel-sized yellow and gold slag pieces Black, moist.	
7		1-2-2-3 (4)	6		0		SAND, Medium to Fine; trace Sand, Coarse; trace Gravel-sized subangular porous black pieces. More fine than 5.0-5.5.	
8							SAND, Very Coarse to Coarse; and Gravel, angular to subangular; Saturated, loose. Some gravel composed of platey pieces and porous yellow material. Soil is black to dark brown with yellow, brown, red, and white.	
9		12-8-8-8 (16)	24				SAND, Fine to Medium; some Sand, Coarse, subangular to angular; Saturated.	
10								
11		4-10-25-11 (35)	8		0		SAND, Medium to Coarse; trace Gravel, Fine, subangular; Moist, black.	
12							SAND, Fine; trace Sand, Medium; and Fines (Silt); Compact.3	
13		1-2-4-5 (6)	12		0		SAND, Coarse to Very Coarse; trace Gravel, angular; Loose, Wet, black, red, yellow, White specs. Fill, re-worked.	
							GRAVEL, subangular to subrounded, red; some SAND, Medium to Coarse; Wet. Fill, re-worked.	
14							SAND, Fine to Very Fine; some Silt (Fines); Compact, moist, well-sorted.Fill, re-worked.	
15		2-6-4-6						

Drilling Co.: B & B
Driller: Doug
Drilling Method: Split spoon
Drilling Fluid: None
Remarks: 2 inch PVC 10 slot screen.

Sampling Method: Hollow stem auger
Sampling Interval: 2
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-5

Sheet: 2 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/25/2008
Date Completed: 02/25/2008

Logger: B. Mason
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
16		(10)	12		0		SAND, Fine to Very Fine; some Silt (Fines); trace Organics (wood debris); Compact, moist, well-sorted.Fill, re-worked.	
							SAND, Medium; Well-sorted, moist, black to dark gray.	
17		2-4-4-5 (8)	18		0		SAND, Medium to Coarse; Well-sorted, dark gray, moist.	
18							ORGANICS (wood pieces); and Sand, Fine; some Fines (Silt); trace Gravel, angular.Fill, re-worked.	
							SAND, Medium to Coarse; trace Gravel, subangular.Fill, re-worked.	
19		10-13-13-19 (26)	24		0		SAND, Fine to Very Fine; and Silt; trace Clay; Gray, moist.Fill, re-worked.	
							SAND, Fine; Well-sorted, moist, dark gray.Fill, re-worked.	
20							SAND, Fine to Very Fine; trace Silt; light gray, moist. Fill, re-worked.	
							SAND, Coarse to Very Coarse, subangular to subrounded; Well-sorted, moist, light gray.Fill, re-worked.	
21		4-10-11-30 (21)	24		0		SAND, Coarse; some Sand, ,Medium; Well-sorted, gray, moist.	
22							PEAT, Fines and Roots; Methane odor; Brown-red compact.3	
23								
24								
25								
26								
27								
28								
29								
30								
31								

Remarks:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-7

Sheet: 1 of 1

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/26/2008
Date Completed: 02/27/2008

Logger: M. Nini
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1					0 6.7		Brown fine to medium SAND, some fine to medium subangular gravel and silt, moist; reworked, fill	
2			29	GP			Dark grayish black medium to coarse SAND and fine to medium subangular GRAVEL, little silt, moist; reworked, fill.	
3					21.8			
4					315		White gray fine angular GRAVEL and fine to medium SAND (concrete like rubble) dry; reworked, fill	
5					42.1			
6			29	GP	18.8		Black fine to medium SAND, some silt and fine to medium gravel, wet; reworked, fill	
7					21.7			
8					66.9		Black fine subangular GRAVEL, some fine to coarse sand and silt, wet; reworked, fill	
9					89.9			
10			29	GP	210		Gray black fine to medium SAND, little fine gravel, wet; reworked, fill	
11					119			
12					56.6		Gray to dark gray fine to medium SAND and SILT, little fine angular gravel, wet; reworked, fill	
13			48	GP	67.8			
14					50.9 44.1			
15								

Drilling Co.: B & B
Driller: Mike and John
Drilling Method: HSA
Drilling Fluid: None
Remarks: 2 inch PVC 10 slot screen.

Sampling Method:
Sampling Interval:
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-9

Sheet: 1 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/26/2008
Date Completed: 02/27/2008

Logger: M. Nini
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							Grayish white medium to coarse SAND and fine to medium GRAVEL, (concrete like), dry; reworked, fill.	
2			36		0			
3								
4								
5					0		Grayish white medium to coarse SAND and fine to medium GRAVEL, (concrete like), dry; reworked, fill.	
					0			
6			36				Dark grayish brown fine to coarse SAND and fine to medium GRAVEL, little silt, dry; reworked, fill.	
7					0		Dark grayish brown fine to coarse SAND and fine to medium GRAVEL, little silt, moist; reworked, fill.	
8								
9							Brown to yellow brown fine to medium SAND and SILT, wet; reworked, fill.	
10			42		0			
11							Dark brown medium to coarse SAND and fine subrounded GRAVEL, some silt, wet; reworked, fill.	
12								
13					0 48.5 10.2		Black medium to coarse SAND, some silt, little fine gravel, wet; reworked, fill.	
14			36		2.1		Wood like material, hihgly fractured, wet; reworked, fill.	
15							Black medium to coarse SAND, some silt, little fine gravel, wet; reworked, fill.	

Drilling Co.: B & B
Driller: Gordon
Drilling Method: Direct Push
Drilling Fluid: None
Remarks: 2 inch PVC 10 slot screen.

Sampling Method: Geoprobe
Sampling Interval: 4 feet
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

ARCADIS

Soil Boring Log

Boring No.: OX-UST-MW-9

Sheet: 2 of 2

Project Name: Sleepy Hollow
Project Number: B0064462.0000.00053
Project Location: New York

Date Started: 02/26/2008
Date Completed: 02/27/2008

Logger: M. Nini
Editor:
Weather Conditions:

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
16					1.7 4.0		Black medium to coarse SAND, some silt, little fine gravel, wet; reworked, fill.	
17					2.2		Gray to black fine SAND, some silt, wet; reworked, fill.	
							Wood like material, highly fractured, wet; reworked, fill.	
18			30		1.4		Gray medium to coarse SAND, little silt, wet; reworked, fill, ** petroleum like sheen on water; slight appearance.	
19					0			
20								
21							Gray SILT, trace clay and fine sand, moist; reworked, fill.	
22			48		0			
23								
24							Dark brown SILT, some organics, trace clay, moist; peat.	
25								
26								
27								
28								
29								
30								
31								

Remarks:

SOIL BORING LOG BORING LOGS.GPJ ARCADIS.GDT 6/29/09

Health and Safety Plan (HASP)

HEALTH AND SAFETY PLAN

For

Former GM Assembly Plant - West Parcel Site

NYSDEC Site No. C360070

Located at:

Sleepy Hollow, NY

Prepared by:

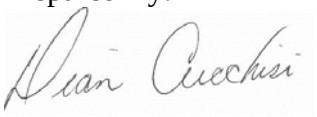
Emilcott
190 Park Ave.
Morristown, NJ 07960

Prepared for:

Lighthouse Landing Venture, LLC
2392 Morse Avenue
Irvine, California 92614

February 2016

Prepared By:



Dian Cucchisi, PhD, CHMM, CPEA

Table of Contents

1.0 GENERAL 1

1.1. INTRODUCTION 1
1.2 PERSONNEL 1
1.3 EMERGENCY PHONE NUMBERS 3

2.0 SITE AND PROJECT DESCRIPTION 4

2.1 SITE PHYSICAL DESCRIPTION AND HISTORY 4
2.2 SCOPE OF WORK 4
2.3 POST REMEDIAL CONDITIONS 4
2.4 GENERAL DUST MITIGATION AND SITE CONTROL 5
3.0 HAZARD ASSESSMENT 6
3.1 INTRODUCTION 6
3.1.1 Non-Contact Personnel 6
3.1.2 Contact Personnel 7
3.2 TASK SPECIFIC HAZARD ANALYSIS 7
3.2.1 Heavy Equipment 8
3.2.2 Soil Excavation 8
3.2.3 Backfilling 9
3.2.4 Personnel and Equipment Decontamination 9
3.2.5 Site Restoration: 10
3.3 CHEMICAL HAZARD ASSESSMENT 10
3.3.1 Chemical Hazards 10
3.3.2 Exposure Pathways 11
3.4 PHYSICAL HAZARD ANALYSIS 12
3.4.1 Weather Hazards 12
3.4.2 Heat and Cold Stress 12
3.4.3 Illumination 14
3.4.4 Slip, Trip and Fall Hazards 14
3.4.5 Confined Space Entry 14
3.4.6 Electrical Hazards 14
3.4.7 Underground Utilities 14
3.4.8 Heavy Equipment (Noise, Traffic) 15
3.4.9 Manual Lifting 15
3.4.10 Excavation and Trenching 16
3.4.11 Biological Hazards 16

4.0 SITE CONTROL 17

4.1 SUPPORT ZONE 17
4.2 EXCLUSION ZONE 17
4.3 CONTAMINATION REDUCTION ZONE (CRZ) 17

5.0 WORK CLOTHING AND LEVELS OF PERSONNEL PROTECTION 18

GOOD WORK PRACTICES 18

6.0 MONITORING PROCEDURES 19

6.1 Initial Personnel Exposure Monitoring 19
6.2 Monitoring During Site Operations 19
6.3 Action Level Criteria 20
7.0 TRAINING 21
7.1 Initial Site Training 21
7.2 Contact Project Personnel Training 21
7.3 Confined Space Training 21
8.0 MEDICAL SURVEILLANCE 22
9.0 COMMUNICATIONS 22
10.0 DISPOSAL PROCEDURES 22
11.0 EMERGENCY PLAN 22
12.0 RECORDKEEPING 22
13.0 AUTHORIZATIONS 22
APPENDIX A - EMERGENCY PHONE NUMBERS 23
APPENDIX B – HOSPITAL INFORMATION AND DRIVING DIRECTIONS 24
APPENDIX C – FIELD SIGN OFF 25

List of Tables

Table 3- 3. Permissible Exposure Limits and Health Hazards of Contaminants of Concern
Table 5- 1. Personal Protection Levels
Table 6- 2. Air Monitoring Instrumentation
Table 6- 3. Suggested Action Levels and Actions to be Taken

1.0 GENERAL

1.1. Introduction

This Site-Specific Health and Safety Plan (HASP) has been developed as requested by the site owner, Lighthouse Landing Venture LLC (which will be referred to as "Owner") to address project work at the Former GM Assembly Plant West Parcel Site, located in Sleepy Hollow, NY. The purpose of this HASP is to ensure that precautions are taken to protect project personnel, the public and the environment.

This HASP addresses the environmental, health and safety activities of this project and must be reevaluated should project conditions change. This HASP only covers hazards associated with potential contamination on-site and, as such, supplements the existing construction health and safety programs of the project personnel. This HASP does not replace the Corporate Health and Safety Requirements for each company working on the site.

The scope of this project includes subsurface activities on a site that has historical contamination. Work activities will be guided by the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations as outlined in 29 CFR 1910.120 and 1926.65.

Although there is a low probability of personnel exposure to health hazards exceeding the OSHA Permissible Exposure Limit (PEL), the procedures and protocols in this plan have been established to ensure that a mechanism is in place to protect personnel in the event that hazards from site contamination are encountered during the project. Compliance with this HASP is required from all Owner authorized project personnel, site workers, and visitors who enter the work areas of this project.

The content of this HASP may change or undergo revision based upon field monitoring results, modifications to the technical scope of work, or additional information made available to health and safety (H&S) personnel. Any proposed changes must also be reviewed and approved by the Owner or Owner's designee.

1.2 Personnel

Owner

The Site is now owned and controlled by Lighthouse Landing Venture, LLC, which will be referred to as Owner, a term which includes Lighthouse Landing Venture, LLC and successors and assigns. The Owner, or Owner's designee, is responsible for ensuring that air monitoring of the work areas is performed. The Owner, or Owner's designee, will confirm that the level of personal protection by the workers follows those dictated by the action levels set in **Table 6-3**.

Environmental Engineer

The Owner shall retain an Environmental Engineer and qualified environmental professionals authorized to work in the State of New York (hereafter collectively referred to as Environmental Engineer). The Environmental Engineer will be on the Site when work occurs that impacts or may impact the Engineering Controls as defined in the New York State Department of Environmental Conservation (NYSDEC)-approved Site Management Plan (SMP), December 2013. The Environmental Engineer will implement a Community Air Monitoring Program (CAMP) in accordance with the SMP. Additionally, the Environmental Engineer will screen excavated material for potential contamination, track stockpiled material, and document imported and exported material.

Contractor

Contractors may include construction firms and subcontractors retained by the Owner, as well as utility and municipal workers conducting work at the Site. All firms and site workers will be referred to as Contractor. Contractors who work on the Site will follow this HASP when conducting work that impacts the Engineering Controls as defined in the New York State Department of Environmental Conservation (NYSDEC)-approved Site Management Plan (SMP), December 2013. Contactor personnel are responsible for adhering to the requirements of this HASP, and following the direction of the Owner, or Owner's designee. Contactor will also adhere to the requirements of their own Corporate Health and Safety Programs. Contractor is responsible for Initial Personnel Exposure Monitoring as discussed Section 6.1. Contractor training and medical monitoring requirements are detailed in Sections 7 & 8.

Stop Work Authorization:

All site workers have stop-work authorization, which he/she will execute upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation, such as extreme weather conditions. Authorization to proceed with work will be issued by the Owner, or Owner's designee, after such action.

1.3 Emergency Phone Numbers

Emergency Phone numbers are listed below. Local hospital information and driving directions are located in **Appendix B**.

Emergency Phone Numbers:

Fire Department	911 or (914) 366-5119
Police Department	911 or (914) 631-0800
Hospital	Phelps Memorial Hospital 701 N. Broadway Sleepy Hollow, NY 10591 (914) 366-3000 (main number) (914) 366-3590 (emergency room)
Utility Mark Out	811
NYSDEC Spill Hotline	1-800-457-7362
National Response Center (NRC) for Oil/Chemical Spills	800-424-8802

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Physical Description and History

The site is located in Sleepy Hollow. NY and is the former location of a General Motors (GM) automobile assembly plant. During the 1900's, the site was expanded several times as GM operations grew before the assembly plant closed in 1996. Historical fill material (consisting of dredged materials, soils, ash, rubble, bulkheads, barges, and other debris) was placed on the site for these expansions. When the assembly plant closed in 1996, the buildings and most above grade structures were demolished.

Remedial activities have been performed at the site. Engineering and Institutional Controls have been put into place. Following remediation, the site was separated into parcels by the New York State Department of Environmental Conservation (NYSDEC) for the purpose of redevelopment and future use.

Project activities will take place on the "West Parcel Site". The West Parcel Site is reported to be approximately 66.67 acres and bounded by Kingsland Point Park to the north; River Street, Horan's Landing Park, Ichabod's Landing, and various municipal and private residences to the south; the Metro North Hudson Rail Line to the east; and the Hudson River and Kingsland Point Park to the west.

2.2 Scope of Work

Construction at the site is expected to start in early 2016 and will include site preparation, concrete crushing, utility and roadway construction, pile driving, and general construction. A CAMP will be implemented during all intrusive work. Work Zone Air monitoring as defined in **Section 6** of this HASP will be implemented as required by site activities. Soil screening and handling will be conducted in accordance with the SMP and the Project's Stormwater Pollution Prevention Program (SWPPP).

2.3 Post Remedial Conditions

In 2013, environmental remediation of the site was completed and approved by NYSDEC under the Brownfield Cleanup Program. Residual contamination associated with historic fill and past industrial operations at the former GM facility is present at the site. Soil and historic fill remaining at the site contain metals (arsenic, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver and zinc), as well as pesticides, PCBs, SVOCs and VOCs at levels exceeding unrestricted site cleanup objectives (SCOs). The contaminated fill is found directly beneath the existing cover system. Fill thickness ranges from approximately 1 to 25 feet below the existing cover. Groundwater at the site does not meet Class GA groundwater standards for drinking water use. After site remediation, the solvent TCE and the metal chromium were detected above applicable groundwater standards. Soil gas detected at the site include methane in the northern portion of the site and solvent-derived vapors in the central portion of the site.

2.4 General Dust Mitigation and Site Control

The completion of the NYSDEC Brownfield Cleanup Program resulted in the placement of an environmental easement on the site. The engineering controls for the site include a site cap that will be impacted during the proposed site construction. In order to mitigate potential exposure to the residual contamination below the cap, engineering controls will be implemented by the Owner and Contractors. These measures include erosion control measures and dust controls measures that may include water trucks, sprinklers, truck washes, etc. A Community Air Monitoring Plan will be implemented by the Environmental Engineer, as directed by the Owner and as required by NYSDEC. Worker monitoring will be implemented as described in Section 6 of this HASP.

3.0 HAZARD ASSESSMENT

The following is a general discussion of the hazards that may be encountered on site. Site control will be enforced and only authorized personnel will be permitted in the work area.

3.1 Introduction

At this site, potential exposure to contamination is dependent principally on the type of work activity being undertaken. Air monitoring will be performed to determine the potential for exposure to personnel during project activities. The air monitoring program and action levels are outlined in **Section 6**.

This plan has established categories of work tasks based on worker exposure potential to site hazards.

Non-Contact -Work activities that have little or no reasonable potential for contact or exposure to site contaminants.

Contact -Work activities that have some reasonable potential for contact or exposure to site contaminants.

3.1.1 Non-Contact Personnel

It is anticipated that the following activities require minimal contact, and should not result in contact with contaminated soil / groundwater or materials used for decontamination. These activities should not require additional H&S considerations beyond those H&S practices already in place for this type of construction project. These tasks may include:

Project Administration

While potential exposure to contaminated materials or vapors is not anticipated during these activities, operations will be evaluated during the project and monitored as necessary. Access to the work zone is limited to Project Personnel, site workers, and Authorized Visitors. Initially, exclusion zones will not be established for such activities. However, exclusion zones will be established if visual evidence of contamination is observed, and/or instrument readings exceeding the action levels detailed in **Section 6** are encountered.

In the event that contaminated materials are encountered, all project personnel involved in such areas (contact or non-contact) must meet the training requirements as defined in this HASP.

3.1.2 Contact Personnel

It is anticipated that personnel working in the following activities have some reasonable potential to come into contact with physical and chemical hazards present at the site.

The activities with a potential for contact with chemical hazards may include:

- Soil excavation and stockpiling
- Hand digging
- Concrete breaking and removal
- Soil screening
- Equipment and personnel decontamination procedures.

These activities will be evaluated and monitored by the Owner or Owner's designee, Contractor Supervisor and his/her designee in accordance with the task specific hazard analysis discussed in Section 3.2.

A variety of potential hazards exist with any construction project; these include:

- Buried Utilities
- Falling Objects / Overhead hazards
- Heavy Equipment
- Noise
- Slips / Trips / Falls
- Weather Hazards

3.2 Task Specific Hazard Analysis

A hazard analysis was developed for the work activities that involve potential physical and/or chemical hazards. Work activities may result in the worker getting dirty; however good work practices and personal protective equipment (PPE) will be utilized to minimize the potential for contamination to personnel. In the event that that visual contamination is encountered or detected, all project personnel involved in such areas will stop work until further instructions from the Owner or designee. Exclusion Zones will be established if visual evidence of contamination is observed, and/or instrument readings exceed the action levels detailed in **Section 6**.

Standard site PPE requirements include hard hat, safety glasses, steel toed shoes and visibility vest or high visibility clothing. Special PPE requirements have been identified for specific tasks and are outlined in **Table 5-1**.

Potential exposure above action levels for contaminated soil or water is not anticipated however, the operations will be evaluated and monitored as necessary. In the event that unexpected contaminated materials are encountered, all project personnel involved in such areas will stop work until further instructions from the Owner or designee. Exclusion Zones may be established if visual evidence of contamination is observed, and/or instrument readings exceed the action

levels detailed in **Section 6**.

This HASP assumes that buried drums, underground storage tanks, or radiological waste will not be encountered during the work activities at this site. If such waste is found or suspected, project personnel will cease work activities and contact the Owner.

3.2.1 Heavy Equipment

Equipment operators must be trained in the operation of the equipment they will be using. Additional requirements include the following:

- Underground utilities will be marked out in accordance with the NY Dig Safe requirements.
- Areas for heavy equipment use will be separated to prevent unauthorized pedestrian and/or vehicular traffic from entering the area.
- Equipment is to be operated in the areas designated for equipment use. Heavy equipment shall not be operated in public pedestrian areas.
- Equipment must be inspected prior to use to ensure proper equipment operation as well as functional safety features. If any worn parts and/or unsafe conditions exist, the operator will document each incident, and the equipment will be removed from service until repairs can be made.
- All equipment will have functioning back up alarms
- Equipment operators must make initial eye contact with personnel working in the vicinity, or otherwise make personnel aware.
- Hearing protection may be required for personnel working around heavy equipment. If it is necessary to raise your voice to be heard by someone within 3 feet – hearing protection devices must be used.

3.2.2 Soil Excavation

During excavation activities, air monitoring should be performed in accordance with **Section 6**. The Contractor's Competent Person shall determine which Employee Protection System should be used in order to keep the company's employees safe during entrance to trenches and excavations.

The Contractor's Competent Person has the responsibility to evaluate the excavation daily and after significant weather events. The inspections must be documented. The Competent Person has the authority to stop the work, if an uncontrolled hazard appears, until it is mitigated.

- Underground utilities should be marked out in accordance with the NY Dig Safe requirements.
- Pedestrian traffic should be separated from the excavation area while the equipment is in operation.

- Personnel must wear visibility clothing/vests when exposed to vehicular (heavy equipment) traffic.
- No one should be permitted to enter the excavation while the equipment is in operation.
- For excavations at a depth of 4 feet or greater; ladders should be placed within the excavation with a maximum travel distance of 25 feet to the nearest ladder. Ladders should extend 3 feet above the top of the trench and should be placed securely on even ground.
- Excavations must be inspected daily by the Contractor's competent person. The inspections must be documented.
- Prior to entry, the need for sloping/shoring will be assessed by the Contractor's competent person. Sloping/shoring will be provided if the trench exceeds 5 feet in depth, or regardless of depth, if the competent person requires sloping/shoring for protection of personnel. Sloping/shoring should be performed in accordance with the contractor's construction health and safety programs.
- Trenches and excavations will be protected when left unattended.
- Excavated and other materials or equipment that could fall or roll into the excavation must be placed at least 5 feet from the edge of the excavation.

3.2.3 Backfilling

Excavated areas will be backfilled with approved materials only.

- Pedestrian traffic should be separated from the excavation area while the equipment is in operation.
- Personnel must wear visibility clothing/vests when exposed to vehicular (heavy equipment) traffic.
- No one should be permitted to enter the excavation while the equipment is in operation.

3.2.4 Personnel and Equipment Decontamination

The minimum and expected level of personal protective equipment for this project will be Level D. If site conditions warrant, PPE may be upgraded to Level C. If Level C is warranted, then decontamination procedures will be followed as described below.

- Personnel assisting with decontamination procedures must be in appropriate personal protective equipment. (e.g. If personnel leaving the potentially contaminated area are wearing Level C protection, personnel assisting with decontamination must be wearing at least Level D Modified protection).
- Personnel and equipment leaving the potentially contaminated area are not to enter clean areas unless decontamination has been completed.
- PPE and decontamination supplies will be properly disposed as directed by the Owner or designee.

- Decontamination solutions (if used) may be contained and properly disposed as directed by the Owner or designee.

3.2.5 Site Restoration:

Equipment may be cleaned prior to leaving the site as directed by the Owner or designee. Regulated waste materials may be containerized and staged in a common area. The regulated waste will be subjected to waste classification testing and properly disposed following receipt of the waste classification results.

Personnel will avoid contact with soiled decontamination and waste materials. Personal protective equipment such as chemical protective clothing (such as poly coated Tyvek) and gloves will be used to prevent contact with potentially contaminated materials. Respiratory protection will be utilized if air monitoring action levels are exceeded as detailed in **Table 6-3**.

3.3 Chemical Hazard Assessment

The following is a general discussion of the hazards that may be encountered on site. Additional information on any contaminants encountered during this project may be found in standard health and safety references, such as the NIOSH "Pocket Guide to Chemical Hazards." Internet site: http://www.cdc.gov/niosh/npg/npg.html

3.3.1 Chemical Hazards

Potential for exposure exists when activities associated with the sampling, excavation and stockpiling of contaminated soil. Excavation and stockpiling activities may result in airborne dust that must be controlled to prevent off-site migration. When work activities are taking place in an Exclusion Zone (EZ), a Contamination Reduction Zone (CRZ) will be designated for personnel and equipment decontamination; a Support Zone (SZ) will be designated for “clean activities.” The Owner or designee will assess the SZ by observation during site operations where the potential exists for contact with contaminants. These zones are further defined in **Section 4**.

Measures must be taken to prevent an uncontrolled release or exposure to vapor, liquid or solid contaminants by workers and/or the general public. Assessment and prevention strategies are discussed in other sections of this HASP and must be practiced on a continuing basis by all on-site personnel throughout this project.

Table 3-3 summarizes exposure limits and health hazards for expected contaminants.

Table 3-3 Permissible Limits and Health Hazards of Contaminants of Concern

Chemical	OSHA Permissible Exposure Limits	Primary Health Hazard (Target Organs)
ANTHRACENE	0.2 mg/m3	Skin, eyes, respiratory system
BENZ[a]ANTHRACENE	-----	suspect human carcinogen
BENZO[b]FLUORANTHENE	-----	suspect human carcinogen
BENZO[a]PYRENE	0.2 mg/m3	suspect human carcinogen
CHRYSENE	0.2 mg/m3	potential occupational carcinogen§ animal carcinogen
NAPHTHALENE	10 ppm; STEL 15 ppm	Respiratory system, GI tract, liver, kidney, blood, CNS
PHENANTHRENE	0.2 mg/m3	Skin
PYRENE	0.2 mg/m3	Skin, eyes, respiratory system
TRICHLOROETHYLENE	100 ppm	CNS, eyes, skin, resp. sys, liver, kidneys
LEAD	0.05 mg/m3	Blood, kidneys, CNS
ARSENIC	0.01 mg/m3	Kidneys, respiratory system, mucous membranes, CNS
BARIUM	0.5 mg/m3	Skin, eyes
CADMIUM	0.01 mg/m3	Kidneys, lungs, liver
COPPER	1 mg/m3	Lungs, mucous membranes
CHROMIUM	1 mg/m3 (OSHA) 0.5 mg/m3 (ACGIH)	Kidneys, lungs, liver, respiratory system
MERCURY	0.1 mg/m3 (OSHA) 0.025 mg/m3 (ACGIH)	Blood, kidneys, liver, brain, peripheral nervous system
ZINC	------	None

3.3.2 Exposure Pathways

A brief discussion of potential pathways of exposure and exposure control methods is presented below:

Inhalation - An inhalation exposure to contaminated soil particles would typically occur if work site activities resulted in the generation of dust. Dust level monitoring and dust control measures will be implemented to minimize the airborne soil particles.

Contact with Skin and Eyes – Contaminated soil and groundwater may come into contact with skin and eyes during work activities. Personal protective equipment as well as utilizing good hygiene/work practices will minimize the potential of exposure by this route.

Ingestion - Ingestion of contaminated materials may occur as a result of a hand-to-mouth contact (eating, drinking, smoking) in contaminated areas or prior to appropriate personal decontamination. Frequent and thorough washing of hands and face, prohibition of eating and smoking in the work area, proper use of work clothing and personal decontamination is recommended to control the potential for ingestion of contaminated materials.

If unanticipated conditions are identified or if work is required in additional areas, work activities will cease until the Owner or Owner's designee develops appropriate procedures.

The project includes the excavation and stockpiling of contaminated soil. Potential hazards posed by acute exposure to contaminates within the soil and groundwater include mucous membrane irritation and skin irritation. Chronic exposure may result in central nervous system effects, GI effects, and reproductive system effects. Some contaminates are suspected carcinogens.

3.4 Physical Hazard Analysis

Potential hazards that are most likely to be encountered at this project site during field operations include, but are not limited to:

Weather conditions (lightning, rain, excessive heat, excessive cold, and high winds, etc.)
Confined Space Entry
Slips, trips, falls on uneven/slippery surfaces
Noise
Heavy equipment use

Below is a summary of guidelines that may be used to eliminate/reduce the potential risk of physical hazards.

3.4.1 Weather Hazards

If severe weather occurs that may affect the safety of site workers, the Owner or designee will stop affected field operations. The NOAA 30/30 rule will be followed for resuming operations. The NOAA 30/30 rule requires retreat under shelter in the event of severe weather appearance (heavy clouds, high winds), thunder, and/or lightning. Outdoor activities can resume 30 minutes following the last thunder clap, lightning strike, and/or clearing skies.

3.4.2 Heat and Cold Stress

Depending on the time of year and weather conditions, cold or heat stress present special problems to unprotected workers. The Contractor Supervisor will be in continuous contact with workers exposed to weather extremes and document that the heat or cold stress programs are implemented. Workers will take adequate appropriate rest breaks and drink adequate amounts of cold or hot liquids.
The use of Personal Protective Clothing can increase heat-related health risks. Work/rest schedules may be altered based on the existing weather conditions encountered and the level of personal protection being utilized by on-site personnel.

Heat stress prevention may be achieved by:

1. Modifying work/rest schedules based on site conditions and personnel monitoring
2. Providing shelter and shade during breaks.
3. Requiring workers to remove all PPE during breaks.
4. Maintaining fluids by drinking water or electrolyte drinks ('Gatorade')
5. Training site personnel to recognize the effects of heat stress.
6. Acclimatizing workers for warm weather work (American Conference of Governmental Industrial Hygienists (ACGIH) recommendations for heat stress)

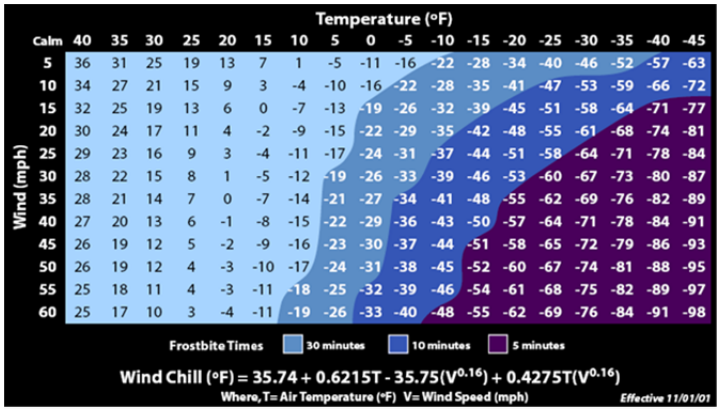
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature	Normal Work Ensemble	Impermeable Ensemble
90° F (32.2°C) or >	After each 45 min of work	After each 15 min of work
87.5-90°F (30.8-32.2°C)	After each 60 min of work	After each 30 min of work
82.5-87.5°F (28.1 -30.8°C)	After each 90 min of work	After each 60 min of work
77.5-82.5°F (25.3-28.1°C)	After each 120 min of work	After each 90 min of work

Cold stress prevention will focus on:

1. Modifying work/rest schedules based on site conditions and personnel monitoring
2. Providing shelter and heat during breaks.
3. Requiring workers to warm feet & hands during breaks.
4. Wearing layers of clothing to put on or take off as body warmth and moisture fluctuates
5. Maintaining fluids by drinking water or electrolyte drinks ('gatorade')
6. Training site personnel to recognize the effects of cold stress.

Work practices and levels of personal protection will consider real temperature and wind chill. Wind chill is calculated as follows:



3.4.3 Illumination

If work activities occur before sunrise and/or after sunset, lighting will be provided at each work area to meet the requirements of 29 CFR 1910.120(m). The Standard states that while any work is in progress, the general site areas shall be lighted to not less than 5 foot-candles; excavation, waste areas, access ways, active storage areas, loading platforms, and field maintenance areas shall be lighted to not less than 3 foot-candles; and first aid stations not less than 30 foot-candle.

3.4.4 Slip, Trip and Fall Hazards

As in any work area, it is expected that the ground may be uneven, the surface may be unreliable due to surface evenness, debris may be present, work is being performed on poly sheeting, and wet or muddy areas may exist. Therefore, the potential for slipping, tripping, and falling is present, especially considering the use of PPE and respiratory protection can impede vision. Severe trip hazards will be identified prior to commencement of project activities and demarcated by flags or caution tape.

3.4.5 Confined Space Entry

Permit Required Confined Space (PRCS) entry may be required during this operation. If an entry is required into a PRCS (as defined by 29 CFR Part 1910.146) the contractor will be responsible for implementation of the standard procedures for confined space operations, which includes personnel training, permit entry system, pre-entry monitoring, and a buddy system according to the requirements of the contractors' Corporate Health and Safety Programs.

3.4.6 Electrical Hazards

Spotter must be used if working within 20 feet of any power lines or structures.

Excavators will maintain the following distance from energized overhead power lines:

1. 10 feet for up to 50kV
2. 4" additional for every 10kV over 50kV

The project tasks are not expected to disturb any live electrical wires. If any electrical equipment is needed, ground fault circuit interrupters will be used.

3.4.7 Underground Utilities

NY Dig Safe (811) system will be utilized before digging operations commence. Underground utilities will be clearly marked out so as not to be impacted by digging operations.

3.4.8 Heavy Equipment (Noise, Traffic)

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. The subcontractor site supervisors must provide this information to the Owner or designee.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicates and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.

Noise

Excessive noise may occur during certain activities on site, such as test pile driving, and the use of machinery or powered hand tools. If necessary, as designated by the contractors' supervision, when expected noise or sustained noise levels exceed 85dBA, the use of earplugs or other hearing protection equipment with a NRR of 25 or greater will be mandatory for personnel use in the immediate area. As a rule, the noise level is excessive if it is necessary to shout to be heard at a distance of three feet.

Traffic

Project personnel shall be required to wear visibility vests or high visibility clothing when working on or adjacent to roadways or within high traffic areas and must comply with all applicable rules and regulations for traffic safety.

3.4.9 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to use power equipment to lift heavy loads whenever possible and to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques, 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist, will be stressed. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods. In addition, hand digging for pipes may present lifting/ergonomic hazards.

3.4.10 Excavation and Trenching

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity, the location of underground installations will be determined. The NY Dig Safe center will be contacted by the excavation subcontractor a minimum of 72 hours prior to excavation activities.
- All excavations will be inspected daily and documented by the Competent Person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavation and trenching will be performed in accordance with the requirements for Soil Type C. Shoring will be performed in accordance with the requirements of 29 CFR 1926.650.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.

3.4.11 Biological Hazards

Worker exposure to biological hazards such as ticks, plants such as poison ivy, oak and sumac, or small animals is not anticipated at this project location.

4.0 SITE CONTROL

A Site Control plan has been established to restrict access to work areas where potential contamination may be present, to select appropriate PPE for personnel working in each control zone and to prevent the accidental spread of contaminated materials. As part of this plan, three separate zones may be used at this site. These zones are identified as 1) the Support Zone, (SZ) (2) the Exclusion Zone (EZ), and 3) the Contamination Reduction Zone (CRZ). Entry into any of these zones will be monitored by the Owner or designee. Contamination reduction zones will be set up in the immediate vicinity of each CWZ.

4.1 Support Zone

The Support Zone is the equipment storage area. The Support Zone is restricted to project (contact and non-contact) personnel and project support personnel and visitors as defined in this document. Entry into and out of the Support Zone will be monitored by the Owner or designee. The Support Zone is considered the non-contact area.

All personnel (project personnel, project support personnel, visitors) entering the Support Zone will be briefed by the Owner or Owner's designee prior to their initial entry. All personnel entering the Support Zone will be required to meet the Training and Medical requirements as outlined in **Sections 7 & 8**.

4.2 Exclusion Zone

The Exclusion Zone (EZ) will be established at active work sites where contamination is anticipated, observed or measured leading to hazardous exposure potentials to workers. The Owner or designee will make the determination to establish an EZ based upon work activities, work conditions, visual evidence of contamination, and/or other knowledge of the site which indicates an increase in the probability of worker exposure.

Access to the EZ will be limited to contact project personnel that meet the training and medical surveillance requirements as outlined in **Sections 7 & 8.** All contact project personnel entering the EZ will be briefed by the Owner or designee prior to initial entry. The protective work clothing and equipment to be worn is defined in **Section 5** or as required by the Action Levels. All personnel and equipment exiting the EZ will be decontaminated (see **Section 10.0**) in the CRZ or as the Owner or designee determines is necessary.

4.3 Contamination Reduction Zone (CRZ)

The CRZ is the area just outside of the EZ where Contact Project Personnel undergo decontamination. This zone will be contiguous with the EZ. The area will be marked using flagging tape or other means to readily identify the boundary of the zone. Access to this zone will be limited to site workers exiting the EZ and personnel assisting with decontamination.

5.0 WORK CLOTHING AND LEVELS OF PERSONNEL PROTECTION

Personal protection for this project may include:

- Work clothing
- Work shoes and disposable overboots (if contact hazard present)
- Safety glasses
- High-Visibility vests or reflective clothing
- Chemical protective gloves as needed during contact with visibly impacted soil and decontamination.
- Ear plugs (as needed)

It is anticipated that Level D Personal Protective Equipment (PPE) will be utilized by Contact Personnel while in construction work areas. Level D PPE includes:

- Work clothing
- Hard hat
- Safety glasses
- Safety shoes or boots
- Work gloves (as needed)
- Hearing protection (as needed)

If site conditions change and the Action Levels in **Table 6-3** are met or exceeded, personal protective equipment will be upgraded as dictated in **Table 6-3**.

Good Work Practices

Good Work Practices should be employed by workers in areas where there is a potential for some contamination. Good Work Practices include:

1. Keep dust levels to a minimum.
2. Use Good personal hygiene practices prior to eating, drinking and smoking.
3. Use work gloves to minimize dirt on hands.
4. Wear work coveralls, or disposable coveralls, to minimize dirt on clothing.
5. Keep dirty clothes, shoes, tools, etc. away from personal areas such as cars and homes.

6.0 MONITORING PROCEDURES

6.1 Initial Personnel Exposure Monitoring

Previous investigations indicate the potential for lead contamination in the West Parcel Site soil. Initial area monitoring in accordance with 29 CFR 1926.62 will be conducted by Contractors with Contact Personnel to determine the presence of lead in airborne soil during ground intrusive activities.

- If initial monitoring indicates the potential for employee exposure at or above the 30 ug/m^3 Action Level, personal exposure monitoring for lead will be conducted for one employee in each task.
- If personal exposure monitoring indicates employee exposure below the action level, monitoring may be discontinued.
- If personal exposure monitoring indicates employee exposure at or above the action level but below the permissible exposure limit, the monitoring must be repeated at least six (6) months. Repeat monitoring must be conducted until two (2) consecutive measurements taken at least seven (7) days apart are at or below the action level.
- If the personal exposure monitoring indicates employee exposure at or above the permissible exposure limit, the monitoring must be repeated at least every three (3) months. Repeat monitoring must be conducted until two (2) consecutive measurements taken at least seven (7) days apart are at or below the permissible exposure limit.

6.2 Monitoring During Site Operations

A total dust meter and photoionization detector will be used to monitor the areas where the soil has been disturbed. A combustible gas indicator will be used in areas where combustion equipment is utilized or hot work is performed. Based on the previous investigations and the tasks to be performed, the contractor will perform monitoring in the work area during excavation activities. **Table 6-2** shows the type of instruments that can be used for different contaminants.

Table 6-2 Air Monitoring Instrumentation

Air Monitoring Instrument Name	**Acronym**	**Contaminant(s) Monitored**
Photoionization Detector	PID	Volatile organic chemicals
Total Dust Meter	Dust Meter	Total dust
Combustible Gas Indicator	CGI	Oxygen, carbon monoxide, lower explosive limit, hydrogen sulfide
Mercury Vapor Analyzer	MVA	Mercury vapor

6.3 Action Level Criteria

A summary of the action levels to be used, action required and the types of instrumentation which may be utilized is presented in **Table 6-3**.

Table 6-3 Suggested Action Levels and Actions to be Taken

Monitoring Instrumentation	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	≤ 10 ppm above background (15 minutes sustained)	No respiratory protection is needed.
		10 – 250 ppm above background (15 minutes sustained)	Stop work, withdrawal from work area, institute engineering controls, if levels persist upgrade to Level C.
		>250 ppm above background (15 minutes sustained)	Stop work, withdraw from work area
Oxygen Level (Combustible gas meter)	Breathing Zone	< 19.5%	Stop work; withdraw from work area; ventilate area
		> 22 %	Stop work; withdraw from work area; ventilate area
Hydrogen Sulfide (H2S) Level (Combustible gas meter)	Breathing Zone	< 5 ppm	No respiratory protection is needed.
		> 5 ppm	Stop work, cover excavation, withdraw from work area, institute engineering controls
Carbon Monoxide (CO) (Combustible gas meter)	Work Area	< 50 ppm	No action needed
		50 – 100 ppm	Stop work, ventilate area, investigate source
		> 100 ppm	Stop work, evacuate area
Lower Explosive Limit (LEL) (Combustible gas meter)	Work Area	>10% LEL	Stop work; withdraw from work area; ventilate area
Total Dust	Work Area	Visible dust or downwind dust greater than 0.25 mg/m3 above upwind dust	Utilize dust control measures. If not controlled by dust control measures, don half face air purifying respirator with P100 filters.
Total Dust	Work Area	Visible dust or downwind dust greater than 1 mg/m3 above upwind dust	Full face APR with P100 filter. Stop work activities and utilize dust control measures (water, plastic sheeting).
Total Dust	Work Area Perimeter	Visible dust or downwind dust greater than 1 mg/m3 above upwind dust	Full face APR with P100 filter. Stop work activities and utilize dust control measures (water, plastic sheeting).
Mercury Vapor Analyzer or Drager System	Work Area	< 0.025 mg/m3	No respirator required
		> 0.025 mg/m3	Full face air purifying respirator with mercury vapor cartridges
		> 0.1 mg/m3	Stop work – notify Owner or designee

7.0 TRAINING

7.1 Initial Site Training

Initial site briefing will be provided on-site by the Owner or Owner's designee for all Project Personnel (Contact and Non-Contact), Project Support Personnel prior to initial entry onto the site. Site training will also be provided on an as needed basis to specifically address the activities, procedures, monitoring, and equipment for the site operations. Such training will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within this HASP. This training will be documented by the Owner.

7.2 Contact Project Personnel Training

Workers designated to work in the Exclusion Zone as outlined in **Section 4**, are required to have successfully met the initial and refresher training requirements pursuant to OSHA 29 CFR 1926.65(e).

7.3 Confined Space Training

If confined spaces are involved, employees shall be trained to recognize confined spaces, the hazards of working in a confined space, and the requirements of this procedure. Any confined space entry will be conducted using the OSHA Confined Space Standard for General Industry (29 CFR 1910.146) as a guideline.

8.0 MEDICAL SURVEILLANCE

All Contact Personnel engaged in on-site activities on this project must meet the requirements of 29 CFR 1910.120(f). Medical surveillance applicability will be determined by each employee's employer. Additionally, any employee required to wear a respirator for Level C PPE or above must be approved by a licensed health care provider for respirator use as defined in the OSHA Respiratory Standard 29 CFR 1910.134.

In the unlikely event of an exposure occurring, the affected employee will be sent for any evaluation and treatment that may be needed to the designated hospital. See **Appendix B** for hospital for written directions and route map.

9.0 COMMUNICATIONS

A means of communication will be provided at this project site. This may include two-way radios, portable telephones, or existing nearby telephones. Site workers will be informed of the communication procedures during site briefings.

10.0 DISPOSAL PROCEDURES

Personal protective equipment, decontamination materials and solutions, and other impacted waste will be disposed in accordance with federal, state and local regulations.

11.0 EMERGENCY PLAN

Emergency situations can be characterized as a fire or explosion, an environmental release, business interruption, or accident or injury to the field personnel. All emergency situations must be reported immediately to the Owner or the Owner's designee.

Emergency phone numbers are listed in **Section 1.3** of this Health and Safety Plan. Written hospital directions and an accompanying map can be found in **Appendix B**.

12.0 RECORDKEEPING

The Owner or Owner's designee will maintain health and safety information records for the site.

13.0 AUTHORIZATIONS

The Owner or a designee must approve all personnel authorized to enter the project work zones at the site. Authorization will involve proof of completion of appropriate training courses and medical examination requirements as outlined by this HASP, as well as the signature of the individual on the Acknowledgement Form recognizing a complete understanding of this HASP (**Appendix C**).

APPENDIX A - Emergency Phone Numbers

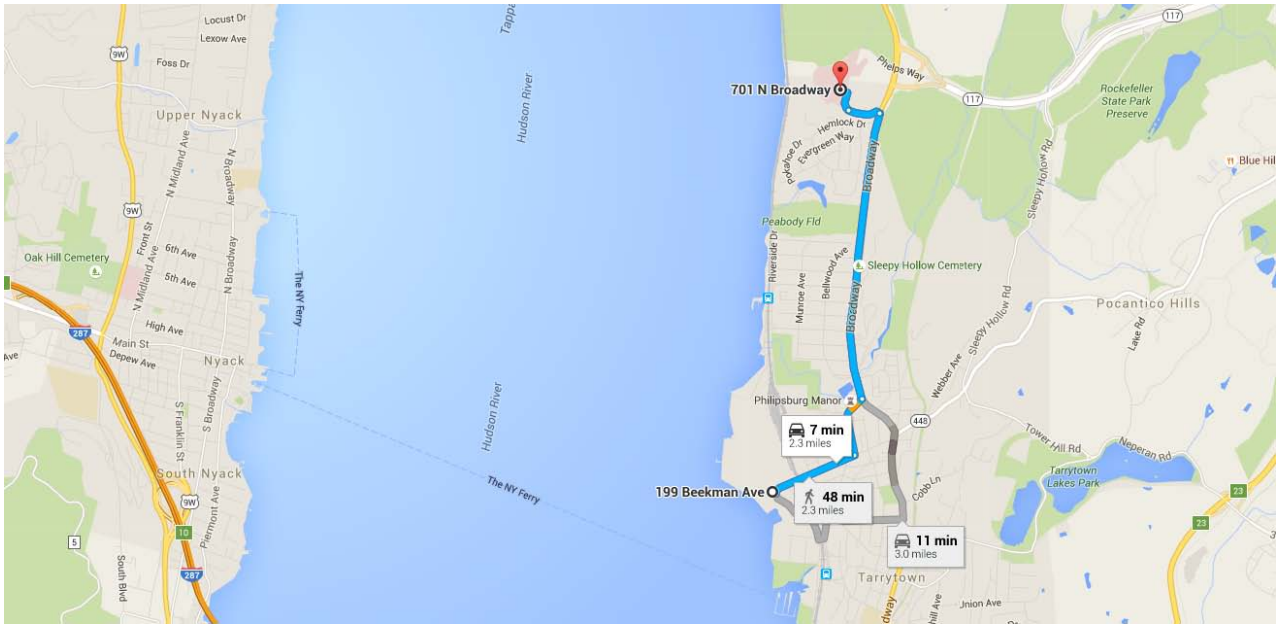
Fire Department	911 or (914) 366-5119
Police Department	911 or (914) 631-0800
Hospital	Phelps Memorial Hospital 701 N. Broadway Sleepy Hollow, NY 10591 (914) 366-3000 (main number) (914) 366-3590 (emergency room)
Utility Mark Out	811
NYSDEC Spill Hotline	1-800-457-7362
National Response Center (NRC) for Oil/Chemical Spills	800-424-8802

APPENDIX B – Hospital Information and Driving Directions

Phelps Memorial Medical Center
701 North Broadway
Sleepy Hollow, NY
(914) 366-3000

1.93 miles – 5 minutes

1. Start out going northeast on Beekman Avenue toward Hudson Street – travel 0.4 mi.
2. Turn left on Pocantico Street - travel 0.3 mi
3. Turn left onto US 9/N Broadway- travel 1.4 mi
4. Slight left onto Phelps Lane – 0.2 mi
5. Slight right onto Hospital Access Road
6. Destination will be on the left



APPENDIX C – Field Sign Off

Each field team member shall sign this section after the site-specific training has been completed and before being permitted to work on site.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with all of its provisions.

Project: Former GM Assembly Plant – West Parcel Site

Name (Print)	Signature	Date

ERRATA SHEET for

DER-10, *Technical Guidance for Site Investigation and Remediation*
Issued on May 3, 2010

Citation and Page Number	Current Text	Corrected Text	Date
Table 1.5, Document 9 (SMPs): 'Certified by' column 'Certification' column Page 21	 Certified by = NYSPE Certification = 1.5(b) 2	 Certified by = QEP or NYSPE Certification = 1.5(b) 1 since SMP is considered to be a work plan	 09/14/2015 09/14/2015
Section 4.1(f)(2)(i) Page 131	for residential or restricted residential use, is to be two feet;	for restricted residential use, is to be two feet;	11/07/2017
Table 1.5, Document 13 (Underground storage tank waiver) Page 21	pursuant to clause 5.5(c)3.v.(3)	pursuant to clause 5.5(d)2.	04/09/2019

DER-10 / Technical Guidance for Site Investigation and Remediation

New York State Department of Environmental Conservation

DEC Program Policy

Issuing Authority: Val Washington	**Title:** Deputy Commissioner, Office of Remediation and Materials Management
Date Issued: May 3, 2010	**Latest Date Revised:**

I. Summary: This guidance provides an overview of the site investigation and remediation process for the New York State Department of Environmental Conservation (DEC) remedial programs administered by the Division of Environmental Remediation (DER). These include the Inactive Hazardous Waste Disposal Site Remedial Program, known as the State Superfund Program (SSF); Brownfield Cleanup Program (BCP); Environmental Restoration Program (ERP); and Voluntary Cleanup Program (VCP); and certain petroleum releases.

II. Policy: DER administers the SSF, BCP, ERP, VCP and Bulk Storage Programs and provides response to releases of petroleum. This guidance assists the user in developing and implementing investigation and remediation projects involving contaminated sites under these programs administered by DER. It is a separate document of the requirements for a remedial program set forth in statute and regulation, as well as in guidance. It reflects DER's experience and knowledge in developing and managing the various programs for the past 25 years.

III. Purpose and Background: This guidance provides the scope of activities needed to satisfy minimum requirements for the life-cycle of the site-specific remedial program under the SSF, BCP, ERP, and VCP, and for certain petroleum releases. It facilitates consistent, accurate, efficient and timely completion of remedial projects. It also contains the minimum technical activities DEC will generally accept for projects where DER oversight, approval or acceptance is sought or mandated by law.

DER will, however, determine the acceptable minimum technical activities for a particular site upon consideration of all the facts and circumstances of such site under the authority of applicable laws and regulations. No provision of this guidance document should be construed to limit DER's authority to require additional investigation and/or remediation based upon site-specific conditions. Sections 1.1 and 1.2 present the scope and applicability of this guidance document in more detail.

No provisions of this guidance, however, should be construed to alter the requirements of the Navigation Law or Environmental Conservation Law, or any regulation or order or permit having the force of law. This guidance does not replace or supersede protocols established for emergency spill response actions, emergency drum removal actions, and other such events requiring immediate responses and follow-up. In such time-critical situations, existing guidance established pursuant to applicable emergency response laws, regulations and policy, and directives of the on-scene DEC Spill Responder or Project Manager must be followed.

IV. Responsibility: Remedial Bureau C in DER is responsible for interpreting and maintaining this guidance document. The procedures are to be used by DER staff and regulated entities responsible for sites in the remedial programs.

V. Procedure: This guidance assists the user in developing and implementing investigation and remediation projects under the above described programs administered by DER. This guidance is attached as a separate document and included herein by reference. A summary of topics addressed by each chapter are provided below.

Chapter 1 provides general information, establishes the basic "rules-of-the-game" for utilizing the guidance, and includes issues which are common to many elements of a remedial program.

Chapter 2 describes the minimum quality assurance guidelines and criteria for sampling and laboratory analysis activities. The guidance provided in Chapter 2 applies to various sampling and analytical activities associated with projects or project phases outlined in subsequent chapters.

Chapters 3 through 6 present technical guidance addressing each of the investigative and remedial steps that should be undertaken at contaminated sites toward fulfillment of the remedial program goals and objectives, from identifying a site to its eventual long term management and close out. This follows an iterative process, which begins in Chapter 3 with an assessment of environmental conditions at the site based on the review of existing sources of information and preliminary field investigations (Site Characterization) and progresses through the detailed and focused site investigation (Remedial Investigation).

Chapter 4 addresses remedy selection, detailing the development of remedial alternatives, their evaluation and selection of the remedy.

Chapter 5 details design and construction activities.

Chapter 6 provides the description of the required site management and periodic review process, and includes guidance on site and project close out considerations.

VI. Related References:

- Environmental Conservation Law, Article 27 Titles 3, 5, 13 and 14.
- Article 12 of the Navigation Law, Section 178.
- 6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.
- 6 NYCRR Part 611, Environmental Priorities and Procedures in Petroleum Cleanup and Removal. November 5, 1984 (amended).
- Bulk Storage Programs:
  - Petroleum Bulk Storage Program (6 NYCRR Parts 612-614; February 1992)
  - Chemical Bulk Storage Program (6 NYCRR Parts 595-599; August 1994)
  - Major Oil Storage Facilities Program (6 NYCRR Part 610; 1985)

- Program Policy DER-23 *Citizen Participation Handbook for Remedial Programs*. NYS DEC. January 2010.

- Commissioner Policy CP-43 *Groundwater Monitoring Well Decommissioning*.

  NYSDEC. August 2009.

- Commissioner Policy on *Soil Cleanup Guidance*. NYS DEC.

- Analytical Services Protocol (ASP). (FTP Zip file folder with documents) NYS DEC.

- *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* . NYS Department of Health. October 2006.

- Preparation Aids for the Development of Category I Quality Assurance Project Plans. USEPA. EPA/600/8-91/003. February 1991.

- USEPA Contract Laboratory Program; Statement of Work for Organic Analysis; Multi-Media, Multi-Concentration. EPA/540/R/94/097. December 1994.

- Standards, Criteria and Guidance (SCGs) for Investigation and Remediation of Sites under Remedial Programs

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DER-10/Technical Guidance for Site Investigation and Remediation

Department of Environmental Conservation

Division of Environmental Remediation

DER-10

TECHNICAL GUIDANCE

FOR

SITE INVESTIGATION AND REMEDIATION

May 2010

New York State Department of Environmental Conservation
David A. Paterson, *Governor* Alexander B. Grannis, *Commissioner*

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DIVISION OF ENVIRONMENTAL REMEDIATION
TECHNICAL GUIDANCE FOR
SITE INVESTIGATION AND REMEDIATION

CHAPTER 1 GENERAL INFORMATION

1.1 Scope 5
1.2 Applicability 5
1.3 Definitions 7
1.4 Notification 17
1.5 Certifications 19
1.6 Documenting Compliance with the Technical Guidance 25
1.7 Considerations for Going Beyond the Acceptable Technical Guidance 27
1.8 Areas of Concern at Sites Subject to This Technical Guidance 28
1.9 Health and Safety Plan 30
1.10 Exemptions From Obtaining NYS and Local Permits and Other Authorizations 32
1.11 Interim Remedial Measures 34
1.12 Use of a Site 36
1.13 Standards, Criteria and Guidance 40
1.14 Sustainability and Green Remediation 40
1.15 Electronic Submissions 41

CHAPTER 2 SAMPLING, ANALYSIS AND QUALITY ASSURANCE

2.1 Sampling and Analysis Requirements 43
2.2 Reporting Requirements 47
2.3 Quality Assurance Requirements 49
2.4 Quality Assurance Project Plan 50

CHAPTER 3 SITE CHARACTERIZATION AND REMEDIAL INVESTIGATION

3.1 Site Characterization and Remedial Investigation Overview 55
3.2 General Sampling Considerations 59
3.2.1 Site Characterization 60
3.2.2 Remedial Investigation 61
3.3 Investigation Work Plans 62
3.4 Building Interiors 71
3.5 Soil
3.5.1 Site Characterization 72
3.5.2 Remedial Investigation 74
3.5.3 Soil Background Evaluation 76
3.6 Soil Vapor 79
3.7 Groundwater
3.7.1 Site Characterization 86
3.7.2 Remedial Investigation 87
3.7.3 Groundwater Background Evaluation 92

3.8. Surface water, sediments and wetlands
3.8.1 Site Characterization 94
3.8.2 Remedial Investigation 95
3.8.3 Sediment Background Evaluation 98
3.8.4 Surface Water Background Evaluation 100
3.9 Area Specific Requirements for Tanks, Storage Facilities, Water Treatment, Drainage Structures and Other Systems....101
3.10 Fish and Wildlife Resource Impact Analysis (FWRIA)
3.10.1 Part 1: Resource Characterization 109
3.10.2 Part 2: Ecological Impact Assessment 112
3.11 Historic Fill Material 113
3.12 Records Search Report 115
3.13 Site Characterization Report 116
3.14 Remedial Investigation Report 120

CHAPTER 4 REMEDY SELECTION
4.1 Remedial Goals, Objectives and Factors to Consider....125
4.2 Remedy Selection Evaluation Criteria....131
4.3 Development and Evaluation of Alternatives 136
4.4 Remedy Selection Reporting Requirements 139
4.5 Remedy Selection Decision Documentation 144

CHAPTER 5 REMEDIAL DESIGN/REMEDIAL ACTION
5.1 General 145
5.2 Remedial Design 150
5.3 Remedial Action Work Plan.... 153
5.4 Remedial Action Implementation Compliance 154
5.5 Underground Storage Tank Closure....161
5.6 Institutional Controls....165
5.7 Remedial Action Schedule and Progress Reports 169
5.8 Construction Completion Report and Final Engineering Report 171

CHAPTER 6 SITE MANAGEMENT, PERIODIC REVIEW AND CLOSEOUT
6.1 Site Management....177
6.2 Site Management Plan....180
6.2.1 Institutional and Engineering Control Plan 181
6.2.2 Monitoring Plan....183
6.2.3 Operation and Maintenance Plan 189
6.3 Periodic Review 190
6.4 Remedial Process Closure Requirements....195
6.5 Site Closeout....202

TABLES

Table 1.5	Identification of Persons Certifying and Required Certifications	21
Table 1.12	Exposure Scenario Receptors and Pathways	39
Table 3.9	Sampling Frequency Based on Tank Capacity and/or Length	104
Table 5.4(e)4	Reuse of Soil from a Site	159
Table 5.4(e)10	Recommended Number of Soil Samples for Soil Imported To or Exported From a Site	161

APPENDICES 203

APPENDIX 1	1A	NYSDOH Generic Community Air Monitoring Plan	204
	1B	Fugitive Dust and Particulate Monitoring	207
	1C	DEC Permits Subject to Exemption	209
APPENDIX 2	2A	The Role of Field-Testing Technologies in Site Investigation and Remediation	210
	2B	Guidance for Data Deliverables and the Development of Data Usability Summary Reports	213
APPENDIX 3	3A	Records Search Requirements	216
	3B	NYSDOH Qualitative Human Health Exposure Assessment	220
	3C	FWRIA Decision Key	222
APPENDIX 4		FWRIA Part 3: Ecological Effects of Remedial Alternatives	223
APPENDIX 5		Allowable Constituent Levels for Imported Fill or Soil	224

DEC Website

All references to DEC's website are available at the following address:
http://www.dec.ny.gov/regulations/67386.html

Document Format Naming Convention

Chapter 1
- Section 1.1
  - Subsection 1.1.1
    - Subdivision (a)
      - Paragraph 1.
        - subparagraph i.
          - clause (1)
            - subclause (A)

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CHAPTER 1 GENERAL INFORMATION

1.1 Scope

(a) This program policy provides guidance for the New York State Department of Environmental Conservation (DEC) Division of Environmental Remediation (DER) and regulated entities on how to conduct acceptable investigation and remediation. No provision of this guidance document should be construed to limit DER's authority to require additional investigation and/or remediation based upon site-specific conditions.

(b) This document presents guidance relative to activities considered necessary to investigate and remediate contamination at any applicable site, as identified in section 1.2.

1. Adherence to this guidance does not relieve any remedial party from:

i. complying with more stringent requirements or provisions imposed by any other federal, state or local applicable statutes or regulations;

ii. obtaining any and all permits required by federal, state or local statute or regulation, except for those described in section 1.10; and

iii. compliance with an existing order, agreement, contract or permit.

2. This guidance document does not apply to emergency interim remedial measures, which are described in subdivision 1.11(b).

(c) No provisions of this guidance should be construed to alter the requirements of Navigation Law or the Environmental Conservation Law (ECL) or any regulation promulgated pursuant thereto.

(d) Pursuant to 6 NYCRR 375-1.11(b)(2), it is a violation to engage in any activity that will, or that is reasonably anticipated to prevent or interfere significantly with any proposed, ongoing or completed remedial program at any site or foreseeable to expose the public health and the environment to a significantly increased threat of harm or damage at any site.

1.2 Applicability

(a) Applicable programs. Sites and activities subject to this guidance are those being conducted pursuant to the DER oversight document identified by paragraphs (d)1, 2, 3, 4, 6 and 7 below or a federal oversight document as set forth in paragraph (d)5 below.

1. The New York State Inactive Hazardous Waste Disposal Site Remedial Program (State Superfund Program or SSF), as defined by ECL, Article 27, Title 13, except for emergency IRMs.

2. The New York State Environmental Restoration Program (ERP), as defined by ECL, Article 56, Title 5.

3. The New York State Brownfield Cleanup Program (BCP), as defined by ECL, Article 27, Title 14.

4. The New York State Voluntary Cleanup Program (VCP), which stopped accepting new applications as of October 31, 2003.

5. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by Superfund Amendments and Reauthorization Act of 1986 (Federal Superfund) Program.

6. For any other approved remedial programs implemented or overseen by DER.

(b) Other programs. Sites and activities in the programs identified in this subdivision may be subject to this guidance on a site-specific basis when the nature and extent of contamination and/or complexity of the issues warrant the use of this guidance. The determination of applicability may be made by DER, and where such determination is made, it will be incorporated in an oversight document, in accordance with subdivision 1.2(d).

1. Remediation of petroleum contamination pursuant to Article 12 of the Navigation Law.

2. The Petroleum Bulk Storage Program, as defined by ECL, Article 17, Title 10.

3. The Chemical Bulk Storage Program, as defined by ECL, Article 40, Title 1.

4. Any other approved remedial programs implemented or overseen by DER.

(c) Applicable projects. DER-10 is applicable to projects as set forth in this subdivision.

1. Except as provided in paragraph 2 below, this guidance is applicable to work plans and reports for all projects in the programs set forth in subdivision (a) above, and as applicable to (b) above.

2. For any approved work plan which is being implemented, as well as any report submitted relative to that work, as of the effective date of this guidance, DER may evaluate the work completed to determine whether the work performed was completed in substantial compliance with this guidance. For example if a remedial investigation (RI) did not evaluate soil vapor intrusion, as set forth in section 3.6, additional work may be necessary in order for the RI to be approved. Subsequent work plans would be subject to this guidance.

3. To the extent that additional work may be necessary to address conditions at a site, or where re-openers pursuant to any certificate of completion or closure letter issued by DEC are triggered, this guidance will be considered at a site where the remedial program has been previously completed, for such required work.

(d) Oversight documents. DER will only review and approve remedial program activities subject to this guidance which are conducted pursuant to an oversight document as set forth in this subdivision.

1. For the SSF, an oversight document may include: an Administrative Consent Order or an order issued by the Commissioner pursuant to ECL 27-1313.3.a.

2. For the ERP, after approval of an application by DEC, a State Assistance Contract is

executed by the municipality proposing the project and DEC, pursuant to ECL 56-0503.

3. For the BCP, after approval of an application by DEC a brownfield site cleanup agreement executed between the applicant and DEC, pursuant to ECL 27-1409.

4. For the VCP, after approval of an application, an oversight document may include: a voluntary cleanup agreement executed by the volunteer and DEC.

5. For Federal Superfund sites, federal consent decrees, administrative orders on consent are entered into or unilateral orders are issued pursuant to CERCLA.

6. For the programs identified in subdivision (b) above, an order on consent or stipulation pursuant to Article 12 of the Navigation Law would be executed, except for underground storage tank closures performed pursuant to section 5.5, which are exempt from this requirement.

7. For any other remedial programs implemented or overseen by DER, a Department-approved oversight document.

1.3 Definitions

(a) Many of the definitions set forth in this section are derived from either the ECL or 6 NYCRR 375 and these are identified with a reference following the definition. Should changes to the definition in either source be made, the applicable new definition is to be used.

1. In addition to the definitions of words and terms used in this guidance in this section, a glossary of terms specific to quality assurance and analytical methods is included in section 2.4

2. Acronyms for the various rules and regulations cited are provided on the DEC website.

(b) The following words and terms, when used in this guidance, will have the meanings set forth below, unless the context clearly indicates otherwise.

1. **"Area of concern" or "AOC"** means any existing or former location at a site where contaminants are known or suspected to have been discharged which is considered a source area. These include locations where contaminants were generated, manufactured, refined, transported, stored, handled, treated, disposed or where they have or may have migrated.

2. **"Concentrated solid or semi-solid hazardous wastes"** means solid or semi-solid hazardous wastes present in surface or subsurface soil, surface water, sediment or groundwater in a concentrated form, such as precipitated metallic salts, metal oxides, or chemical sludges. [see 6 NYCRR 375-1.2(f)]

3. **"Confirmation sample"** means a sample taken during the course of a remedial action to determine whether cleanup requirements have been achieved or whether further remediation is required. For a final delineation sample, the analysis must be by an ELAP-accredited laboratory.

4. **"Contaminant"** means hazardous waste and/or petroleum as such terms are defined in paragraphs 25 and 43 below. [see 6 NYCRR 375-1.2(g)]

5. **"Contamination" or "contaminated"** means the presence of a contaminant in any environmental media, including soil, surface water, sediment, groundwater, soil vapor, ambient air or indoor air. [see 6 NYCRR 375-1.2(h)]

6. **"Data Usability Summary Report" or "DUSR "** means a document that provides a thorough evaluation of the analytical data to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and use.

7. **"Days"** means calendar days. [see 6 NYCRR 375-1.2(i)]

8. **"Dense Non-Aqueous Phase Liquid" or "DNAPL"** means a liquid contaminant that is denser than water and does not dissolve or mix easily in water. DNAPL is a non-aqueous phase or immiscible liquid which remains as a separate phase or layer and has a specific gravity greater than water. A DNAPL has the potential to sink through a formation until it pools on a confining unit or is immobilized as a residual. Unlike LNAPLs, DNAPLs may flow down the slope of the aquifer bottom independent of the direction of the hydraulic gradient.

9. **"Deed restriction"** means an encumbrance on the property that controls the use of the property. The restriction runs with the land in favor of the State and contains the use restriction(s) and/or any prohibition(s) on the use of land in a manner inconsistent with engineering controls.

10. **"DER"** means DEC's Division of Environmental Remediation.

11. **"Disposal"** means the abandonment, discharge, deposit, injection, dumping, spilling, leaking or placing of any contaminant so that such contaminant or any related constituent thereof may enter the environment. Disposal also means the thermal destruction of a contaminant and the burning of a contaminant as fuel for the purpose of recovering usable energy. [see 6 NYCRR 375-1.2(k)]

12. **"Documentation sample"** means a sample taken after remedial action is complete to document the level of contamination remaining. For example, if the remedial objective specifies the treatment or removal of a specific volume of soil instead of a cleanup level, documentation samples are taken so that the level of any remaining contaminants is known. For a final delineation sample, the analysis must be by an ELAP-accredited laboratory.

13. **"Ecological resources"** means all flora and fauna and the habitats (natural or human-made) that support them, excluding such biota as pets, livestock, agricultural and horticultural crops. Ecological resource may include:

i. endangered species, threatened species and species of special concern listed by DEC as provided in 6 NYCRR 182 and 193.3;

ii. a significant coastal fish and wildlife habitat that is designated by New York State under Article 42 of the Executive Law and regulated under 19 NYCRR 602.5(a);

iii. a significant habitat or ecological communities designated by the New York State Natural Heritage Program; or

iv. a wild, scenic or recreational river or river segment designated under ECL Article 15 and regulated under 6 NYCRR 666.4.

14. **"Emergency"** means a spill, or other event or condition, whether natural or human-made, as a result of which a release or threatened release of contamination presents an immediate threat to life, health, property, or natural resources. [see 6 NYCRR 375-1.2(n)]

15. **"Emergency response action" or "Emergency interim remedial measure"** means an action taken which requires immediate containment and/or remedial actions to ensure that a release or potential release does not threaten the immediate health and safety of humans and/or the environment.

16. **"Engineering control" or "EC"** means any physical barrier or method employed to actively or passively contain, stabilize, or monitor contamination, restrict the movement of contamination to ensure the long-term effectiveness of a remedial program, or eliminate potential exposure pathways to contamination. Engineering controls include, but are not limited to, pavement, caps, covers, subsurface barriers, vapor barriers, slurry walls, building ventilation systems, fences, access controls, provision of alternative water supplies via connection to an existing public water supply, adding treatment technologies to such water supplies, and installing filtration devices on private water supplies. [see 6 NYCRR 375-1.2(o)]

17. **"Environment"** means any water including surface or groundwater, sediment, water vapor, any land including land surface or subsurface, air including soil vapor, fish, wildlife, other biota, all other natural resources and humans. [see 6 NYCRR 375-1.2(p)]

18. **"Environmental easement"** means an interest in real property, created under and subject to the provisions of ECL Article 71, Title 36 which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls, provided that no such easement shall be acquired or held by the state which is subject to the provisions of article 14 of the constitution of the State of New York. [see 6 NYCRR 375-1.2(q)]

19. **"Exposure pathway"** means the route through which a human or biota may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure, and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

20. **"Feasible"** means suitable to site conditions, capable of being successfully carried out with available technology, implementable and cost effective. [see 6 NYCRR 375-1.2(s)]

21. **"Final engineering report" or "FER"** means a report prepared to document implementation of the complete remedial program, including the necessary certifications for it. The scope of the FER will vary to reflect the manner in which the remedial program was implemented for the entire site.

22. **"Free product"** means an immiscible non-aqueous phase liquid, other than a DNAPL, present as a liquid, in surface or sub-surface soil, surface water or groundwater in a potentially mobile state.

23. **"Grossly contaminated media"** means soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of NAPL that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise

readily detectable without laboratory analysis. [see 6 NYCRR 375-1.2(u)]

24. **"Groundwater"** means water below the land surface in a saturated zone of soil or rock. This includes perched water separated from the main body of groundwater by an unsaturated zone. [see 6 NYCRR 375-1.2(v)]

25. **"Hazardous waste"** means a waste which appears on the list or satisfies the characteristics promulgated by the Commissioner pursuant to ECL 27-0903 and any substance which appears on the list promulgated pursuant to ECL 37-0103; provided, however, that the term "hazardous waste" does not include:

i. natural gas, natural gas liquids, liquefied natural gas, synthetic gas usable for fuel, or mixtures of natural gas and such synthetic gas; nor

ii. the residue of emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; nor

iii. source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established under section 170 of such act (42 USC 2210) or, for the purpose of section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or any other response action, any source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 USC 7912(a)(1) or 7942(a); nor

iv. petroleum as defined in paragraph 44 below, even if appearing on the list promulgated pursuant to ECL 37-0103. [see 6 NYCRR 375-1.2(w)]

26. **"Historic fill material"** means non-indigenous or non-native material, historically deposited or disposed in the general area of, or on, a site to create useable land by filling water bodies, wetlands or topographic depressions, which is in no way connected with the subsequent operations at the location of the emplacement, and which was contaminated prior to emplacement. Historic fill may be solid waste including, but not limited to, coal ash, wood ash, municipal solid waste incinerator ash, construction and demolition debris, dredged sediments, railroad ballast, refuse and land clearing debris, which was used prior to October 10, 1962. Any soil or soil-like wastes from any area which was operated by a municipality or other person as a landfill is not considered historic fill. For purposes of a remedial program, historic fill does not include any material which is chemical production waste or waste produced on the site from processing of metal or mineral ores, residues, slag or tailings. [see 6 NYCRR 375-1.2(x)]

27. **"Inorganic analyte" or "metal"** means non-organic compounds/elements as identified as target analyte list analytes in the United States Environmental Protection Agency (USEPA) "Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration" (ILM05.3) and also identified in Part II of Exhibit C of the current DEC Analytical Services Protocol.

28. **"Institutional control" or "IC"** means any non-physical means of enforcing a restriction on the use of real property that limits human or environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of a remedial program or with the effectiveness and/or integrity of site management activities at or pertaining to a site. [see 6 NYCRR 375-1.2(aa)]

29. **"Interim remedial measure" or "IRM"** means activities to address both emergency and non-emergency site conditions, which can be undertaken without extensive investigation and evaluation, to prevent, mitigate or remedy environmental damage or the consequences of environmental damage attributable to a site, including, but not limited to, the following activities: construction of diversion ditches; collection systems; drum removal; leachate collection systems; construction of fences or other barriers; installation of water filters; provision of alternative water systems; the removal of source areas; or plume control. [see 6 NYCRR 375-1.2(ab)]

30. **"Light non-aqueous-phase liquid" or "LNAPL"** means a liquid contaminant that is lighter than water and does not dissolve or mix easily in water. LNAPL is a non-aqueous-phase or immiscible liquid which remains as a separate phase or layer and has a specific gravity less than water. Because LNAPLs are less dense than water, they tend to float on top of the water table and are also commonly referred to as a floating product.

31. **"Monitored natural attenuation" or "MNA"** is the process by which a natural systems ability to attenuate contaminant(s) at a specific site is confirmed, monitored and quantified. Contaminant concentrations may attenuate in natural systems through biodegradation; sorption; volatilization; radioactive decay; chemical or biological stabilization; transformation; dispersion; dilution and/or the destruction of contaminants.

32. **"Natural resource"** means all land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the State.

33. **"Natural resource damages" or "NRD"** means the amount of money necessary to restore, rehabilitate, replace or otherwise compensate for the injury to, destruction of, loss of or loss of use of natural resources, including the reasonable costs of assessing or determining the damage, which shall be recoverable by the designated trustees for natural resources pursuant to the CERCLA.

34. **"Natural resource injury"** means an observable (i.e. qualitative) or measurable (i.e. quantitative) adverse change in a natural resource or any impairment of a human or ecological service provided by that resource relative to baseline, reference, or control conditions.

35. **"Non-aqueous-phase liquid" or "NAPL"** means a contaminant that is a liquid which may be denser or lighter than water and does not mix easily or dissolve in water, but remains as a separate phase. [see 6 NYCRR 375-1.2(ac)]

36. **"NYSDOH"** means the New York State Department of Health.

37. **"Off-site contamination"** means any contamination which has emanated from a remedial site beyond the real property boundaries of such site, via movement through air, indoor air, soil, surface water or groundwater. [see 6 NYCRR 375-1.2(ad)]

38. **"On-site contamination"** means any contamination located within the real property boundaries of a remedial site. [see 6 NYCRR 375-1.2(ae)]

39. **"Operable unit"** means a portion of the remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat

of release or exposure pathway resulting from the site contamination. Operable units may address geographical portions of a site, media-specific action, specific site problems or an initial phase of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site. An operable unit may be proposed by DEC or a remedial party; however, only DEC can approve the use of operable units. [see 6 NYCRR 375-1.2(af)]

40. **"Oversight document"** means any order, agreement, stipulation or state assistance contract entered into by DEC as set forth in subdivision 1.2(d) of this guidance to define the role of a person implementing in the investigation and/or remediation of a site or area(s) of concern.

41. **"Periodic review report" or "PRR"** means a report which evaluates the institutional and engineering controls, summarizes any monitoring results and/or evaluates any operation and maintenance activities.

42. **"Person"** means an individual, trust, firm, joint stock company, limited liability company, corporation, joint venture, partnership, association, state, municipality, commission, political subdivision of a state, public benefit corporation or any interstate body. Provided however, a person shall not include a person as defined in ECL 27-1323. [see 6 NYCRR 375-1.2(ag)]

43. **"Petroleum" or "Oil"** means petroleum as defined by Article 12 Section 172 of the NYS Navigation Law or Article 17, Title 10 of the ECL, specifically oil or petroleum of any kind and in any form including but not limited to, oil, petroleum, fuel oil, oil sludge, oil refuse, oil mixed with other wastes and crude oils, gasoline, kerosene and dielectric fluids. For purposes of this guidance, oil includes mineral oils or any other oil for which an investigation and/or remediation is determined necessary by DER to address a spill discharge or any disposal impacting public health and the environment.

44. **"Petroleum remediation project"** means those petroleum related sites which are determined to be subject to this guidance in accordance with paragraphs 1.2(b)1 and 2.

45. **"Plume-management monitoring" or "PMM"** is the process by which a dissolved groundwater plume, which has yet to reach equilibrium with the processes of natural attenuation, is monitored to ensure that it does not cause an unacceptable impact.

46. **"Presumptive remedy"** means technologies or approaches appropriate for the remediation of specific types of contamination which, based on historical patterns of remedy selection and DEC's scientific and engineering evaluation of performance data, can be used to accelerate the remedy selection process. [see 6 NYCRR 375-1.2(ai)]

47. **"Professional engineer" or "PE"** means an individual or firm licensed or otherwise authorized under article 145 of the education law of the State of New York to practice engineering. [see 6 NYCRR 375-1.2(aj)]

48. **"Project manager"** means the DER staff member with primary responsibility for ensuring that an investigation or remediation was completed in accordance with the applicable sections of this guidance, using appropriate professional judgment and experience to ensure the goals and objectives of a given remedial program are achieved.

49. **"Qualified environmental professional"** means a person, including a firm headed by such person, who possesses sufficient specific education, training, and experience necessary to exercise professional judgment to develop opinions and conclusions regarding the presence of releases or threatened releases to the surface or subsurface of a site or off-site areas, sufficient to meet the objectives and performance factors for the areas of practice identified by this guidance. Such a person must:

i. hold a current professional engineer's or a professional geologist's license or registration and have the equivalent of three (3) years of full-time relevant experience in site investigation and remediation of the type detailed in this guidance; or

ii. be a site remediation professional licensed or certified by the federal government, a state or a recognized accrediting agency, to perform investigation or remediation tasks identified by this guidance, and have the equivalent of three (3) years of full-time relevant experience. Examples of such license or certificate include the following titles:

(1) Licensed Site Professional, by the State of Massachusetts;

(2) Licensed Environmental Professional, by the State of Connecticut;

(3) Qualified Environmental Professional by the Institute of Professional Environmental Practice; or

(4) Certified Hazardous Materials Manager, by the Institute of Hazardous Materials Management.

50. **"Qualitative exposure assessment"** means an evaluation to determine the route, intensity, frequency, and duration of actual or potential exposures of humans and/or fish and wildlife to contaminants.

51. **"Quality assurance"** means the total integrated program for assuring the reliability of monitoring and measurement data which includes a system for integrating the planning, assessment and improvement efforts to meet data end use data quality requirements.

52. **"Quality assurance project plan" or "QAPP"** means a document which presents in specific terms the policies, organization, objectives, functional activities and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of a specific project or operation.

53. **"Quality control"** means the routine application of procedures for attaining prescribed standards of performance in the monitoring and measurement process.

54. **"Receptor"** means any humans or biota which are, or may be expected to be, or have been, exposed to or affected by a contaminant from a site.

55. **"Regulated wetland"** means any tidal or freshwater wetland regulated by New York State under ECL Articles 15, 24 and 25 and as defined in 6 NYCRR 608.5, 661.4(hh) and 663.2(p)

56. **"Release"** means any pumping, pouring, emitting, emptying or leaching, directly or indirectly, of a contaminant so that the contaminant or any related constituent thereof, or any degradation product of such a contaminant or of a related constituent thereof, may enter the environment, or the disposal of any contaminant. [see 6 NYCRR 375-1.2(am)]. This includes discharges from a pipe, except discharges pursuant to and in compliance with the conditions of a valid state or

federal permit, in addition to those discharges exempted from a permit, in accordance with 6 NYCRR 375-1.12.

57. **"Remaining contamination"** means contamination which is left in media at a site following implementation of the remedy.

58. **"Remedial action"** means those actions taken at or near a site as may be required by DER, including, without limitation, sampling, removal, treatment, containment, transportation, securing, or other engineering or institutional controls, whether of a permanent nature or otherwise, designed to ensure that any discharged contaminant is remediated in compliance with the applicable decision document, pursuant to Chapter 5 of this document.

59. **"Remedial investigation" or "RI"** means a process undertaken to determine the nature and extent of contamination at a site or operable unit of a site. The RI emphasizes data collection and site characterization (SC), and generally is performed in support of the selection of a remedy. The scope of a RI is more fully described at 6 NYCRR 375-1.8(e) and in Chapter 3.

60. **"Remedial party"** means a person implementing a remedial program at a remedial site pursuant to an oversight document as set forth in 1.2(d). [Note: Actions required of the remedial party may also be undertaken by the person(s) (for example, a contractor or consultant) actually undertaking the investigation and/or remediation for a site owner, responsible party, volunteer, by the USEPA for federally funded sites or by DER for state funded sites.]

61. **"Remedial program"** means all activities undertaken to investigate, design, eliminate, remove, abate, control, or monitor existing health hazards, existing environmental hazards, potential health hazards, potential environmental hazards in connection with a site, and all activities including, but not limited to, the following undertaken to manage waste and contamination from a site:

i. SC and RI activities needed to develop and evaluate remedial alternatives;
ii. interim remedial measures;
iii. design activities;
iv. remedial actions, including, but not limited to, construction related activities and the implementation of remedial treatment technologies, including without limitation grading, contouring, trenching, grouting, capping, excavation, transporting, incineration and other thermal treatment, chemical treatment, biological treatment, or construction of groundwater and/or leachate collection and treatment facilities;
v. post-remedial site management including, but not limited to, the operation, maintenance, monitoring of remedial treatment technologies, and the certification of institutional and engineering controls;
vi. restoration of the environment;
vii. appropriate involvement by local governments and by the public; and
viii. oversight by DEC. [see 6 NYCRR 375-1.2(ap)]

62. **"Remedial site" or "Site"** means any real property consisting of a parcel, adjacent properties or parcels, or portions of properties or parcels, identified as:

i. a property being addressed under the inactive hazardous waste disposal site program (SSF);
ii. a brownfield site;

iii. an environmental restoration project, as defined by the state assistance contract;
iv. a voluntary cleanup site;
v. a petroleum remediation project; or
vi other projects identified pursuant to 1.2(a)6.

63. **"Restricted use"** means a use of a site with imposed restrictions (e.g., environmental easements, deed restrictions) which as part of the remedy selected for the site require a SMP which relies on institutional or engineering controls to manage exposure to contamination remaining at a site. Restricted use can include residential, restricted residential, commercial or industrial uses.

64. **"Sediment"** means unconsolidated particulate material found at the bottom of lakes, rivers, streams and other water bodies at bed elevations equal to or lower than the mean high water level as defined in 6 NYCRR 608.1(r). [Note: Materials present in enclosed sumps, sewers or piping systems not accessible to fish and wildlife and not forming any benthic or aquatic habitat are not considered sediments for the purpose of comparison to DEC's *Technical Guidance for Screening Contaminated Sediment*.]

65. **"Semi-volatile organic compound" or "SVOC"** means organic compounds amenable to analysis after extraction of the sample with an organic solvent. For the purposes of this guidance, semi-volatiles are those target compound list compounds identified in the USEPA *Contract Laboratory Program Statement of Work for Organics Analysis; Multi-Media, Multi-Concentration* (OLM04.2) and also identified in Part I of Exhibit C of the current DEC Analytical Services Protocol.

66. **"Site characterization" or "SC"** means the first phase in the process of identifying areas of concern at a site, which is conducted pursuant to Chapter 3 of this guidance.

67. **"Site management"** means the activities undertaken as the last phase of the remedial program at a site which continue after a certificate of completion (closure letter) is issued. Site management is conducted in accordance with a site management plan, which identifies and implements the institutional and engineering controls required for a site, as well as any necessary monitoring and/or operation and maintenance of the remedy. [see 6 NYCRR 375-1.2(at)]

68. **"Site management plan" or "SMP"** means a document which details the institutional and engineering controls required for a site and any physical components of the remedy required to be operated, maintained and monitored to assure continued effectiveness, developed pursuant to Chapter 6.

69. **"Site-specific background concentration"** means the concentration of an element, chemical or contaminant in an environmental medium present at a site that has been determined following an approved sampling and analysis plan to be either due to natural conditions or to be widespread regionally and not attributable to the site.

70. **"Source area" or "source"** means a portion of a site or area of concern at a site where the investigation has identified a discrete area of soil, sediment, surface water or groundwater containing contaminants in sufficient concentrations to migrate in that medium, or to release significant levels of contaminants to another environmental medium, which could result in a threat to public health and the environment. A source area typically includes, but is not limited to, a portion of a site where a substantial quantity of any of the following is present:

i. concentrated solid or semi-solid hazardous substances;
ii. non-aqueous phase liquids; or
iii. grossly contaminated media. [see 6 NYCRR 375-1.2(au)]

71. **"Standards, Criteria and Guidance" or " SCGs"** mean standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with, and with consideration being given to guidance determined, after the exercise of scientific and engineering judgment, to be applicable. This term incorporates both the CERCLA concept of "applicable or relevant and appropriate requirements" (ARARs) and the EPA's "to be considered" (TBCs) category of non-enforceable criteria or guidance. The most common applicable SCGs are identified on the DEC website identified in the table of contents. For purposes of this Guidance, "soil SCGs" means the soil cleanup objectives and supplemental soil cleanup objectives identified in 6 NYCRR 375-6.8 and the Commissioner Policy on *Soil Cleanup Guidance* (CP-Soil).

72. **"Substantive technical permit requirements"** means those requirements that have a direct bearing on the action to be taken and relate to the technical (scientific) aspects of the action rather than the administrative procedures of obtaining a permit. Also see section 1.10.

73. **"Toxicity assessment"** means a field study, laboratory study and/or literature review conducted to determine the concentration at which a contaminant becomes toxic to an individual or an organism. A contaminant is considered toxic if it causes death, morbidity or sub-lethal effects on growth, reproduction, behavior or physiology of an organism, whether through direct or indirect toxicity or through bioaccumulation.

74. **"Underground storage tank"** means any tank or other vessel that has at least 10 percent of its volume underground. Tanks in subterranean vaults accessible for inspections are not considered underground storage tanks.

75. **"Unrestricted use"** means use without imposed restrictions such as environmental easements, deed restrictions or other land use controls.

76. **"Volatile organic compound" or "VOC"** means organic compounds as identified as target compound list compounds in the USEPA *Contract Laboratory Program Statement of Work for Organics Analysis; Multi-Media, Multi-Concentration"* (OLM04.2) or identified in Part I of Exhibit C of the current DEC Analytical Services Protocol.

77. **"Waste"** means any garbage, refuse, sludge from a waste water treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, whether or not such material may eventually be used for some other purpose, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations or from community activities, and source, special nuclear or by-product material as defined in the Atomic Energy Act of 1954, as amended, except as may be provided by existing agreements between the State of New York and the government of the United States, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under ECL Article 17. [see 6 NYCRR 375-1.2(aw)]

78. **"Waste oil"** means used engine lubricating oil or any other oil, including but not limited

to: fuel oil, motor oil, hydraulic fluid, dielectric fluid, gear oil, cutting oil, transmission fluid, oil storage tank residue, animal oil and vegetable oil, which has been contaminated by physical and/or chemical impurities and has not been subsequently refined.

79. **"Waters"** means all lakes, bays, sounds, ponds, impounding reservoirs, groundwater, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial limits of the State of New York and all other bodies of water, natural or artificial, inland or coastal, fresh or salt, public or private, which are wholly or partially within or bordering the state or within its jurisdiction.

80. **"Wetland"** means any freshwater or tidal wetland including federal jurisdictional wetlands, NYS regulated wetlands and unregulated wetlands.

1.4 Notification

(a) Notification process. The remedial party, unless otherwise specified, should notify DER in the manner set forth by this subdivision.

1. These notifications should be in writing and provided in the time frames identified for the notice in subdivisions (b) to (d) below. The notification must include the following information:

i. name and address of the person responsible for implementing the remedial program;

ii. name of the site;

iii. DER site identification number;

iv. street address of the site;

v. nature of the:

(1) change of use being reported, in accordance with subdivision (b) below;
(2) element of the field activities associated with a remedial program or other planned activities subject to a SMP to be performed, in accordance with subdivision (c) below; or
(3) emergency action undertaken at the site, in accordance with subdivision (d) below; and

vi. anticipated start date of the actions identified in subparagraph v above.

2. The information required to be sent to DER should be submitted to the assigned project manager or, if no project manager is assigned, to the following address:

DEC
Division of Environmental Remediation
Site Control Section
625 Broadway
Albany, NY 12233

3. These notifications are not intended to satisfy the citizen participation requirements applicable to sites being investigated or remediated pursuant to any of the programs to which this guidance is applicable, which are provided in DER-23 *Citizen Participation Handbook for Remedial Programs.*

4. No provisions of this guidance alter the notification requirements of:

i. any statute or any regulation, including but not limited to Navigation Law 175; ECL Title 14, 17-1007, 17-1743 or 40-011; and/or

ii. an order, agreement or permit that requires notifications or any additional notices required by the applicable programs identified in subdivisions 1.2(a) or (b).

(b) Change of use notification. Notice is to be made at least 60 days before a change of use for all programs.

1. For the programs set forth in paragraphs 1.2(a)1 through 3:

i. a change of use is defined at 6 NYCRR 375-2.2(a), 3.2(d) or 4.2(b), respectively; and

ii. requires that the notice be made at least 60 days before the change of use, pursuant to the provisions of 6 NYCRR 375-1.11(d).

2. For the programs set forth in paragraphs 1.2(a)4-6 and 1.2(b)1-4 a notice consistent with the notice requirements pursuant to 6 NYCRR 375-1.11(d) is required for a change of use as defined at 6 NYCRR 375-3.2(d) at least 60 days before the change of use.

(c) Notification regarding the start of any field activities associated with a remedial program, including those planned activities conducted during site management. Notice is to be made seven (7) calendar days prior to the actual start of any such field activities. The notice is to be made in accordance with subdivision (a) above and include a schedule of the work. Subsequent 7-day notices and work schedules will be required where the work is to proceed in phases not subject to the initial schedule provided.

1. Field activities associated with an ongoing remedial program for which a schedule has been approved as part of a work plan prepared pursuant to this guidance, where the schedule is current, are exempted from this additional reporting.

2. The remedial party must also notify DEC's Division of Fish Wildlife and Marine Resources at least 7 calendar days prior to the initiation of any field work or biota sampling related to the Fish and Wildlife Resources Impact Analysis (FWRIA). The notification should contain the

information listed in (a)1 above.

3. Any action undertaken as part of the ongoing site management (e.g., an excavation plan) not considered an emergency action in accordance with subdivision (d) below, requires notification to the parties set forth in subdivision (a) above, and must include:

i. a detailed description of the work, including:

(1) plans for any intrusive elements or utilities to be installed in the subsurface prior to the implementation of the remedy at a site; and/or

(2) impact any engineering control or other component of the site remedy;

ii. a summary of environmental conditions anticipated in the work areas, including but not limited to the nature and concentrations of contaminants of concern, and potential presence of contaminated soil or groundwater; and

iii. a schedule for the work detailing the start and completion of intrusive elements of the proposed work.

(d) Emergency action notification. Notification of actions undertaken in response to an emergency situation for which prior written notice could not be provided is to be made in accordance with 6 NYCRR 375-1.5(b)1.

1. Emergency response actions or emergency IRMs are:

i. situations as defined in paragraph 1.3(b)15; or

ii. those actions undertaken in response to the need for emergency repairs to utilities or other site infrastructure.

2. The initial verbal report is to be made by noon of the next business day, upon knowledge of any condition posing an emergency, to the regional remediation engineer for the region in which the site is located and to the identified site project manager.

3. In addition, a written notice, as set forth in subdivision (a) above, is to be provided within seven (7) business days.

(e) The remedial party must notify DER if it is determined during the investigation or remediation of the site that contamination has migrated onto such site from another property or when a spill, release or underground storage tank is identified. No provisions of this guidance should be construed to alter the notification requirements of Navigation Law 175.

1.5 Certifications

(a) All documents, which are prepared in final form in accordance with this guidance for submission to DER for approval, are to be prepared and certified in accordance with the applicable statute and/or regulations identified in section 1.2.

1. Persons preparing and certifying the various work plans and reports identified in Table 1.5 below include:

i. New York State licensed professional engineers, as defined at 6 NYCRR 375-1.2(aj) and paragraph 1.3(b)47;

ii. qualified environmental professionals as defined at 6 NYCRR 375-1.2(ak) and paragraph 1.3(b)49;

iii. remedial parties, as defined at 6 NYCRR 375-1.2(ao) and .paragraph 3(b)60; or

iv. site owners, which are the owners of the property comprising the site at the time of the certification.

2. A person who does not meet the definition of a professional engineer or a qualified environmental professional may assist in the conduct of all appropriate investigation or remediation activities in accordance with this document, if such person is under the supervision or responsible charge of a person meeting the definition provided above.

3. Other plans or reports which may be prepared for submission to DER as part of a remedial program, to which these certification requirements do not apply, include:

i. Health and safety plans. All health and safety plans submitted in response to section 1.9 are to be prepared, signed and implemented by a certified industrial hygienist by the American Board of Industrial Hygiene, a certified safety professional by the Board of Certified Safety Professionals or other qualified person pursuant to 29CFR1910.120. This requires the decision-making skills of a qualified health and safety professional with practical hazardous waste site experience. The person developing your plan should have the knowledge and skills necessary to identify and evaluate the range of hazards associated with hazardous waste site operations. In addition, this individual must be qualified to identify the appropriate monitoring and exposure controls necessary for employee protection based on the contaminants and other hazards anticipated onsite.;

ii. Fish and Wildlife Resources Impact Analysis. A FWRIA submitted pursuant to section 3.10 is to be conducted by a qualified biologist, ecologist or other qualified professional experienced in habitat assessment and assessment of contaminant impacts. The FWRIA should document the education and experience of the professional conducting the FWRIA; and

iii. when a phase I or II environmental site assessment report, prepared in accordance with the applicable ASTM standards, which was conducted prior to a site entering one of the remedial programs identified in section 1.2, is provided in lieu of a records search report, no certification beyond what may be called for by ASTM is required.

4. Table 1.5 Identification of Persons Certifying and Required Certifications.

Table 1.5 Identification of Persons Certifying and Required Certifications		
Work Plans and Reports		
Document	**Certified by**	**Certification**
1. Work plans prepared pursuant to section 3.3.	QEP	1.5(b)1
2. The following reports: i. records search reports pursuant to section 3.12; ii. site characterization reports pursuant to section 3.13; iii. site characterization investigation data summary pursuant to subdivision 3.13(f); or iv. remedial investigation reports pursuant to section 3.14.	QEP	1.5(b) 2
3. Remedy selection reports prepared pursuant to section 4.4.	NYSPE	1.5(b) 2
4. Interim remedial measure (IRM) design or an IRM design work plans for remedial treatment system, pursuant to sections 5.2 or 5.3, unless the IRM is solely for a soil vapor mitigation system as described in item 6 below.	NYSPE	1.5(b) 1
5. Remedial design work plans and remedial designs pursuant to section 5.2 or remedial action work plans pursuant to section 5.3; i. pre-design or design investigations; ii. pumping tests; and/or iii. pilot studies.	NYSPE	1.5(b) 1
6. Soil vapor mitigation systems: i. if a design or remedial work plan is required for their installation; or ii. with the approval of DER, a contractor who has met certain requirements and is trained to identify and mitigate radon intrusion in buildings may install without a design (see subdivision (c) below).	i. NYSPE ii. See 1.5(c)	i. 1.5(b) 2 ii. None
7. IRM construction completion reports, including as-built drawings, prepared pursuant to section 5.8.	NYSPE	1.5(b) 3
8. Construction completion reports for operable units or construction phases, including as-built drawings, prepared pursuant to section 5.8.	NYSPE	1.5(b) 3
9. SMPs prepared pursuant to section 6.2	NYSPE	1.5(b) 2
10. FERs, including as-built drawings, prepared pursuant to section 5.8.	NYSPE	1.5(b) 4
11. Underground storage tank closure reports for closures performed in accordance with section 5.5.	QEP	1.5(b) 2
12. Underground storage tank closure reports for the closure of underground storage tanks which are not performed pursuant to section 5.5	NYSPE	1.5(b) 3
13. Underground storage tank waiver of sampling requirements certifications prepared pursuant to clause 5.5(c)3.v.(3).	NYSPE	1.5(b) 2

Periodic Review Reports		
Document	**Certified by**	**Certification**
14. Periodic review reports prepared pursuant to subdivision 6.3(b), in those instances where an engineering evaluation of engineering controls is required to certify the IC/ECs.	NYSPE	1.5(b) 5
15. Periodic review reports prepared pursuant to subdivision 6.3(b), in those instances where an engineering evaluation of the engineering controls is not required to certify the IC/ECs.	QEP	1.5(b) 5
16. Periodic review reports prepared pursuant to subdivision 6.3(b), in those instances where the certification relates solely to land or groundwater use restrictions (i.e. there are no engineering controls and/or monitoring).	RP or SO	1.5(b) 5
17. To the certifications for 14 and 15 above, for a site under the BCP program which has been determined by DER not to represent a significant threat to public health and the environment and where contaminants in groundwater at the site boundary contravene drinking water standards: i. add the additional statement (f); and ii. in addition every five years also add statement (g).	QEP	 i. 1.5(b) 6.i ii. 1.5(b) 6.ii
QEP = Qualified Environmental Professional **NYSPE**=New York State Professional Engineer		**RP** = Remedial Party **SO** = Site Owner

(b) All reports and work plans identified in Table 1.5, prepared in accordance with this guidance, will use one of the certifications provided by this subdivision. The appropriate certification must be included on the title page of all submissions of the document (so it can be reviewed along with the rest of the document) and must be fully executed when a submission of the document is made by the remedial party to DER for approval.

1. For a work plan:

"I _____certify that I am currently a [NYS registered professional engineer or Qualified Environmental Professional as defined in 6 NYCRR Part 375] and that this Report [Remedial Design, Remedial Action Work Plan] was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).";

2. For a report/design document:

"I _____certify that I am currently a [NYS registered professional engineer or Qualified Environmental Professional as defined in 6 NYCRR Part 375] and *that this Report [Remedial Design, Remedial Action Work Plan] was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.";* or

3. For a construction completion report or a UST closure report not performed in accordance with section 5.5. The NYS registered professional engineer certifying:

i. does not have to have been personally in charge of all others engaged by the firm in the implementation of the project, rather was the person in the firm with direct responsibility for the personnel engaged in the inspection and engineering provided by the firm to assure the implementation of the project by the construction contractor was in accordance with the approved remedial design or remedial action work plan, including the engineering review of all contractor submittals and field changes approved for the project;

ii. to the implementation of the work under the firms oversight is attesting to work having been performed by the construction contractor in accordance with the approved remedial design or remedial action work plan, including the engineering review of all contractor submittals and field changes approved for the project; and

iii. will use the following certification:

"I _____certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan (or Remedial Design or Plans and Specifications) was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan (or Remedial Design or Plans and Specifications).

If the Remedial Action Work Plan (or Remedial Design or Plans and Specifications) identifies time frames to be achieved by the remedial program, the certification must include: The data submitted to DER demonstrates that the remediation requirements set forth in the Remedial Work Plan (or Remedial Design or Plans and Specifications) and all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, are established in the work plan(or Remedial Design or Plans and Specifications)."

4. For the final engineering report. The NYS registered professional engineer certifying:

i. does not have to have been personally in charge of all others engaged by the firm in the implementation of the project, rather was the person in the firm with direct responsibility for the personnel engaged in the inspection and engineering provided by the firm to assure the implementation of the project by the construction contractor was in accordance with the approved remedial design or remedial action work plan, including the engineering review of all contractor submittals and field changes approved for the project;

ii. to the implementation of the work under the firms oversight is attesting to work having been performed by the construction contractor in accordance with the approved remedial design or remedial action work plan, including the engineering review of all contractor submittals and field changes approved for the project; and

iii. will use the following certification:

"I _____certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan (or Remedial Design or Plans and Specifications) was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan (or Remedial Design or Plans and Specifications).

If the Remedial Action Work Plan (or Remedial Design or Plans and Specifications) identifies time frames to be achieved by the remedial program, the certification must include: The data submitted to DER demonstrates that the remediation requirements set forth in the Remedial Work Plan (or Remedial Design or Plans and Specifications) and all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established in the work plan (or Remedial Design or Plans and Specifications)."

If the remedial program requires ICs or ECs, the certification must include: *"All use restrictions, institutional controls, engineering controls and/or any operation and maintenance requirements applicable to the site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 and that any affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded."*

If the remedial program requires applicable SMP, the certification must include: *"A Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of any engineering controls employed at the site including the proper maintenance of any remaining monitoring wells, and that such plan has been approved by DER."*

If the remedial program requires financial assurance, the certification must include: *"Any financial assurance mechanisms required by DEC pursuant to Environmental Conservation Law have been executed."*

5. For the periodic review report for those site remedial programs undertaken pursuant to subdivision 1.2(a), where an institutional control/engineering control (IC/EC) certification is to be provided:

"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

(a) the institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by DER;

(b) nothing has occurred that would impair the ability of such control to protect public health and the environment;

(c) nothing has occurred that would constitute a violation or failure to comply with any Site Management Plan for this control;

(d) access to the site will continue to be provided to DER to evaluate the remedy, including access to evaluate the continued maintenance of this control; and

(e) if a financial assurance mechanism is required under the oversight

document for the site, the mechanism remains valid and sufficient for their intended purpose under the document [certifier may delete this clause if no financial assurance is required for the remedial program and re-letter the certification accordingly].

6. For a site in the BCP program, which DER has been determined does not represent a significant threat to public health and the environment and where contaminants in groundwater at the site boundary contravene drinking water standards:

i. the following statement (f) will be added to the certification identified in paragraph 5 above:

"(f) no new information has come to the remedial party (site owners) attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of offsite contamination are no longer valid "; and

ii. in addition every five years the following statement (g) will be added to the certification:

"(g) the assumptions made in the qualitative exposure assessment remain valid".

(c) Exemption for the design of soil vapor mitigation systems. As noted in Table 1.5 line 6, an exemption is available whereby a contractor who has met the certification requirements of this subdivision and is trained to identify and mitigate radon intrusion into buildings, with the approval of DER, may install such systems without a design prepared and certified by a NYS professional engineer.

1. The certifications required are:

i. Certified Residential Mitigation Provider, by the National Environmental Health Association - National Radon Proficiency Program; or

ii Certified Radon Mitigation Specialist, by the National Radon Safety Board.

2. This exemption applies solely to the installation of a mitigation system without a design, if any structural modifications are necessary to the building requiring mitigation, a NYS PE prepared and certified design will be required.

1.6 Documenting Compliance with the Technical Guidance

(a) All remedial program activities conducted are to be documented and included in reports which follow the format and contain the information described in the reporting sections of Chapters 2 through 6 and be certified as set forth in section 1.5.

1. If a report has previously been submitted to DEC pursuant to another DEC regulatory program, the previously submitted report may be submitted to DER to satisfy the applicable

requirements.

2. Multiple reports may be combined into a single report.

(b) The remedial party is to submit work plans and reports pursuant to the schedule contained in the oversight document and they should comply with the format and contain the information described in Chapters 2 through 6 of this document.

(c) To provide flexibility for the investigation and remediation, DER has identified certain limited situations where alternate sampling, analytical or investigatory methods may be used with DER pre-approval.

1. The alternate methods are to be documented in the appropriate work plan. The decision whether to grant the request rests solely with DER.

2. DER will evaluate an alternate method in terms of its site-specific application, based upon the documentation provided and other appropriate information available to DER. DER will consider the extent to which the alternate method:

i. has previously been used successfully by DER or USEPA Region 2 in New York State in similar situations;

ii. reflects current technology as documented in peer-reviewed professional journals;

iii. provides results which are verifiable and reproducible;

iv. can be expected to achieve the same results or objectives as the method which it proposes to replace;

v. furthers the attainment of the goals of the specific remedial phase for which it is used; and

vi. ensures the investigation and/or remediation of a site is conducted in a manner which is protective of public health and the environment.

3. A request to use alternate methods should be initiated by the remedial party and should include:

i. the name and address, unless all are the same, of the person:

(1) submitting the request; and
(2) conducting the investigation and/or remediation;

ii. a description of the proposed alternate approach;

iii. applicable citation from this document;

iv. a description of site-specific conditions applicable to the request;

v. the technical basis for the request pursuant to this document; and
vi. any other information or data DER requests to thoroughly evaluate the request.

(d) Verbal approvals of alternative methods (e.g., field decisions) may also be granted and these field decisions should be documented as detailed in paragraph 3.2.1(c)4.

1.7 Considerations for Going Beyond the Technical Guidance

(a) DER may request additional work beyond the technical guidance set forth in this document to ensure an appropriate investigation and/or remediation of the site.

1. Reasons for such additional work include:

i. the complexity of the site geology, hydrogeology, contaminated media and/or proximity to receptors;

ii. the number or magnitude of the disposal site or areas of concern being investigated;

iii. the nature of the contaminants disposed;

iv. a change in the certification or other authorization of the laboratory performing analyses previously submitted for the site in question or any other site;

v. the identification of exposure pathways not otherwise fully investigated pursuant to these requirements;

vi. the identification of receptors not otherwise fully investigated pursuant to these requirements;

vii. distance to and sensitivity of receptors and natural resources;

viii. when DER determines that additional data or information is needed to fully evaluate or remediate the nature and extent of contamination at the site;

ix. when additional work is required pursuant to any applicable statute or regulation, including 6 NYCRR 375; and

x. any other conditions DER identifies which necessitate the need for additional activities.

2. DER may also request the use of alternative methods where the alternative method satisfies the conditions set forth in paragraph 1.6(c)2.

(b) Natural resource damages (NRD). The remedial party may elect to examine the issue of potential NRD liability early on in the remedial process. If the remedial party wishes to address their potential NRD liability at any time prior to the submission of a fish and wildlife resources impact analysis (FWRIA) Part 1, they should contact DEC's Office of General Counsel.

(c) Radiation. Should the remedial party or DER suspect radioactive contamination on a site, the guidance in this document may not be appropriate and alternative methods for assessing site conditions may need to be considered. Such sites will be investigated and remediated with DEC oversight by the Division of Solid and Hazardous Materials and the NYSDOH Bureau of Environmental Radiation Protection.

1.8 Areas of Concern at Sites

(a) A site should be organized into Areas of Concern or "AOCs" as defined in paragraph 1.3(b)1 for purposes of the investigation of the site.

(b) AOCs identified at a site may be further organized into operable units, as defined by paragraph 1.3(b)39 at the request of the remedial party, with DER approval, or by DER.

(c) AOCs may include all current, former and suspected areas of the site associated with the possible contaminant sources identified by this subdivision.

1. Bulk storage tanks and appurtenances, including, without limitation;

    i. tanks and silos;

    ii. rail cars or rail sidings at the site;

    iii. piping, above and below-ground pumping stations, sumps and pits; and

    iv. loading and unloading areas.

2. Storage and staging areas including, without limitation;

    i. storage pads and areas;

    ii. surface impoundments and lagoons;

    iii. waste piles;

    iv. dumpsters; and

    v. chemical storage cabinets or closets.

3. Drainage systems and areas, including, without limitation:

    i. building floor drains and piping, sumps and pits, including trenches and piping from sinks that potentially received process waste;

    ii. roof leaders (when process or storage operations vent to the roof or they are adjacent to air emission points);

iii. drainage swales and culverts;

iv. storm sewer and sanitary collection systems (interior or exterior);

v. storm water detention ponds and fire ponds;

vi. surface water bodies;

vii. septic systems, cesspools and leach fields; and

viii. dry wells and sumps.

4. Discharge and disposal areas, including, without limitation:

i. areas of discharges;

ii. wastewater treatment, collection and disposal systems including without limitation septic systems, seepage pits and dry wells;

iii. landfills;

iv. landfarms;

v. sprayfields;

vi. incinerators;

vii. fill areas, not defined as historic fill in accordance with paragraph 1.3(b)26; and

viii. any discharge regulated by the Underground Injection Control program.

5. Other areas of concern, including, without limitation, areas where the following are or were suspected to have been present:

i. electrical transformers and capacitors;

ii. hazardous materials storage or handling areas;

iii. waste treatment areas;

iv. discolored areas or spill areas;

v. open areas uncharacteristic of the general site cover type away from production operations;

vi. areas with stressed vegetation;

vii. other discharge areas;

viii. compressor vent discharges;

ix. non contact cooling water discharges;

x. areas that may have received flood water or storm water runoff from potentially contaminated areas;

xi. structures; and

xii. any other area suspected of containing contaminants.

(d) Areas of concern may also be associated with other media or resources impacted by contamination resulting from activities at the site or AOCs identified in subdivision (c) above.

1. Groundwater areas of concern may include, without limitation, present or past regulated activities under the New York State Pollutant Discharge Elimination System (SPDES) regulations for discharges to groundwater, including; seepage pits, dry wells, lagoons, and septic systems which may have received unauthorized discharges of waste or other contaminants in contravention of their permitted use.

2. Surface water areas of concern may include, without limitation, any area(s) of a surface water body and associated bottom and floodplain sediment on or proximate to a site, which received or may have received any point or non-point source discharge from the site.

3. Ecological resource AOCS may include, without limitation, areas where ecological resources which have been determined by DEC to constitute an important component of the environment at or in the vicinity of the site may be present. Such AOCs may include, without limitation, all biota and areas of terrestrial, aquatic and marine habitat where contaminants are, have been or are suspected to have been discharged or have migrated.

4. Soil areas of concern may include, without limitation, areas of surface or subsurface soil at a site where:

i. visual evidence of contamination is identified;

ii. distressed vegetation is present; or

iii. previous sampling has indicated contamination at levels or frequencies that exceed applicable SCGs which indicate a need for further evaluation.

1.9 Health and Safety

(a) Health and Safety Plan (HASP). Any person conducting investigation or remediation activities is required to prepare and implement a site-specific health and safety plan which will be adhered to by all personnel involved in the investigation and/or remediation at the site. The HASP is a requirement of the federal Occupational Safety and Health Administration (OSHA) and is not subject to the approval of DER.

1. The plan will be prepared by a qualified person in accordance with the most recently adopted and applicable general industry (29 CFR 1910) and construction (29 CFR 1926) standards of OSHA, the U.S. Department of Labor, as well as any other federal, state or local applicable statutes or regulations.

2. A copy of the health and safety plan (HASP) will be available at the site during the conduct of all activities to which it is applicable.

(b) Community Health and Safety Plan (CAMP). In addition to the HASP for the protection of site workers, all work plans for any intrusive activities must include a site-specific plan, the CAMP, to address community health and safety which identifies measures and/or actions to ensure that the public living and working near the site as well as employees or visitors to any facility located on the site are protected from exposure to site contaminants during intrusive activities, remedial actions or on-site treatment actions undertaken during the investigation and/or remediation of the site, including site management as detailed in subdivision (b) below.

1. At a minimum, a Community Air Monitoring Plan or "CAMP" must include the appropriate requirements identified by the NYSDOH for a site, which are included in Appendix 1A.

2. A fugitive dust/particulate monitoring program is a component of the NYSDOH community air monitoring plan described in paragraph (b)1 above and is necessary for all sites where intrusive activities are planned during the investigation and remediation of the site. Guidance for developing a fugitive dust/particulate monitoring program is included in Appendix 1B.

(c) A HASP, prepared in accordance with OSHA 1910.120, will be required by the site management plan (SMP) prepared in accordance with Chapter 6 as detailed in this subdivision.

1. The SMP, as defined in paragraph 1.3(b)68, will include a HASP and CAMP and be available at the site for use by employees of the remedial party/site owner for activities where the public using the site, surrounding community or the site workers may be exposed to remaining contamination. Such activities associated with the development, redevelopment or use of a site include those:

i. which will expose, excavate or otherwise come in contact with remaining contamination at the site

ii. related to the implementation of the monitoring plan included in the SMP (SMP); and/or

iii. related to the operation, maintenance, removal or decommissioning of any engineering controls.

2. Development of a HASP/CAMP will be required for all contractors engaged in work where the public using the site, surrounding community or the site workers may be exposed to remaining contamination including, but not limited to, activities identified in paragraph 1 above. The HASP/CAMP must:

i. comply with this subdivisions requirements or any site-specific requirements of the site SMP; and

ii. be available at the site to DER or other agencies, site workers, contractor workers and the public during the work period.

3. The CAMP should be in effect whenever:

i. the site cap or soil cover is breached, penetrated or has been temporarily removed from areas of the site;

ii. any potential for exposure to the public or site workers from the remaining contamination may result from activities subject to the SMP; and/or

iii. except as identified in paragraph 4 below, intrusive activities undertaken at a site associated with the implementation of the remedial program which are related to the investigation or delineation of site conditions;

4. A CAMP will not generally be required for the investigation or delineation of site conditions which are not considered intrusive activities for purposes of section 1.9, these activities include the sampling of:

i. surface soil;

ii. groundwater;

iii. surface water;

iv. sediment;

v. ambient or indoor air; and/or

vi. soil gas and sub-slab soil vapor, after the sampling ports have been installed.

5. The HASP/CAMP in the SMP and the requirements imposed on contractors, will be updated as necessary prior to any of the activities identified by this subdivision to reflect any changes to the OSHA requirements or NYSDOH CAMP guidance. These changes will be identified in the periodic review report (PRR) when made or in any notification provided to DER, in accordance with subdivision 1.4(b), which occurs prior to the PRR submission.

1.10 Exemptions from Obtaining NYS and Local Permits and Other Authorizations

(a) The remedial party may be exempted from a requirement to obtain certain permits and other authorizations for site activities issued by the State of New York and local agencies pursuant to DEC statutes, regulations, policies and procedures. An exemption of the obligation to obtain a permit and other authorizations may be provided if all of the criteria below apply to the remedial program being implemented.

1. The activity is on-site. For purposes of this guidance an activity is on-site if:

i. it is conducted on the site; or

ii. it is conducted on different premises that are under common control or are contiguous to or physically connected with the site and the activity manages exclusively contamination for which the remedial party is responsible.

2. The activity satisfies all substantive technical requirements applicable to like activity conducted pursuant to the State or local permit as determined by DEC; and

3. The activity is a component of the remedial program. For purposes of the permit exemptions provided by this section, the construction of a building(s) or other applicable appurtenance on the site is not considered a component of the remedial program.

4. The activity is being conducted pursuant to an oversight document.

(b) Exemptions for permits and other authorizations.

1. DEC permits and other authorizations. An exemption from obtaining permits and other authorizations issued by DEC which meet the criteria in subdivision (a) above will typically be granted.

2. Permits and other authorizations issued by other New York State agencies or authorities. DER will require a remedial party obtain applicable State permits and other authorizations which are not issued by DEC unless there is a demonstration that:

i. obtaining such State or local permit or other authorizations will substantially delay the project or present a hardship, DER may exempt the party from the need to obtain such State or local permits or other authorizations provided:

(1) the remedial program or activity is conducted on the site or on premises that are under common control or are contiguous to or physically connected with the site and the activity manages exclusively contamination which DEC or remedial party is handling as part of the site remedial program;

(2) all substantive technical requirements applicable to like activity conducted pursuant to a permit or other authorizations are complied with, as determined by DEC; and

(3) the activity is a component of a program selected by a process complying with the citizen participation requirements of DER 23 - *Citizen Participation Handbook*, to the extent applicable; or

ii. the substantive nature of the permit or other authorizations criteria are such that

(1) the permit or other authorization has no substantive technical requirements, rather it is only administrative or fee-based;

(2) the substantive requirements are already being complied with by the remedy; or

(3) compliance with the substantive requirements would jeopardize the integrity of the remedy but would not jeopardize the integrity of the infrastructure (e.g., roadways, pipelines, canals) which the permit or other authorization is intended to protect; and

3. Permits or other authorizations issued by local municipalities or agencies. DER will require a remedial party obtain applicable local permits or other authorizations unless there is a demonstration by the remedial party that an exemption is appropriate as set forth in paragraph 2 above.

4. Notwithstanding anything to the contrary in this section, DEC will not waive building or other state or local permits or other authorizations which as a condition of issuance require inspections by the permitting or authorizing agency to confirm compliance with building codes or local ordinances.

5. The remedial party will be responsible for obtaining all permits or other authorizations required for actions associated with the development of the site.

(c) The remedial party must obtain Federal permits or other authorizations required to complete the investigation and/or remediation.

(d) Waiver of registration fees for tanks. For a site that is being remediated under an order or agreement in accordance with paragraphs 1.2(b)1 through 3, the remedial party must ascertain if tanks at the site are regulated under the petroleum bulk storage (PBS) or chemical bulk storage (CBS) regulations. Bulk storage staff in the DEC regional offices or Bulk Storage Section in DER can assist with this determination.

1. If the remedial party determines that the site has tanks regulated under the bulk storage regulations, then the remedial party must ensure the following:

i. the identified tanks must either:

(1) be brought into compliance as active tanks; or
(2) permanently closed in accordance, and in compliance, with the bulk storage regulations;

ii. if the registration qualifies for a waiver of the fee in accordance with 6 NYCRR 375-1.12(e), the remedial party must provide written notification (email is sufficient) to the Bulk Storage Section that the fee for a particular CBS/PBS application is waived; and

iii. the applicant/owner must note on the CBS/PBS application that the fees are waived in accordance with 6 NYCRR 375-1.12(e) by writing "Part 375 Fees exempt" in or near the amount enclosed box on Section A in order for the application to be processed without any fees being required.

2. If the steps given in paragraph 1 above are not followed, the application will be processed as normal. That is, the application will be processed if submitted with fees or rejected if submitted without the fees. Please note that once an application is processed, refunds will not be made.

1.11 Interim Remedial Measures

(a) A priority during investigation and/or remediation is to contain and/or stabilize, to the extent possible, sources of contamination identified in any media to reduce/eliminate receptor exposure to contaminants or to contain further movement of contaminants through any pathway.

1. Actions taken to mitigate environmental or human exposures before the completion of the RI and appropriate remedial alternative selection, are considered interim remedial measures (IRMs).

2. IRMs may include the following activities: removal of source areas, hot spots, wastes and contaminated materials including environmental media; construction of diversion ditches, collection systems, or leachate collection systems; installation of NAPL recovery systems; construction of fences or other barriers; posting of warning signs; installation of water filters or provision of alternative water supplies; installation of sub-slab depressurization systems or soil vapor extraction systems.

3. When the need for an IRM is identified, the remedial party should:

i. immediately notify DER so that the IRM can be performed under DER oversight, as appropriate;

ii. determine whether the IRM is an emergency or non-emergency IRM; and

iii. follow the guidance for the appropriate type of IRM provided in subdivisions (b) or (c) below.

(b) An emergency IRM, as defined in paragraph 1.3(b)15, is to be undertaken pursuant to the *Spill Response Guidance Manual*, or other applicable guidance, as an initial response action.

1. An emergency or time-critical IRM:

i. is not subject to the requirements of this guidance; and

ii. is equivalent to a CERCLA time-critical IRM.

2. IRMs at sites identified by subdivisions1.2(a) or (b), consisting of surface drum removals, construction of fences or other barriers; posting of warning signs, installation of water filters or provision of bottled water will not need to be conducted in accordance with this subdivision.

(c) A non-emergency or non-time critical IRM is an action which may be undertaken at any time during the course of the remedial program, in response to actual or potential environmental or public health exposures identified at the site.

1. The use of a non-emergency IRM is encouraged when a source of contamination or exposure pathway can be effectively addressed before completion of the ongoing investigation and remedy selection process.

2. Non-emergency IRMs:

i. for underground storage tank removals should be conducted in accordance with the requirements of section 5.5 and are not required to comply with paragraph 3 below.

ii. all other non-emergency IRMs should be planned, as appropriate for the level of complexity of the work proposed, in accordance with the guidance for either a remedial design, section 5.2 or remedial action work plan, section 5.3 and implemented in accordance with section 5.4.

3. An IRM construction completion report (CCR) prepared in accordance with the

requirements of subdivision 5.8(b)-(d) should be prepared for each non-emergency IRM undertaken, with the exception of those identified in paragraph (b)2 above. IRMs with no CCR will need to be documented in the FER prepared for the site.

4. Non-emergency IRMs should include the applicable citizen participation requirements for the program under which the IRM is undertaken.

(d) Accelerated remediation is encouraged as an IRM subject to DER approval. IRMs are advanced pursuant to section 1.11 and may be conducted concurrently with sampling to delineate the contamination and to confirm contaminant removal.

1.12 Use of a Site

(a) DER's preference is to achieve a permanent cleanup of a contaminated site, including application of the unrestricted soil SCGs and restoration of groundwater to its classified use, resulting in no future land use restrictions. However, it is realized that achieving this goal is not required by some programs, nor will it always be feasible or practical, in the remedial programs identified in subdivisions 1.2 (a) and (b). Accordingly, the use of a site, or portion of a site, can be either unrestricted use or restricted use as set forth in 6 NYCRR 375-1.8(g).

1. In developing a remedial program for a site the remedial party will:

i. first define the nature and extent of contamination through the RI; and

ii. consider use scenarios set forth in this section in developing a remedy consistent with the remedy selection provisions and limitations for the various remedial programs as set forth in Chapter 4.

2. Unrestricted use. A site designated for unrestricted use is a site subject to no imposed institutional or engineering controls, such as an environmental easement or deed restriction.

3. Restricted use. A site designated for restricted use is a site subject to imposed restrictions on its use, in the form of institutional or engineering controls, to manage exposure to remaining contamination at the site. DER recognizes four categories of restricted land use, from least restrictive to most restrictive as shown below:

i. residential;
ii. restricted residential;
iii. commercial; and
iv. industrial.

Least Restrictive Use
⇕
Most Restrictive Use

(b) Categories of restricted use. The four categories of restricted use detailed in this subdivision require, at a minimum, institutional controls (e.g., environmental easement, deed restriction) in accordance with section 5.6.

1. Residential. The residential use category allows a site to be used for any use(s) other than producing animal products for human consumption. Residential use is the land use category intended for single family housing and requires the fewest restrictions on the use of the site. The residential use

category:

i. does not allow for the use of a SMP or other institutional or engineering controls to manage any remaining soil contamination on the site, although engineering controls without an institutional control, may be used to address:

(1) on-site soil vapor intrusion; or
(2) off-site impacts to other media attributable to site soil; and

ii. allows only two restrictions on the use of the site:

(1) a groundwater use restriction; and/or
(2) a prohibition against producing animal products for human consumption; and

iii. will require an environmental easement or deed restriction, except when the remedial program achieves the residential use soil cleanup objectives (SCOs) set forth at 6 NYCRR 375-6.8 to a depth of fifteen feet below the developed ground surface or to bedrock, if shallower. This will only apply, where DER determines that the:

(1) protection of ecological resources SCOs are not applicable;
(2) groundwater beneath the site is not contaminated above standards, or if there is a groundwater concern, there is a municipal prohibition on the extraction of groundwater for potable purposes; and
(3) property will not be used for producing animal products for human consumption, either by:
(A) an existing restriction on such use; or
(B) by the site's location in an area which precludes such use.

2. Restricted residential. The restricted residential use category allows a site to be used for residential use but only when there is common ownership or control by a single owner/managing entity of the site. Restricted residential use is the land use category intended for apartments, condominium, co-operative or other multi-family/common property control residential development. The restricted residential use category:

i. requires, in addition to the restrictions in 1.ii above, at a minimum the following additional restrictions on the use of the site:

(1) a prohibition on vegetable gardens on the site, unless planted in gardens where the soil achieves the residential use soil cleanup objectives; and
(2) a prohibition of single-family housing;

ii. requires a SMP to manage remaining contamination and institutional/ engineering controls at the site;

iii. is the appropriate use category for the following site uses:

(1) day care or other child care facilities;
(2) elementary or secondary schools; or

(3) college or boarding school residential buildings; and

iv. allows for active recreational uses, which includes recreational activities with a reasonable potential for soil contact, such as:

(1) designated picnic areas;
(2) playgrounds; or
(3) natural grass sports playing fields, including surrounding unpaved spectator areas.

3. Commercial. The commercial use category anticipates use by businesses with the primary purpose of buying, selling or trading of merchandise or services. The commercial use category:

i. restricts the use to commercial activities including the buying and/or selling of goods or services, or other uses identified in subparagraph iii below;

ii. requires a SMP to manage remaining soil contamination and institutional/ engineering controls at the site;

iii. is the appropriate use category for the following site uses:

(1) health care facilities, including hospitals, clinics etc.; or
(2) college academic and administrative facilities; and

iv. allows for passive recreational, which includes recreational uses with limited potential for soil contact, such as:

(1) artificial surface fields;
(2) outdoor tennis or basketball courts;
(3) other paved recreational facilities used for roller hockey, roller skating, shuffle board, etc.;
(4) outdoor pools;
(5) indoor sports or recreational facilities;
(6) golf courses; and
(7) paved (raised) bike or walking paths.

4. Industrial. The industrial use category anticipates use for the primary purpose of manufacturing, production, fabrication or assembly processes and ancillary services. The industrial use category:

i. allows the use of the site only for industrial purposes with access to the site limited to workers or occasional visitors;

ii. includes all of the restrictions set forth in subparagraph 2.i, above; and

iii. requires a SMP to manage remaining soil contamination and institutional/engineering controls at the site.

(c) Land-use exposure assessment. Site use categories are based on use-based exposure assessments to soil that will remain at a site and were developed pursuant to ECL 27-1415(6)(b). These exposure assessments were developed using a number of exposure scenarios which evaluated various receptors, all of which are presented and discussed in detail in the Technical Support Document as defined at 6 NYCRR 375-6.2(b). The use-based soil cleanup objectives (SCOs) for the protection of public health were developed based upon these scenarios. A summary of the receptors and pathways considered in these exposure scenarios, which are the basis of the protection of human health soil cleanup objectives for each of the unrestricted and restricted use categories set forth in subdivisions (a) and (b) above, are summarized in Table 1.12 below.

Table 1.12 Exposure Scenario Receptors and Pathways Used as the Basis for the Development of the Protection of Public Health SCOs

Use Category	Unrestricted	Residential	Restricted Residential	Commercial	Industrial
Exposed Person →	*Adult & Child*	*Adult & Child*	*Adult & Child*	*Adult & Child*	*Adult & Adolescent*
Route of Exposure ↓					
Incidental Soil Ingestion	✔	✔	✔	✔	✔
Inhalation of Soil	✔	✔	✔	✔	✔
Dermal Contact with Soil	✔	✔	✔	✔	✔
Homegrown Vegetable Consumption	✔	✔			
Producing animal products for human consumption	✔				
Groundwater Protection	✔	Consider per 375-6.5	Consider per 375-6.5	Consider per 375-6.5	Consider per 375-6.5
Ecological Resource Protection	✔	Consider per 375-6.6	Consider per 375-6.6	Consider per 375-6.6	Consider per 375-6.6

1. A check mark in the box indicates the person considered (e.g., child, adult) by category and route of exposure were included in the evaluation to determine the SCO for each use category. For example, the restricted residential exposure does not have the boxes for “Homegrown Vegetable Consumption” or “Raising of Livestock” checked, accordingly these activities are not allowed in the restricted categories.

2. When groundwater or ecological resources are impacted by soil contamination at a site, the SCOs for the protection of groundwater or ecological resources will apply, respectively per 6 NYCRR 375-6.5 or 6 NYCRR 375-6.6. Since the unrestricted use SCO already has accounted for both protection of groundwater and ecological resources, the box is checked and there is no need to consider their applicability.

1.13 Standards, Criteria and Guidance

(a) Applicability. The standards, criteria and guidance (SCGs) discussed in this section are intended to apply to the remedial program, unless good cause exists why conformity with particular SCGs should be dispensed with.

1. An index to potentially applicable New York State SCGs is provided on DEC's website identified in the table of contents, which lists some of the SCGs potentially applicable to site investigation and remediation activities conducted in New York State. This list is neither meant to be comprehensive nor to imply that all of the listed SCGs are appropriate for every investigation or remediation conducted.

2. The remedial party must also comply with other federal and local SCGs, if applicable to the site, which are also identified on the website SCG page.

(b) SCG description. SCGs as defined at paragraph 1.3(b) 71, are promulgated requirements and non-promulgated guidance which guide site activities during investigation and remediation.

1. Standards and criteria are set forth in Federal or New York State law. They are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations which are generally applicable, consistently applied and officially promulgated under federal or State law that are either directly applicable or relevant and appropriate to a contaminant, remedial action, location, or other circumstance.

2. Guidance includes non-promulgated criteria which should be considered, for investigation and/or remediation.

1.14 Sustainability and Green Remediation

(a) Role of green remediation in remedial programs. Green remediation seeks to minimize ancillary environmental impacts such as green house gas emissions (GHGs) from remedial programs. Applying green remediation concepts, such as minimizing energy consumption, maximizing the reuse of land and the recycling of materials, and conserving natural resources helps to achieve that objective.

1. Green remediation concepts will be applied to the cleanup of contaminated properties such that the remedies are protective of public health and the environment, economically sound, and as sustainable as possible.

2. Green remediation is not intended to encourage, and does not justify, implementation of a "no action" or lesser remedy when a more comprehensive remedy is called for, appropriate, and feasible.

3. Consistent with existing laws and regulations, consideration of green remediation

concepts will be expected and encouraged in all phases of the remedial program. These efforts will provide for a more sustainable cleanup by:

i. reducing direct and indirect emissions of carbon dioxide (CO2) and other GHGs;

ii. conserving natural resources;

iii. reducing waste; and

iv. maximizing habitat value.

(b) Role of sustainability in remedial programs. Opportunities to increase sustainability exist throughout the investigation, design, construction and site management phases of site remediation regardless of the selected cleanup remedy.

1. DER will emphasize and encourage the use of green strategies and approaches at every stage of the remedial program by remedial parties and will also foster the use of green remediation best management practices as they are identified by DEC.

2. While sustainability will be a consideration in remedy selection, it will not change any existing statute, regulation or guidance.

(c) Additional guidance relative to green remediation and sustainability in DER remedial programs is available on DEC's website identified in the table of contents.

Section 1.15 Electronic Submissions

(a) DER supports and encourages the use of electronic submissions by the remedial party to the greatest degree appropriate for the site-specific remedial program. The electronic submission approach for a given activity may vary and should be defined in the appropriate work plan or by consultation with the DER project manager.

1. The remedial party will deliver to the DER preliminary or final reports in an electronic format that complies with DEC's Electronic Document Standards (EDS) or as otherwise directed by DER.

2. All data generated will be submitted in an electronic data deliverable (EDD) that complies with the DEC's Electronic Data Warehouse Standards (EDWS) or as otherwise directed by DER.

3. Additional information relative to the EDS, EDD and EDWS is available on the DEC website identified in the table of contents.

(b) DER will also seek to maximize its use of electronic responses and document distributions in all reviews, approvals or other DER initiated actions required in accordance with this guidance.

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CHAPTER 2 SAMPLING, ANALYSIS and QUALITY ASSURANCE

2.1 Sampling and Analysis Requirements

(a) Selection of analytical parameters.

1. All initial investigations must analyze and report on:

i. for organic contaminants the full target compound list plus the 30 (10 volatile organic compounds and 20 semi-volatile organic compounds) highest concentration tentatively identified compounds (TICs). The full target compound list plus the 30 (TCL+30), as defined in paragraph 2.4(d)15; and

ii. for inorganic compounds, the full target analyte list (TAL), as defined in paragraph 2.4(d)13.

2. Samples from an area of concern or a site may be analyzed for a limited contaminant list as approved by DER once the nature of the contamination is fully characterized.

3. For investigations of known petroleum releases, sample analysis must be for the suite of contaminants shown in the fuel oil and gasoline tables (tables 2 and 3) contained in the Commissioner Policy on *Soil Cleanup Guidance* (CP-Soil).

4. For investigation of non-petroleum storage and discharge areas, sample analysis must use the methods appropriate for the stored or discharged material.

5. Analysis must be conducted by a laboratory that is accredited pursuant to the NYSDOH Environmental Laboratory Accreditation Program (ELAP) for the category of parameters analyzed.

(b) Laboratory analytical methods. Except as provided in paragraph 1 below, samples collected by the remedial party will be analyzed by an analytical method included in the most current DEC Analytical Services Protocol (ASP), available on DEC's website identified in the table of contents.

1. An alternative to the ASP may be proposed if an analytical method, as described in the most current ASP:

i. does not exist for a specific contaminant or parameter (e.g., pH, dissolved oxygen) within a specific matrix;

ii. is demonstrated to be inappropriate for the matrix analyzed; or

iii. cannot achieve an acceptable detection limit or minimum reporting limit as provided in a DER-approved work plan.

2. Where one of the exceptions in paragraph 1 exists, the remedial party will:

i. select an appropriate method from another source;

ii. document the rationale for selecting the method;

iii. develop a standard operating procedure for the method, including a quality control section; and

iv. propose the method and standard operating procedure for such method to DEC for its consideration and approval.

3. The method selected must achieve a detection limit or minimum reporting limit that is below the applicable cleanup level for all contaminants that may be present in the medium being sampled and analyzed.

4. Unless otherwise provided in a DER-approved work plan, the Lloyd Kahn method must be used for the determination of total organic carbon in soil and sediment. This method is available on DEC's website identified in the table of contents.

5. Except for tissue samples (see subdivision 2.1 (d) below), gas chromatography methods with a mass spectrometer detector system must be used for analysis of semi-volatile contaminants (exclusive of herbicides, pesticides and PCBs). Other chromatography methods (e.g., high-performance liquid chromatography) with appropriate detector systems must be used for the analysis of organic analytes amenable only to non-gas chromatographic methods. A mass spectrometer detector system is preferable but not required if the site has already been characterized to the extent that all contaminants are known.

6. The procedures (including quality control and quality assurance) specified in the ASP analytical method must be followed unless an alternate procedure is included in the approved work plan.

(c) Field-testing technologies and methods.

1. DER accepts the use of field-testing technologies (e.g., immunoassay test kits, x-ray fluorescence devices, direct-sensing down-hole tools) when supported by ELAP approved analytical methods, provided the data are not used to make final determinations relative to impacts of contamination on public health. The role of field testing technologies for programs for which this guidance applies is described in Appendix 2A.

2. Field-testing technologies are encouraged in the following circumstances:

i. for contaminant delineation if contaminant identity is known or if there is reasonable certainty that a specific contaminant may be present (e.g., benzene, toluene, ethyl benzene, xylene in the case of sampling for a gasoline release);

ii. to bias sample location to the specific location of greatest suspected contamination;

iii. for testing or analysis of intermediate samples;

iv. to collect data in support of engineering design or remedy optimization; or

v. for segregating wastes for off-site disposal or treatment.

3. Where a field-testing technology is proposed to be used:

i. a standard operating procedure must be provided for DER approval that includes:

(1) a detailed step-by-step procedure for the analysis method;
(2) qualifications of the technician responsible for performing the field testing; and
(3) quality assurance procedures (e.g., calibration standards, blanks) as specified by the method;

ii. laboratory analysis of split samples must be performed to evaluate the correlation between the field testing technology and the ELAP-certified laboratory results. A minimum of 10% of the samples must be analyzed by the ELAP-certified laboratory using a standard ASP method. In general, sufficient correlation occurs if the field testing and laboratory results are within 30 relative percent difference;

iii. 10% of sample analyses using the field-testing technology must be performed in duplicate;

iv. there should be no bias in the selection of duplicate or correlation samples, such as selecting only positive detections for duplicate or correlation sampling. The duplicate or correlation analysis should be done on every tenth sample, selected in the order they are collected and presented for analysis; and

v. the field testing must be performed by a field technician with the following minimum qualifications:

(1) completion of a certification course or training by an experienced technician who has demonstrated proficiency in the method; or
(2) demonstration of proficiency by correlation of the technician's field-testing technology results with fixed laboratory analysis results collected from a previous site.

(d) Tissue analysis. Where the analysis of tissue samples is required, the sampling and analysis included in any work plan must be in accordance with this subdivision.

1. For tissue analysis. Methods and sampling plans must be specified in the work plan and approved prior to implementation. EPA SW-846 methods are not appropriate for biological tissue as these methods, for example, often underestimate PCB/organochlorine concentrations.

2. Analysis of lipid content is required for all organochlorine compounds using EPA3540C Soxhlet extraction with 1:1 hexane/acetone ratio or other approved method. The percent lipids should be determined from the same aliquot as that used to determine the organochlorine concentration.

3. Tissue sampling should follow the current procedures set forth in the most current DEC guidance documents for biota collection, preparation and analysis.

(e) Soil vapor intrusion sampling. When soil vapor, sub-slab vapor, crawl space air, indoor air or outdoor air sampling is required the NYSDOH document, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006) or the most current version with appropriate updates, must be

used.

(f) Determination of the presence of non-aqueous-phase liquid (NAPL).

1. Methods acceptable to DER must be used to determine the presence of NAPL in soil or water. Such methods include, without limitation, visual identification of sheens or other visible product, measurable thickness of product on the water table, the use of field instruments, ultraviolet fluorescence, soil-water agitation, centrifuging and hydrophobic dye testing.

2. NAPL is suspected to be present in groundwater where:

i. concentration is equal to or greater than 1% of the water solubility of the contaminant; or

ii. a mixture of such contaminants in (i) above is present, then the effective water solubility of the contaminant should be estimated for this determination.

3. NAPL is suspected to be present in soil where a single contaminant is present at concentrations greater than 10,000 mg/kg.

(g) Alteration of groundwater samples collected for metals analysis.

1. Provision for the alteration of groundwater samples (filtration as defined in section 2.4) for metals analysis is only acceptable when the rationale for any proposed filtration is prepared in accordance with this subdivision and, if a field decision, must be reviewed and approved in accordance with subdivision 1.6(d) by the DER project manager prior to any filtration of samples.

2. Alteration of groundwater samples will not be approved unless the following conditions can be documented:

i. the target turbidity level of 50 NTUs for development and sampling of groundwater monitoring well is or will be exceeded;

ii. the well(s) being sampled was (were) properly designed, installed, constructed, developed, maintained and sampled;

iii. attempts have been made to repurge and/or redevelop the well; and

iv. replacement of the well(s) with documentation of proper well construction and installation where necessary, has been considered and is not justified.

3. Any request to filter groundwater samples must include a justification which addresses the conditions listed in paragraph 2 above and include a filtering protocol which:

i. is consistent with the methods in the November 1986 Environmental Protection Agency document entitled Test Methods for Evaluating Solid Waste (EPA-SW846);

ii. is a filtration methodology which minimizes changes in the water chemistry of the sample;

iii. provides that any precipitates which may form upon removal of the sample from the well (e.g., iron floc) must not be filtered out but dissolved by acid/preservation; and

iv. provides that a filtered sample would not be collected without an accompanying unfiltered sample.

4. When collecting filtered groundwater samples:

i. the sample must be collected using a minimally disturbing method (e.g., low-rate bladder or peristaltic pumping, bailing);

ii. the turbidity of the samples must be recorded at the time of collection;

iii. two samples must be collected:

(1) one of which must be preserved immediately in an unaltered state; and
(2) the second must be filtered and preserved; and

iv. if split samples are required, then both the filtered and unfiltered samples must be split.

5. When analyzing the samples:

i. if the unfiltered sample does not exceed SCGs, there is no need to analyze the filtered sample; and

ii. if there is a question whether metal contaminants are naturally occurring or were introduced through human-made activities, upgradient and background wells may be sampled using the same procedure, with best efforts made to obtain an uncontaminated sample of the horizon which is being screened, to allow a comparison of contaminant data to naturally occurring metal ion concentrations in the aquifer matrix.

2.2 Reporting Requirements

(a) Unless otherwise approved in advance by DER, laboratory data deliverables must be as defined in this subdivision.

1. Category B laboratory data deliverables. Category B data deliverables which are defined in the ASP and summarized in Appendix 2B:

i. must be submitted for the following types of samples, except for sites subject to section 5.5 (UST closure):

(1) samples representing the final delineation of the nature and extent of contamination for a SC or RI completed pursuant to Chapter 3;
(2) correlation samples as defined in section 2.4;
(3) confirmation and documentation samples as defined in paragraphs 1.3(b)3 and 11 and collected pursuant to section 5.4; and/or

(4) samples to determine closure of a system pursuant to sections 6.4 and/or 6.5; and

ii. must include the preparation of a Data Usability Summary Report (DUSR) prepared by a party independent from the laboratory performing the analysis for all samples when Category B data deliverables are provided. This party must also be independent from any direct involvement with the project, e.g. Project Manager or property owner. The required content of a DUSR and qualifications for the person preparing the DUSR are detailed in Appendix 2B.

2. Category A and Category Spills laboratory data deliverables. Category A or Category Spills data deliverables, which are defined in the ASP and summarized in Appendix 2B must be submitted for all analyses not identified in paragraph 1 above.

3. Analytical cleanup. Any analytical cleanup methods required must be:

i. in accordance with subdivision 2.3(c);

ii. identified in the work plan; and

iii. if employed, identified in the data deliverable package.

4. Tentatively identified compounds (TICs). TICs identified by the analysis of a sample in accordance with subparagraph 2.1(a)1.ii must be reported in the data deliverables in the following cases:

i. all samples analyzed as part of a SC, RI or pre-design sampling effort undertaken to delineate the nature and extent of contamination;

ii. all samples in all phases of a project when (a) TIC(s) has/have been identified as a contaminant of concern; or

iii. if TICs are present and included on the discharge limits for a treatment system.

(b) Submission of data. Final/validated analytical data, with applicable data qualifiers are to be summarized in tables for all reports prepared in accordance with this guidance.

1. When reporting analytical results below the method detection limit (MDL) or method reporting limit (MRL), the result will be shown as non-detect (ND) along with the appropriate MDL or MRL.

2. The data from individual samples, QA information (e.g., chromatograms) and other supporting documentation identified by this section are not to be included in appendices or otherwise included in the reports or work plans. This information and other supporting data identified in subdivision 3.13(c) are to be included in a separate electronic data submission provided at the time of the submission of the report/work plan.

(c) Electronic submissions. All required documentation identified by this Chapter must be provided in an electronic format in accordance with section 1.15.

2.3 Quality Assurance Requirements

(a) The remedial party must ensure that suitable and verifiable data result from sampling and analysis. To achieve this objective the quality assurance procedures detailed in this section must be followed for all sampling and laboratory analysis activities.

1. Determination of need for a quality assurance officer (QAO). The remedial party shall consult with DER during the development of the work plan, pursuant to section 3.3, to determine whether a QAO will be required. A QAO will generally be necessary for large or complex projects, such as those requiring non-routine analytical methods or sampling techniques (e.g., field testing technologies).

2. Role of the QAO. Where required, the QAO:

i. will review sampling procedures and certify that the data was collected and analyzed using the appropriate procedures;

ii. shall not be directly involved in the collection and analysis of samples from the site for which they are the QAO.; and

iii. acts in conjunction with the project manager in the development of the sampling and analytical portion of a site-specific quality assurance project plan (QAPP);

3. QAO qualifications. The QAO:

i. must not have another position on the project, such as a project or task manager, that involves project productivity or profitability as a job performance criteria;

ii. must, at a minimum, hold a bachelors degree:

(1) in a relevant natural or physical science; or
(2) engineering; and

iii. must be familiar with analytical methods, data interpretation and validation, the development of sampling plans, quality control procedures and auditing requirements and techniques.

3. As required by the approved work plan, during the course of the sampling and analytical portion of the project the QAO or a designee may:

i. conduct periodic field and sampling audits;

ii. interface with the analytical laboratory to resolve problems; and

iii. interface with the data validator and/or the preparer of the DUSR to resolve problems.

(b) Data acceptance.

1. DER will reject analytical data from any laboratory which does not have a current and

appropriate certification for the parameters analyzed.

2. Laboratories performing the analysis of tissue samples must provide documentation of the demonstration of capability (e.g., analysis of reference samples) for approval by DER prior to conducting any tissue analysis.

3. DER may reject data that do not meet the data quality objectives (e.g., if minimum reporting limits specified in the approved work plan are not achieved, if the pressure in an air canister is outside of the acceptable ranges, if holding times or temperature ranges are not met, etc.).

(c) Specific sampling and analytical requirements.

1. Laboratories will follow all quality assurance/quality control procedures specified in the approved analytical methods.

2. Sampling methods, sample preservation requirements, sample holding times, decontamination procedure for field equipment and frequency for field blanks, field duplicates and trip blanks for aqueous samples should conform to the ASP, unless an alternate method/procedure has been approved in the work plan. Duplicate and matrix/matrix-spike duplicates are required at a frequency of 1 per 20 samples. Aqueous trip blanks are required at the same frequency for samples that are to be analyzed for volatiles. Field and/or rinsate blanks may also be required at the same frequency.

3. Sample matrix cleanup. Sample matrix cleanup (in laboratory) must occur when chemical interferences may be causing elevated reporting limits or inadequate contaminant identification or quantitation. Sample matrix cleanup must conform to the procedures specified in the ASP.

4. Results from analysis of soils and sediments will be reported on a dry-weight basis, except for those results required by the method to be otherwise reported. Analysis of vegetation tissue shall be on a dry-weight basis. All other tissue analysis shall be reported on a wet-weight basis.

5. Samples must be sent to the laboratory as soon as practicable. Generally, samples should be received by the laboratory within 48 hours of sampling.

(d) Soil vapor or air sampling and analysis. Where soil vapor, sub-slab vapor, crawl space air, indoor air or outdoor air sampling is required, the work plan is to be prepared using the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006) or the most current version must be used.

(e) A glossary of quality assurance terms is provided in subdivision 2.4(d).

2.4 Quality Assurance Project Plan

(a) All work plans must include quality assurance procedures to be followed for sampling and analysis. All work plans and the QAPP, undertaken pursuant to an oversight document in accordance with subdivision 1.2(d), must be submitted and approved in advance of sampling.

1. These procedures will be incorporated into the work plan or be supplied as a separate stand alone document. If a separate QAPP is submitted, a summary of the sample information identified in subparagraph 2.v below must also be included in the work plan.

2. The following should be included in either the work plan QAPP section or a standalone QAPP:

i. the project scope and project goals as well as how the project relates to the overall site investigation or remediation strategy;

ii. project organization, including the designation of a project manager, QAO and field analyst, (if field analysis is planned). Resumes of these individuals must be included;

iii. sampling procedures, data quality usability objectives and equipment decontamination procedures;

iv. site map showing sample locations;

v. an "Analytical Methods/Quality Assurance Summary Table" which must include the following information for all environmental, performance evaluation and quality control samples:

(1) matrix type;
(2) number or frequency of samples to be collected per matrix;
(3) number of field and trip blanks per matrix;
(4) analytical parameters to be measured per matrix;
(5) analytical methods to be used per matrix with minimum reporting requirements;
(6) number and type of matrix spike and matrix spike duplicate samples to be collected;
(7) number and type of duplicate samples to be collected;
(8) sample preservation to be used per analytical method and sample matrix;
(9) sample container volume and type to be used per analytical method and sample matrix; and
(10) sample holding time to be used per analytical method and sample matrix; and

vi. a detailed description of sampling methods to be used and sample storage in the field.

(b) If tissue samples are being collected, the QAPP for tissue analysis should follow the outline in the USEPA publication *Preparation Aids for the Development of Category I Quality Assurance Project Plans* (EPA/600/8-91/003).

(c) Analytical data must be provided in an electronic format in accordance with section 1.15.

(d) Quality assurance glossary. Quality assurance terms and definitions presented in this subdivision must be used in preparing all documents related to quality assurance or control.

1. "Alteration" means altering a sample collected for analysis in any way other than by adding a preservative, such as nitric acid to lower pH. Examples of alteration include, but are not limited to: filtering, settling and decanting, centrifuging and decanting and acid extracting.

2. “Analytical Services Protocol” or "ASP" means DEC’s compilation of approved EPA laboratory methods for sample preparation, analysis and data handling procedures.

3. “Correlation sample” means a sample taken, when using a field-testing technology, to be analyzed by an ELAP-certified laboratory to determine the correlation between the laboratory and field analytical results.

4. "Effective solubility" means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate-phase (NAPL) mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure-phase solubility.

5. “Environmental Laboratory Accreditation Program” or “ELAP” means a program conducted by the NYSDOH which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing. Information regarding ELAP is available at the NYSDOH Wadsworth Laboratory website .

6. "Filtration" means the filtering of a groundwater or surface water sample, collected for metals analysis, at the time of collection and prior to preservation. Filtering includes but is not limited to the use of any membrane, fabric, paper or other filter medium, irrespective of pore size, to remove particulates from suspension.

7. “Final delineation sample” means a sample taken to make a decision regarding the extent of contamination at a site during the investigation and the design of the remedy or confirmation/documentation sampling during remedial construction, which is to be analyzed by an ELAP-certified laboratory.

8. “Intermediate sample” means a sample taken during the investigation or remediation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

9. "Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

10. “Minimum reporting limit” means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits, and is also referred to as the practical quantitation limit (PQL).

11. “Nephelometric Turbidity Unit” or "NTU" is the unit by which turbidity in a sample is measured.

12. "Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

13. "Target analyte list" or "TAL" means the list of inorganic compounds/elements designated for analysis as contained in the version of the *EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration* in effect as of the date on which the laboratory is performing the analysis. For the purpose of this chapter, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/elements.

14. "Targeted compound" means a contaminant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

15. "Target compound list plus 30" or "TCL+30" means the list of organic compounds designated for analysis (TCL) as contained in the version of the EPA *Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration* in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis.

16. "Tentatively identified compound or TIC" means a chemical compound that is not on the target compound list but is detected in a sample analyzed by a GC/MS analytical method. TICs are only possible with methods using mass spectrometry as the detection technique. The compound is tentatively identified using a mass spectral instrumental electronic library search and the concentration of the compound estimated.

17. "Well development" means the application of energy to a newly installed well to establish a good hydraulic connection between the well and the surrounding formation. During development, fine-grained formation material that may have infiltrated the sand pack and/or well during installation is removed, allowing water from the formation to enter the well without becoming turbid and unrepresentative of groundwater in the formation.

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CHAPTER 3 SITE CHARACTERIZATION and REMEDIAL INVESTIGATION

3.1 Site Characterization and Remedial Investigation Overview

(a) Site Characterization. This chapter sets forth guidance for characterization of a site, pursuant to an oversight document identified in paragraph 1.2(d). The remedial program for a site requiring a site characterization (SC) is completed in the steps detailed in this chapter, beginning with the site characterization and concluding, where necessary, with a remedial investigation (RI).

1. The SC is designed to determine whether a site poses little or no threat to public health and the environment or if it poses a threat and whether the threat requires further investigation. The SC gathers the information necessary to characterize whether site-related contamination requires further action pursuant to one of the DER remedial programs identified in section 1.2. The SC is a defined activity for a SSF site. The SC is not generally performed for sites in the ERP, BCP or VCP, with the exception of manufactured gas plant sites, provided however, that the need for a SC may be identified by DER or the remedial party in any program.

2. A SC requires a records search followed, if needed, by field characterization. The purpose of a SC is to identify potentially contaminated areas at a site. It includes the gathering of sufficient information to determine whether the site requires further investigation or remediation. The steps in the SC process are:

i. a records search, conducted in accordance with Appendix 3A; and

ii. to the extent necessary, a field characterization. If field work is necessary, a work plan, developed in accordance with section 3.3, will be implemented and a site characterization report (SCR), prepared in accordance with section 3.13, will be completed and submitted to DER.

3. For those programs requiring a SC, based upon a review of the SCR, DER will:

i. find that no further action is required at the site, where DER determines:

(1) no contaminated areas of concern were discovered; or
(2) that any contamination identified would not require further investigation or remediation;

ii. require a RI, pursuant to this chapter, where DER determines contamination is present at levels and to an extent that warrants further delineation of the nature and extent of the contamination to support selection of a remedy; or

iii. determine that no further RI is required, as sufficient information exists to make a decision regarding remediation for the site. This would occur where the nature and extent of contamination was sufficiently defined to determine an appropriate IRM or to initiate the remedy selection process.

4. If at any time contamination is identified at levels that indicate the need for a RI, prior to the completion of the SC, in accordance with subdivisions (b) and (c) below, the SC may be discontinued and the data and a RI work plan submitted as set forth in subdivision 3.13(b). The SC will be discontinued:

i. at DER's direction; or

ii. with DER approval of a request from the remedial party.

5. Site characterization (SC). A SC investigation is intended to determine whether any of the conditions identified by this subdivision can be attributed to disposal in an area of concern (AOC) on the site identified by the site records search and if the site is a contaminated site requiring further investigation and remediation.

(b) Evaluation of data relative to standards, criteria or guidance (SCGs),. The presence of contaminants in any environmental media can be compared to applicable SCGs) for the environmental media which may be present on the site.

1. At sites where soil contaminant concentrations are equal to or below unrestricted SCGs no action or study is warranted because of soil contamination.

2. At sites where contaminants in any medium are above unrestricted SCGs, the remedial party and DER must consider whether the contaminants presence at the site are:

i. attributable to the release or disposal of a hazardous waste (or petroleum, if applicable to the program) disposal on the site; and

ii. present, at levels and/or at a frequency in the samples collected from the site, sufficient for DER to require a further delineation of the nature and extent of the contamination in a RI, as set forth in paragraph 2 below.

3. Evaluation of soil contamination for the protection of public health. At sites where soil contaminant concentrations are identified above the unrestricted soil SCGs, the remedial party should consider the soil SCGs based upon the protection of public health set forth in CP Soil. When evaluating these SCGs:

i. no action or study is warranted because of soil contamination where contaminant concentrations are equal to or below applicable protection of public health SCOs; or

ii. if one or more applicable SCOs for the protection of public health are exceeded, this alone does not trigger the need for remedial action or define ”unacceptable“ levels of contaminants in soil. In assessing the need for further investigation or other action, DER will also consider that:

(1) soil SCOs are applicable statewide and do not account for many site-specific considerations which could potentially result in higher levels (e.g. site-specific background conditions);

(2) concentrations of contaminants which are higher than the soil SCGs for the current, future or reasonably anticipated future use of the site are not necessarily a health or environmental concern;

(3) should a soil SCG for the current, future or reasonably anticipated future use of the site be exceeded, the degree of public health and environmental concern depends on several factors, including:

(A) the magnitude by which the concentration exceeds the SCG;

(B) the accuracy of the exposure assessments;

(C) other sources of exposure to the chemical; and

(D) the strength and quality of the available toxicological information on the chemical; and

(E) the level of concern associated with SCO concentrations for the current, future or reasonably anticipated future use of the site depends on the likelihood of exposure to soil contamination at levels of potential concern to public health or to ecological receptors.

4. Evaluation of soil contamination for the protection of groundwater. At sites where soil contaminant concentrations are identified above the unrestricted soil SCGs and there are impacts to groundwater above the applicable groundwater SCGs, the remedial party should consider the soil SCGs based upon the protection of groundwater set forth in CP Soil. When evaluating groundwater protection soil SCGs:

i. no action or study is warranted because of soil contaminations impact on groundwater, where contaminant concentrations are equal to or below applicable protection of ground water SCOs; or

ii. if one or more applicable soil SCGs for the protection of public health are exceeded, this alone does not trigger the need for remedial action or define ”unacceptable“ levels of contaminants in soil. In assessing the need for further investigation or other action DER will also consider the items set forth in subparagraph 3.ii above.

5. Evaluation of soil contamination for the protection of ecological resources. At sites where soil contaminant concentrations are identified above the unrestricted soil SCGs and an ecological resource is identified, the remedial party should consider the soil SCGs based upon the protection of ecological resources set forth in CP Soil. When evaluating ecological resources protection soil SCGs:

i. no action or study is warranted because of soil contaminations impact on an ecological resource, where contaminant concentrations are equal to or below applicable protection of ecological resources SCGs; or

ii. if one or more applicable soil SCGs for the protection of public health are exceeded, this alone does not trigger the need for remedial action or define ”unacceptable“ levels of contaminants in soil. In assessing the need for further investigation or other action, DER will also consider the items set forth in subparagraph 3.ii above.

6. Surface water and wetlands. If a surface water body or wetland is present on the site, or sediments are present on a site where disposal may have occurred and contaminant concentrations are identified above the applicable surface water or sediment SCGs, DER will consider the items set forth in subparagraph 2.ii above in assessing the need for further investigation or other action.

7. In addition to the factors detailed in paragraph 1 above, if one of the following is determined to be attributable to the site by the SC, the need for a RI should also be evaluated:

i. the potential for an adverse impact to fish and wildlife resources exists, as determined by subsection 3.10.1 and Appendix 3C;

ii. a public health exposure pathway was identified or potentially exists, as determined by Appendix 3B;

iii. the identified contamination emanates beyond the property boundary of the site being characterized, at levels and/or at a frequency in the samples collected from the site, at levels and/or at frequencies sufficient for DER to require a further delineation of the nature and extent of the contamination, as discussed in paragraph 2 above; or

iv. hazardous waste has been disposed which DER has determined represents a significant threat to public health and the environment.

8. After appropriate investigation of a site subject to an oversight agreement as set forth in subdivision 1.2(d), DER may conclude that the SC supports a no further action determination and further investigation is not warranted, when:

i. contaminants identified in media at the site do not exceed the applicable soil SCG, the groundwater standard or another SCG applicable to the site;

ii. the SCGs for the current, future or reasonably anticipated future use of the site are exceeded however the levels remain protective;

iii. none of the conditions identified in paragraphs 2 through 6 above were identified; or

iv. contamination cannot be confirmed as having occurred at the site based on disposal in an area of concern identified by the records search cannot be confirmed as existing at the site.

(c) Remedial investigation. A RI is necessary where data indicates disposal of contaminants at the site has occurred and contamination is potentially present at levels and/or at frequencies sufficient for DER to require a full delineation of the nature and extent of the contamination, to allow a decision by DER regarding any necessary remediation.

1. The purpose of a RI is to:

i. delineate the areal and vertical extent of contaminants in all media at or emanating from the site;

ii. determine the surface and subsurface characteristics of the site, including topography, geology and hydrogeology, including depth to groundwater;

iii. identify the sources of contamination, the migration pathways, and actual or potential receptors of contaminants on or through air, soil, bedrock, sediment, groundwater, surface water, utilities, and structures at a contaminated site, without regard to property boundaries;

iv. collect and evaluate all data necessary for a fish and wildlife resource impact analysis (FWRIA), pursuant to section 3.10, to determine all actual and potential adverse impact to fish and wildlife resources;

v. collect and evaluate all data necessary to evaluate the actual and potential threats to public health and the environment. This would include evaluating all current and future potential public health exposure pathways, in accordance with Appendix 3B, as well as potential impacts to biota; and

vi. collect the data necessary to evaluate any release to an environmental medium and develop remedial alternative(s) to address the release.

2. Where appropriate, the RI should also identify removal, treatment, containment, or other interim remedial measures, pursuant to section 1.11:

i. to remove, treat or contain any source areas identified, and

ii. prevent, mitigate, or remedy environmental damage or human exposure to contaminants while remedial alternatives are being evaluated.

3.2 General Sampling Considerations

(a) A SC or RI should be conducted based upon the information collected pursuant to the record search requirements of Appendix 3A; the analysis, reporting and quality assurance requirements of Chapter 2 and should satisfy the below noted media-specific requirements of this chapter.

1. The general considerations identified in subdivisions (b)-(d) below, if applicable.

2. The work plan requirements of section 3.3.

3. The building interior sampling requirements in section 3.4, if applicable.

4. The soil sampling requirements in section 3.5.

5. The soil vapor, sub-slab vapor, crawl space air, indoor air or outdoor air sampling requirements in section 3.6.

6. The groundwater sampling requirements in section 3.7, if applicable.

7. The surface water and sediment sampling requirements in section 3.8., if applicable.

8. The area-specific sampling requirements in section 3.9.

9. The background soil, groundwater, sediment and surface water sampling requirements in subsections 3.5.3, 3.7.3, 3.8.3 and 3.8.4, where applicable.

10. The fish and wildlife impact analysis requirements in section 3.10.

11. The historic fill requirements in section 3.11, where applicable.

(b) If required pursuant to an oversight document or other applicable rule, the remedial party will submit work plans pursuant to section 3.3 and reports pursuant to sections 3.13 and/or 3.14 in accordance with the schedules contained in the oversight document.

(c) Geophysical surveys may be included as a component of an investigation to identify subsurface anomalies. Typical geophysical surveying considered for site investigations include magnetometer surveys, electromagnetic terrain conductivity surveys, electrical resistivity surveys and

ground penetrating radar surveys. Geophysical techniques are recommended to delineate underground utilities such as conduits, water lines or underground storage tanks, or to focus test pit searches for buried drums, containers and metallic objects.

(d) Composite sampling should not be conducted for volatile contaminants. Compositing of samples for other contaminants is generally not acceptable when establishing the nature and extent of contamination in a SC or RI and for documentation or confirmation samples. Except when sampling for semi-volatile compounds associated with tank investigations as detailed in section 3.9 and in Table 5.4(e)10, compositing of non-volatile organic compound (VOC) samples can be proposed for DER approval in an applicable work plan.

3.2.1 Site Characterization

(a) A SC investigation is undertaken based on the information from the records search report to determine whether contaminants are present at the site at levels above unrestricted SCGs, groundwater standards or other applicable SCGs for the unrestricted use of a site.

(b) It may be appropriate to phase the investigation effort for the SC so that the areas of concern most likely to be contaminated above the applicable SCGs are sampled first and if confirmed will result in termination of the SC and initiation of a RI. In accordance with this provision it should be recognized that the full scope of work identified by subdivision (c) below may not be required.

(c) Sampling performed as part of the SC should be identified in the work plan for all potentially contaminated areas of concern, whether relating to current or former uses of the site.

1. Sampling should be biased to the suspected location of greatest contamination.

2. Sample locations should be based on professional judgment, area history, discolored soil, stressed vegetation, drainage patterns, field instrument measurements, odor or other field indicators.

3. Sampling locations should be designed in accordance with sections 3.4 through 3.9 and 3.11.

4. If access to sampling locations required pursuant to sections 3.4 through 3.11 is not feasible due to physical obstructions or safety hazards, and no feasible sampling alternatives are available, upon approval by DER, sampling may be modified subject to the technical criteria in paragraph 1.6(c)3. Where this is necessary:

i. confirmation of any approval by DER should be included in the SCR; and

ii. for verbal approvals, in accordance with subparagraph i above, the SCR should also note the date of the verbal approval and the name of the DER representative who granted the approval should be provided in written correspondence to DER within seven days of the verbal approval.

(d) All sampling methods and laboratory analyses should be conducted in accordance with Chapter 2. The full Target Compound List/Target Analyte List and TICs, in accordance with subparagraph 2.1(a)1.ii, should be sampled and analyzed for unless otherwise approved by DER.

3.2.2 Remedial Investigation

(a) A conceptual site model should be used, at the outset of a RI, to develop a general understanding of the site and to evaluate potential human exposure pathways and impacts to the environment. This will assist in identifying and setting priorities for the activities to be conducted. The conceptual site model should identify potential sources of contamination, types of contaminants and affected media, release mechanisms and potential contaminant pathways and actual/potential human and environmental receptors.

(b) Sampling of all media which exist at the site should be conducted to delineate the nature and extent of contamination and to provide a basis for the evaluation of remedial alternatives.

(c) Contaminant concentrations in background soils, sediments, surface water and groundwater may be used in the assessment to help determine whether a contaminant is related to a site. The RI work plan should consider the sampling necessary to evaluate background levels in accordance with this subdivision where appropriate for the remedial program.

1. The number and location of background surface soil samples must follow the procedure set forth in subsection 3.5.3 to establish site-specific background soil contaminant concentrations.

2. To support a claim that all or part of on-site groundwater contamination is caused by background groundwater contamination, the procedure set forth in subsection 3.7.3 must be followed.

3. Upgradient sediment and surface water samples (which are outside the influence of site contamination) may be used to establish background contaminant concentrations in sediments and surface water as detailed in subsections 3.8.3 and 3.8.4.

(d) Data quality objectives are to be considered when deciding the sample collection technique, the type of analysis and the level of data documentation.

1. Data quality objectives may include: defining the site's physical characteristics, physical and chemical characteristics of contaminant sources, nature and extent of contamination, potential receptors and associated exposure pathways, the fate and transport of contaminants, the development and evaluation of remedial alternatives, identifying SCGs, identifying the need for treatability studies and supporting future enforcement or cost recovery activities.

2. In determining the objectives, detection limits or minimum reporting limits must be capable of defining the nature and extent of contamination to levels consistent with the SCGs for the media being analyzed.

(e) The SCGs which pertain to the site location, site contaminants, and potential remedial actions must be identified and the probable SCGs must be listed in the remedial investigation report (RIR).

1. The chemical-specific SCGs must also be considered when preparing the sampling protocols for the site to ensure the use of appropriate analytical detection limits or minimum reporting limits.

2. A listing of SCGs applicable to the RI is included on the DEC website identified in the table of contents.

(f) If a building interior investigation is required by the criteria in section 3.4, it should be included as part of the RI.

3.3 Investigation Work Plans

(a) This section provides the basis for the preparation of any investigation work plans including those associated with SCs, RIs, pilot testing, pumping tests, predesign investigations/delineations or confirmatory/documentation sampling undertaken pursuant to this guidance.

1. Investigation work plans, once approved by DER, are used in the field to govern the identification of all field investigation aspects of a site remedial program. At a minimum, the work plan must include the elements identified in this section and the investigations must be supervised by a qualified environmental professional.

2. The work plan for a SC or RI should be prepared after the records search (a previously documented records search may be sufficient, if consistent with Appendix 3A) and a site visit. A site visit should be conducted before the work plan is developed to confirm and update the results of the records search and to note any access restrictions or other site conditions (e.g., the land uses around the site such as adjacent residential properties, schools, day care centers, etc.) which may affect the level of investigation. If the investigation is directed at either a specific discharge event or an underground storage tank or tank system, then a full records search may not be needed.

3. The work plan must include site-specific QA/QC protocols to be used during the investigation, which are developed in accordance with the requirements of section 2.3. The QA/QC section of the work plan is to:

i. determine whether a QAO will be required in accordance with paragraph 2.3(a)1;

ii. indicate the sampling and analytical protocols and data deliverables to be followed for obtaining and evaluating data of sufficient quality to support decisions during the remedial process;

iii. identify data evaluation requirements (data validation and/or a DUSR) and qualified data reviewers, in accordance with section 2.2, section 2.4 and Appendix 2B; and

iv. assure that the analytical methods identified provide a low enough detection limit or minimum reporting limit to compare with all applicable SCGs. A list of potential SCGs is available on DEC's website identified in the table of contents.

4. Include a HASP and CAMP, consistent with section 1.9, to be used during field activities. In addition:

i. community air monitoring consistent with section 1.9 may be needed for sites contaminated with VOCs or where particulates might be generated by investigative activities or nuisance odors may be encountered; and

ii. in addition to any worker safety measures required by law or regulation, where site conditions are not already well known appropriate monitoring instruments such as organic vapor analyzers (OVAs), photoionization detectors (PIDs), explosimeters, oxygen detectors and radiation

detectors are to be used to ensure personal safety and assist with characterization.

(b) Investigation work plans. The work plan must define the scope of work for the required investigation. In general, the elements of an investigation identified by this subdivision should be considerations for any investigation. Additional investigation elements which are more typically appropriate only for an RI are provided in subdivision (c) below.

1. A summary of any significant results of the records search and site visit, undertaken pursuant to paragraph(a)1 above:

i. with a focus on identifying historical chemical/petroleum product usage or disposal, potential contaminant sources and possible migration conduits including all subsurface utilities; and

ii. the presentation of any prior sampling locations on a separate figure. and analytical results with a summary and interpretation of those results.

2. Descriptions of the following, unless the investigation is directed at either a specific release, an underground storage tank or underground storage tank system:

i. the physical conditions of the site and surroundings, including a general description of soils, geology, hydrogeology and topography, including site drainage patterns; and

ii. a copy of the United States Geologic Survey (USGS) 7.5 minute topographic quadrangle that includes the site and an area of at least a one-half-mile radius around the site. This map should be the USGS revision in effect at the time of the report and must clearly note the site location.

3. A summary table of proposed sampling locations and analysis should be presented in the work plan text or on the sample location map specified in paragraph 4 below, which includes:

i. location (use the same alpha or numeric designation as shown on the scaled sampling location map);

ii. matrix (waste, soil, surface water, groundwater, sediment, air, soil vapor or biota as appropriate);

iii. sample depth (soils/ soil vapor/sediments/surface water) or water bearing zone to be sampled (groundwater);

iv. analytical parameters for each sample (for example, TAL metals or semi-volatile compounds);

v. sampling method, with minimum reporting limits to be achieved;

vi. the rationale for each sample (for example, to delineate the nature and extent of contamination, to assess potential human exposure/environmental impacts or to support potential remedies); and

vii. QA/QC samples (e.g., MS/MSD, duplicates, blanks), as needed.

4. A sample location figure which:

i. identifies the proposed sample locations

ii. is scaled appropriate to the area of the site and consistently applied in all reporting;

iii. is keyed to the site map;

iv. identifies site boundaries and property borders; and

v. shows significant site features including building locations, paved/unpaved areas, water bodies and wetlands.

5. A detailed schedule for all activities, including time lines and target dates for the start and completion of all field activities and submission of all reports to DER.

6. A list of the names, contact information and roles of the principal personnel who will participate in the investigation including the project manager, contractor and subcontractor contacts. Qualifications of these personnel:

i. must be included as an appendix to the work plan; and

ii. if the principal personnel designated on the project change, information for new personnel must be submitted to DER for approval, as set forth in the oversight document for the remedial program.

7. The name(s) and contact information for the remedial party contact and, if applicable a facility contact for the location the work is taking place.

(c) RI work plans. In addition to the requirements for investigations noted in subdivision (b) above, a more detailed level of effort or the investigation of additional aspects of a site may be required for an RI work plan.

1. In addition to the descriptions identified in paragraph (b)2 above, an RI work plan must:

i. identify and provide a map of all wetland areas on or near the site including wetlands in the "National Wetlands Inventory" and/or DEC regulated wetlands;

ii. the usage, distance to, flow direction (if appropriate) and names of surface water bodies, as well as for an initial survey the locations of public/private drinking water supply wells within at least one half mile of the site with emphasis upon water bodies and supply wells topographically or hydraulically down gradient of the site that may be in the path of site discharges or runoff. A map which shows the location of residences and other sensitive receptors must be included;

iii. land use within a half mile radius of the site boundary including proximity of the site to sensitive human or ecological receptors (e.g., residences, schools, parks, wetlands) including a database search of other known contaminated sites or spill sites in this area. See the discussion of land use factors to be considered in remedy selection in subdivision 4.2(i) to guide the identification; and

iv. any major infrastructure (storm drains, sewers, underground utility lines, piping tunnels, subways, etc.) and a discussion of whether such infrastructure may influence contaminant migration.

2. A description of each area of concern including approximate dimensions, suspected contaminants, suspected source of discharge, and potential receptors. Individual area of concern maps must be scaled at one inch to 40 feet or less to clearly indicate possible source areas and sampling locations.

3. Fish and wildlife resource impact analysis (FWIRA). Proposed sampling and analysis for the FWRIA Resource Characterization (Part 1) and Ecological Impact Assessment (Part 2), if determined necessary by DEC. To determine the FWRIA steps necessary for a work plan:

i. see subsection 3.10.1 to determine whether a FWRIA Part 1 is necessary and should be included in the scope of the RI work plan; and

ii. if required based on the Part 1, a FWRIA Part 2 using the scope of work for gathering the necessary data to perform the evaluations identified in subsection 3.10.2.

4. Qualitative exposure assessment. The qualitative exposure assessment for both human health and/or fish and wildlife resources required to be completed during the RI to qualitatively determine the route, intensity, frequency and duration of actual or potential exposures to contaminants. This assessment should:

i. describe the nature and size of the population currently exposed or which may reasonably be expected to be exposed to the contaminants that are present at or migrating from a site;

ii. include a determination of the reasonably anticipated future land use of the site and affected off-site areas;

iii. identify the reasonably anticipated future groundwater use;

iv. characterize the exposure setting, identifying current and reasonably foreseeable exposure pathways;

v. evaluate contaminant fate and transport;

vi. be developed in accordance with the following parts of this guidance:

(1) Appendix 3B, for human health exposure assessments; and

(2) subsection 3.10.1, for fish and wildlife exposure assessments; and

vii. include a full delineation of the nature and extent of off-site impacts; unless the remedial party is a volunteer in the BCP, in which event off-site field information is only needed sufficient to identify the presence of contamination and support the qualitative off-site exposure assessment for these sites.

5. Data collection needs for evaluating monitored natural attenuation (MNA) of groundwater are provided in subdivision (d) below.

(d) Work plans for evaluating MNA. When submitting an investigation work plan for a site where

MNA of groundwater may be evaluated during remedy selection, the remedial party should collect sufficient data to delineate the source of the contamination and to demonstrate to DER that groundwater contaminant concentrations will decrease to applicable groundwater or surface water standards through degradation, retardation, or dispersion under present site conditions, in a reasonable time frame, and if applicable that any human exposures will be addressed during the MNA time frame.

1. MNA may be evaluated by a RI and identified as a component of a remedy as an exit strategy for biodegradable groundwater plumes after source areas have been addressed to the extent feasible. Plumes that are naturally attenuating to a significant degree reach an apparently stable length (and then shrink) while concentrations along their centerline decrease over time.

2. MNA may be a viable remedial approach where it can be demonstrated that contamination attenuates naturally (and sufficiently) before impacting a sensitive receptor. To establish this the remedial party should evaluate the following to determine the viability of MNA as a remedy:

i. remedies to reduce or eliminate the contaminant mass representing the source of the groundwater contamination, as determined by free or residual product, soil exceeding the protection of groundwater SCO and dissolved phase delineation and dissolved contaminant concentrations;

ii. hydrogeologic and geochemical data used to demonstrate and quantify natural attenuation, such as dissolved oxygen, nitrate, iron, manganese, sulfate, methane content, oxidation/reduction potential or others as appropriate:

iii. presence or absence of microorganisms in soil and groundwater;

iv. groundwater flow velocity;

v. applicable physical and chemical characteristics of contaminants and contaminant degradation products present in both soil and groundwater;

vi. other wells and the location of those used for potable water supply;

vii. sorptive and desorptive characteristics of the soil; and

viii. other data deemed necessary by DER.

3. Monitored natural attenuation will only be considered a viable alternative where the source of contamination has been addressed pursuant to paragraph 4.1(d)2. Delineation of the source should:

i. adequately delineate the extent of any NAPL and/or grossly contaminated media in the unsaturated and saturated zones; and

ii. for MNA to be evaluated as a remedy, obtain sufficient data to develop treatment or removal alternatives for the source, if practicable, or containment if treatment or removal are not practicable, during the remedy selection evaluation in Chapter 4.

4. Consider the extent of soil contamination in the unsaturated zone, to allow the development of a MNA remedy(ies) which will remediate these soils to the applicable soil remediation

SCGs in accordance with a schedule approved by DER;

5. Continue to delineate groundwater contamination until the applicable groundwater or surface water standard for the nearest downgradient receptor or surface water body is reached;

6. Demonstrate that groundwater contaminated above the applicable groundwater standard will not reach the nearest downgradient receptor, using an appropriate groundwater flow/contamination transport model approved by DER.

7. Document the fate and transport of the contaminant plume;

8. Obtain sufficient information with respect to soil vapor intrusion to evaluate whether actions are necessary to address exposures related to soil vapor intrusion. This determination will be made on a case by case basis, pursuant to section 3.6; and

9. Demonstrate that predicted impacts to potential receptors are consistent with groundwater standards. This should include, without limitation, information pertaining to:

i. the existence of water lines;

ii. the locations which are or may be suitable for the placement of public water supply wells;

iii. proposed or future installation of water lines; or

iv. local and/or county ordinances restricting installation of potable wells.

(e) Management of investigation derived waste (IDW). An investigation work plan is also to identify provisions for management of IDW. This subdivision sets forth guidance for the handling and disposal of contaminated soil and water generated during an investigation, in a manner that does not pose a threat to public health and the environment and is compliant with applicable rules and regulations. Absent a regulatory exemption, the transport, storage and disposal of IDW is generally subject to one or more solid or hazardous waste regulations (e.g., 6 NYCRR Parts 360, 364 and the 370 series). Unless specifically noted herein, no guidance provided in this subdivision is intended to impose more stringent requirements than the applicable regulations regarding the handling, transport, storage or disposal of IDW.

1. Drill cutting and spoil disposal from on-site locations. Drill cuttings and other soil generated on-site during an investigation from the installation of soil borings, monitoring wells or geoprobes are presumed to be contaminated. Such cuttings and spoil:

i. must be stored on protective sheeting and covered with protective sheeting if cuttings remain on ground at the end of the day;

ii. may be disposed at the site within the borehole that generated them to within 12 inches of the surface or if the site is a residential site backfilling may be to within 24 inches of the surface, unless:

(1) free product, NAPL or grossly contaminated soil, are present in the cuttings;

(2) the borehole will be used for the installation of a monitoring well (cuttings may only be used to backfill boreholes installed for soil sampling);

(3) the borehole has:

(A) penetrated an aquitard, aquiclude or other confining layer; or

(B) extended into bedrock;

(4) backfilling the borehole with cuttings will create a significant path for vertical movement of contaminants. Soil additives (bentonite) may be added to the cuttings to reduce permeability;

(5) the soil cannot fit into the borehole as set forth in subparagraph i. above.

iii. cuttings meeting any of the conditions set forth in subparagraph i above, which cannot be disposed in the borehole must be containerized and handled as set forth in paragraph 3 below; and

iv. the borehole area must be restored, after backfill:

(1) in unpaved areas, by placing 12 inches of cohesive, compacted soil meeting the requirements for fill of subdivision 5.4(e) and Appendix 5 over the area of the borehole, unless the site is a residential site in such case 24 inches are required; or

(2) for paved areas, by placing clean cohesive, compacted soil in the borehole to sufficient depth to allow restoration of the paved surface; and

v. if the site includes streets, sidewalks or other publicly accessible areas, the off-site provisions in paragraph 2 should be applied to samples collected in those areas.

2. Drill cutting and spoil disposal from off-site locations not know to be contaminated. Cuttings and spoils generated from off-site locations during an investigation are to be managed as follows:

i. cuttings, may initially be placed on plastic as generated,, but should be containerized as drilling progresses. Overnight storage outside of a container is not allowed. The cuttings may be transported from the point of generation to a temporary on-site storage area without a 6 NYCRR Part 364 permit;

ii. cuttings from off-site boring locations are considered non contaminated until testing indicates otherwise, unless field screening results of the soil are positive for the presence of contamination; and

iii. the borehole will be filled with soil or a soil bentonite mixture and restored as set forth in clauses 1.iv. (1) or (2) above.

3. Drill cutting and soil disposal from known contaminated locations. Representative samples of drill cuttings or other IDW from known contaminated locations at a site or from off-site locations, identified in accordance with paragraphs 1 and 2 above, must be characterized for disposal. Such samples must be analyzed to ensure proper classification, treatment and disposal and where determined to be:

i. hazardous waste or a solid waste, must be properly managed and disposed at a properly permitted treatment, storage or disposal facility. Such waste will:

(1) be transported by a hauler permitted in accordance with 6 NYCRR Part 364;
(2) if such cuttings and soil are determined to be a hazardous waste, the waste shipment shall be accompanied by a manifest in accordance with 6 NYCRR Part 372; and
(3) any IDW soil identified as either a solid or hazardous waste, may be stored on the site in a secure area awaiting disposal, in accordance with applicable DEC waste management regulations or other provisions approved by DER; and

ii. soil not characterized as a solid or hazardous waste may be placed at the site, or returned to the off site location where it originated, in a manner set forth in the DER-approved work plan.

4. Test pits. When excavating test pits to delineate the extent of contamination, the soil removed from the excavation is to be managed as follows:

i. any drums or other containers encountered, as well as NAPL or other free product, will be over packed or otherwise containerized for appropriate off-site disposal, as discussed in subparagraph 2.ii above;

ii. where subparagraph i above does not apply, material removed may be placed back in the excavation in the same general strata from which it was removed; and

iii. the excavation shall be managed so as not to contaminate the surface of the site, all soil removed will be placed on plastic.

5. Investigation generated water/fluid handling and disposal. All water/fluid resulting from well development and/or well purging before sampling must be collected, handled and discharged/disposed of pursuant to applicable guidance and regulations. Water/fluid generated during an investigation:

i. is to be containerized upon production and is to subject to the following handling/disposal guidelines:

(1) 6 NYCRR Part 364 will not apply to the transport of the containers from the point of generation to a temporary on-site storage area, or treatment facility;
(2) the containers must be securely staged, pending appropriate disposal as set forth in subparagraph ii below;
(3) NAPL shall never be released to the ground;
(4) where containers include water mixed with NAPL, the water can be decanted from the NAPL (or vice versa) as long as a measurable layer of water remains with the NAPL, and the decanted water is NAPL- and/or sheen-free;
(5) groundwater from several monitoring wells may be combined provided they are associated with the same disposal site and aquifer; and
(6) NAPL may be collected from several containers and combined provided it all comes from monitoring wells associated with the same disposal site;

ii. it may be stored on-site in labeled containers in an area with secondary containment awaiting treatment and/or disposal, in accordance with applicable DEC waste management regulations (e.g., 6 NYCRR Parts 360, 364 and the 370 series) or other provisions approved by DER. The contents

of the containers will be

(1) properly treated or disposed of, when any of the following are observed:

(A) visual evidence of contamination, consisting of discoloration, sheens, free product or NAPL;

(B) olfactory evidence of contamination; or

(C) concentrations of contaminants above groundwater standards at levels of concern are known to be present in the monitoring wells, based on previous sampling of the groundwater; or

(2) if none of the conditions described in clause ii.(1) apply, the containerized water may be:

(A) recharged to unpaved ground into the same groundwater unit, within or directly adjacent to a source area in a manner which does not result in surface water runoff, with DER approval; or

(B) if a remedial treatment system designed to treat water is operational at the site the water may be added to the influent of the treatment system; and

(3) treatment or disposal of contaminated water/fluids will be at:

(A) a permitted off-site facility;

(B) an existing on-site permitted facility or a remedial treatment facility capable of treating the water/fluids, if one exists; or

(C) an on-site treatment unit brought to the site, properly designed to handle the water/fluids, where a permit waiver pursuant to section 1.10 has been granted by DER; and

iii. sediment that settles out of the IDW, provided there is no NAPL or free product present, must be handled and disposed in accordance with paragraphs 1 to 3 above, as appropriate for the location of the well.

6. Short-term surface water or groundwater discharges. Water resulting from pump tests or pilot studies conducted at a site pursuant to a DER approved work plan may be discharged to surface or groundwater providing the water meets, or is treated to meet, certain generic criteria. The generic discharge criteria for short term discharges can be found on the DEC website or may be obtained from the DER project manager.

(f) Evaluation of Natural Resource Injury.

1. The remedial party may elect to incorporate the collection of data necessary for a natural resource injury evaluation into a RI work plan.

2. The goal of a natural resource injury evaluation would be to collect data necessary to assess the existence of natural resource injuries, including the nature and extent of injury to soil, sediments, surface or groundwater, flora and fauna, caused by contamination. DEC's Division of Fish, Wildlife and Marine Resources should be consulted in the development of protocols for such data collection.

(g) The work plan should be organized to include the following as sections or appendices. Available investigation work plan template(s) available on the DEC website identified in the table of contents should be used, as directed by the DER project manager.

1. Introduction or purpose

2. Site history and description

3. Work plan objectives, scope and rationale

4. Quality assurance/quality control protocols

5. Health and safety protocols

6. Reporting and schedule

7. Citizen participation activities, references and appendices, as appropriate.

(h) Work plans for other investigations undertaken in support of other phases of the remedial program (e.g., pilot studies, pre-design delineations) should utilize any applicable guidance provided in this chapter.

3.4 Building Interiors

(a) The remedial program for a site is intended to investigate contamination of the real property comprising the site however, as set forth in paragraph 1 below, the SC or Ri of building interiors may be necessary. Where necessary it should be performed in accordance with this section.

1. The investigation of a building interior should be conducted when:

i. contaminants inside the building have the potential to migrate to and impact the environment outside of the building; or

ii. contamination or contaminated media outside the building have the potential to migrate into the building; or

2. The requirements for investigating contaminants inside buildings, or associated with tanks and above or below ground means of conveyance of solids or liquids of any kind including piping, plumbing, floor drains, vents, trenches, duct work, gutters, leaders, or fissures in floors, walls or ceilings that create pathways inside the building, which have the potential to migrate to the environment outside or under the building are found in the area specific investigation procedures specified in section 3.9

3. Requirements for investigating contaminants outside the building, which have the potential to migrate into buildings, potentially impacting public health, will be specified by DER on a site-specific basis.

(b) If evidence of prior activities or areas of concern are identified that may have impacted the building structure, an investigation must be undertaken as specified by DER.

(c) The investigation of asbestos, asbestos contaminate material (ACM) and lead-based paint should follow applicable state, federal and local guidance and regulations and. For asbestos or ACM, consultation with the NYS Department of Labor is required.

(d) Soil vapor intrusion in buildings is addressed in section 3.6.

3.5 Soil

3.5.1 Site Characterization

(a) SC soil investigations should satisfy the applicable elements of this subsection.

1. Initial site survey. The presence of potential source areas to be considered by the initial site survey are those AOCs identified in subdivision 1.8(c). Where the potential for buried drums, tanks, deposits of waste or other discrete and identifiable AOCs may exist the use test pits, ground penetrating radar, magnetometry, electromagnetic, or other techniques capable of detecting metal containers and other waste to an average depth of 20 feet or deeper should be considered.

2. Based on the findings of this survey and/or other AOCs identified by the records search to be undertaken in accordance with Appendix 3A and reported as set forth in section 3.12, soil sampling to characterize contaminant levels in surface or subsurface soil should be planned where:

i. there have been any indications of buried drums, tanks or waste;

ii. groundwater contamination is detected and no source has been identified;

iii. aerial photographic history of the site indicates the presence of drums, tanks or waste in or adjacent to regraded and/or filled areas;

iv. historic fire insurance maps, or other documentation, has identified the past presence of structures or operations (e.g., former manufactured gas plants) which are likely sources of contamination;

v. there are areas of soil staining;

vi. distressed vegetation exists; or

vii. bare soil is present.

(b) Surface soil sampling. Samples, except those being analyzed for VOCs as noted below, should be collected based upon the type of exposure or disposal to be assessed by the sample.

1. Assessing human exposures to soil. When assessing the human exposure resulting from soil contamination related to:

i. incidental soil ingestion, inhalation of soil or dermal contact with soil; soil samples should be collected from a depth of 0 to 2 inches below the vegetative cover, unless VOCs are the only contaminants of concern in which case the sampling should be from 0 to 6 inches; and/or

ii. vegetable/fruit gardens, soil samples should be collected from a depth of 0 to 6 inches below the vegetative cover.

2. Assessing ecological resource exposure to soil. When assessing the impact of soil

contamination on ecological resources samples should be collected from:

i. surface soil at a depth of 0 to 6 inches below the vegetative cover; and

ii. a deeper soil horizon, typically from 12 to 24 inches below ground surface.

3. Where both human and ecological resource exposures are being evaluated, samples at each depth may be required.

(c) Subsurface soil sampling. Samples should be collected via soil borings and/or test pitting for chemical analysis and to provide a profile of subsurface conditions in identified or suspected AOCs and in other areas as needed to characterize the site.

1. Boring logs should be prepared by a qualified individual, reporting to the site QEP, for all soil samples to document subsurface conditions including, without limitation:

i. soil types and description of non-soil materials;

ii. field instrument measurements;

iii. depth to groundwater, if groundwater is encountered; and

iv. to document physical evidence, if present, including but not limited to:

(1) soil mottling;
(2) presence of odor or vapors;
(3) soil discoloration or staining; and
(4) NAPL, free and/or residual product;

2. Soil should be described using the:

i. New York State Department of Transportation *Soil Description Procedure* (NYSDOT Soil Mechanics Bureau STP-2 dated May 1, 1975, as amended); or

ii. unified soil classification system (USCS) which is set forth in ASTM 2488.

3. Known hazardous waste, concentrated solid or semi-solid substances, soils with free product or NAPL and/or grossly contaminated media will not be returned to the subsurface and must be disposed of in accordance with applicable guidance and regulations. If contaminated materials are returned to the ground, in accordance with subdivision 3.3(e), the remedial party must address the presence of this contamination as part of any remedial action.

4. Soil sample locations should be documented by the use of GPS. They may also be photo-documented.

5. Samples should be collected continuously in discrete increments as grab samples prior to any consolidation of the sample. If less than full recovery is obtained by the sampling technique, an explanation should be provided in the soil log.

6. Additional sampling of soil from boring-depth increments below those specified in a work plan to investigate AOCs or based on observations as set forth in paragraph 3.5.1(a) 2 should be completed in cases where:

i. the surface has been regraded;

ii. evidence is identified in a boring of:

(A) the conditions identified in subparagraph 1.iv above;
(B) LNAPL, from the water table; or
(C) DNAPL, form the top of a confining unit; or

iii. other evidence is found which indicates the possible presence of contamination.

7. If the designated subsurface soil sampling point is within the saturated zone, when sample recovery is possible, a sample of the saturated soil should be collected and analyzed.

(d) The use of expedited site investigation approaches, such as the USEPA Triad, are encouraged.

1. Expedited site investigation involves systematic project planning, use of dynamic work strategies and field screening techniques.

2. Sampling methodologies using field-screening techniques:

i. have similar analytical limitations to laboratory methods, which are addressed in subdivision 2.1(c); and

ii. should be detailed in a work plan and approved by DER before use.

3. Field testing sampling plans should be prepared in accordance with Appendix 2A.

3.5.2 Remedial Investigation

(a) The RI should include provisions to identify all soil which may contain contaminants above the unrestricted use soil SCGs.

1. Soil sampling during the RI is intended to determine the areal and vertical extent of those areas found to be contaminated. Sampling locations should be biased toward locations expected to be contaminated or source areas, but must also provide sufficient coverage of the entire site to allow decisions relative to land use restrictions.

2. In addition, soil data is used in the exposure assessment to identify any actual, or potential for, exposure.

3. The use of the field-screening techniques/investigations (e.g., Triad) as described in subdivision 3.5.1(d) and Appendix 2B are encouraged to focus the location of surface or subsurface soil sampling to the most likely source areas, to minimize multiple mobilizations and obtain more complete data set and to indicate a potential for vapor intrusion into buildings.

4. Geophysical surveys. Geophysical surveys may be used as described in paragraph 3.5.1(a)1 and should also be considered during the RI to:

i. identify subsurface utilities as sources of discharge or preferential pathways;

ii. obtain geologic characterization of bedrock, clay layers, etc.; or

iii. focus test pit and/or soil boring locations to areas of subsurface anomalies.

5. Soil gas surveys may be used to identify areas of soil contamination which are a source of soil vapor, in accordance with section 3.6.

(b) Surface soil investigations.

1. Follow the sampling procedures identified in subdivision 3.5.1(b).

2. For suspected surface discharges. Soil samples to be analyzed/screened for VOCs should be collected to minimize contaminant loss during sampling. Each sample should be field screened with a properly calibrated photoionization detector or flame ionization detector (PID/FID) or other suitable instrument. When field screening is used the following should apply:

i. at a minimum, the initial 24 inches of soil rather than the surface soil sampling depths identified in subdivision 3.5.1(b) should be field screened for the presence of VOCs; and

ii. if field measurement readings are detected above background, the sampling should be extended until background readings are achieved, or groundwater or bedrock is encountered; or

iii. a sample from the interval registering the highest field-measurement reading should be collected and analyzed for VOCs.

(c) Subsurface soil investigations.

1. Subsurface soil sampling from soil borings, geoprobes and/or test pits/trenches, in addition to the areas described in paragraphs 3.5.1(a)2 and (c)6, is required in any area:

i. where it is likely that contaminants have migrated downward from the surface or were released below ground surface; for example, from dry wells, leach fields, injection wells or underground storage tanks;

ii. where the investigation of a geophysical or soil vapor anomaly suggests a possible contaminant source;

iii. where waste was or was reported to have been disposed. Such sampling should delineate the boundaries of the area impacted by the disposal; and

iv. when surficial contamination is known or suspected. Such sampling should determine the vertical extent of that contamination.

2. If VOCs are confirmed in the subsurface, the investigation should evaluate any

subsurface utilities, structures (with both basement and slab on grade) and/or other preferential pathways to identify additional sampling that may be warranted to determine whether actions are needed to address exposures associated with soil vapor intrusion, as a result of the soil contamination.

3. When any soil boring, geoprobe or test pit/trench is installed, written logs of the findings are to be prepared and maintained which include, but are not limited to:

i. the data identified in paragraphs 3.5.1(c)1 and 2;

ii. documentation and/or observations regarding the interface between waste and native soils (if appropriate);

iii. identification of the groundwater table and related observations, such as floating product or LNAPL;

iv. identification of the mobility of any contaminants, NAPL or free product identified; and

v. a photographic record of such excavation areas is also recommended to document subsurface features and observations.

(d) The investigation should gather sufficient data on contamination present in soil to evaluate the need for remediation or mitigation at the site.

3.5.3 Soil Background Evaluation

(a) This guidance is intended for soil background evaluations conducted as a component of a SC, RI or, where appropriate, at another element of the remedial program. Site background evaluations are not considered for use on-site at BCP sites.

1. If a suspected contaminant is identified in soil in excess of the unrestricted soil SCGs, the guidance in this subsection may be followed to demonstrate to DER that the concentration of the element, chemical or contaminant in the soils may be due to background conditions.

2. Area-wide soil background studies, intended to be applied to more than one site, may require an expanded level of effort to be determined after consultation with DEC.

3. Background evaluations typically focus on surface soils, although the same approach is applicable to deeper soil horizons.

(b) The remedial party may evaluate soil background conditions at a site using the approaches discussed in this subdivision. The evaluation of background conditions consists of a two-step process. The first step is gaining an understanding of soil conditions on-site and the second step is understanding the soil conditions off-site.

1. On-site soil conditions. Understanding conditions on-site includes an evaluation of whether:

i. the contaminant(s) of concern was(were) never used, stored, or disposed on or near

the site);

ii. (an) element(s) or chemical concentration detected in the soil at the site are within the ranges reported in appropriate references for naturally or regionally occurring background levels for New York. In doing so, the remedial party needs to consider the applicability of the rural background study (see subparagraph 2.ii, below) to the study area;

iii. the distribution of the element, chemical or contaminant in the soil does not follow a concentration gradient indicative of disposal or a discharge; and

iv. the presence of historic fill material.

2. Off-site soil conditions. The remedial party may employ one of the following three approaches to gain an understanding of off-site soil conditions:

i. use an existing DEC-approved background evaluation which was conducted generally in accordance with subdivision (c) below, for soils near the site to establish the background soil conditions;

ii. use the rural background study conducted by DEC, in collaboration with the New York State Department of Health, as part of the development of the soil cleanup objectives set forth at 6 NYCRR Part 375 as background soil conditions and available in the technical support document [see 6 NYCRR 375-6.2(b)]; or

iii. undertake a site-specific background evaluation, to demonstrate background conditions of the soil in the vicinity of the site, in accordance with subdivision (c) below.

(c) Site-specific background evaluation. A site-specific background evaluation will consider soil samples collected and analyzed from no less than five background sample locations in the vicinity of the site as detailed in this subdivision to assist in the characterization of site-related contamination. An evaluation intended to develop site-specific cleanup objectives is addressed in subdivision (d) below.

1. The background grab samples should be collected from:

i. a depth which conforms to the same depths of the surface soils sampled during the surface soil investigation;

ii. the 0 to 2 foot soil horizon if no surface soil samples were collected at an AOC or from the site.; or

iii. deeper horizons if appropriate based where the contamination is present

2. Background samples should be collected at locations which are:

i. unaffected by current and historic site operations, as documented by the records search;

ii. wherever possible, from locations which are topographically upgradient and upwind of contaminant sources; and

iii. off the site being investigated, unless the site being investigated encompasses a large area which includes separable areas having no identified AOCs.

3. Background samples should not be collected from potentially contaminated areas, including any of the following:

i. areas where materials or wastes were loaded, handled or stored;

ii. identified waste-disposal areas;

iii. areas which receive runoff from areas identified in subparagraphs i or ii above or adjacent contaminated sites;

iv. storm drain outfall discharges or ditches receiving runoff from the site or adjacent contaminated sites; or

v. any other area of concern, as defined by section 1.8;

4. Background samples generally should not be collected from the following areas unless it can be demonstrated that the contamination in the area is due to generally occurring pollution related to the urban or industrial nature (anthropogenic) of the surrounding area and the results will be compared to samples taken from similar areas on the site:

i. parking lots, roads or roadside areas;

ii. areas near railroad tracks;

iii. areas of historic fill material;

iv. storm drains or ditches receiving runoff not impacted by the site or adjacent contaminated sites; or

v. depositional areas outside the influence of known sources.

5. Background studies should use the same sampling and analytical methods as were used for other site samples.

6. Samples collected from a site or an area of concern cannot be averaged for background comparisons, rather the individual samples should be evaluated, in consultation with DEC and the NYSDOH to determine a background level for the site. Except for on-site at a BCP site, if contaminant concentrations are found at any sampling location on the site exceeding the background level developed from the background samples, the RI may delineate the extent of the contamination based on the background level, rather than the applicable unrestricted soil SCG.

7. The background evaluation should be presented in a work plan developed in accordance with section 3.3, if not included in the RI work plan.

(d) Site-specific remediation levels based on background concentrations. If a site-specific

background soil level identified by subdivision (c) above is to be proposed as a remediation level at the site, a more extensive sampling program to allow a statistical analysis of background levels may be required.

1. The remedial party should, after consulting with DER, submit a work plan outlining the proposed methods for the additional sampling and any proposed statistical evaluation of samples.

2. Where a grid or predetermined sample spacing is to be used in a site-specific evaluation , the limitations on the location of samples identified by paragraph (c)3 above are not applicable, because the investigation is intended to assess the impacts from other potential sources of contaminants in the vicinity of the site to the site-specific background.

3. Any statistical analysis should be in designed consistent with the rural background study data analysis methods provided in Appendix D, Section B of the *New York State Brownfield Cleanup Program Development of Soil Cleanup Objectives Technical Support Document (TSD) September 2006* or any subsequently approved applicable document, which is available on DEC's website identified in the table of contents.

3.6 Soil Vapor

(a) For guidance relative to recommended sampling protocols, quality assurance/quality control of sampling, analytical methods and the use of field laboratories/mobile gas chromatographs, as well as any updates to the sampling requirements detailed above, the most recent NYSDOH guidance document should be used. Soil vapor is considered an environmental medium that must be characterized during the investigation in accordance with this section.

(b) This section focuses on the collection of data which is used to determine whether actions are needed to address exposures to volatile chemical contamination related to soil vapor intrusion (SVI). Volatile chemical contamination may result from the presence of VOCs as defined at paragraph 1.3(b)76, and certain semi-volatile compounds such as napthalene.

1. The soil vapor pathway is to be investigated at any site where buildings are presently located, or may be constructed in the future, when:

i. a source of volatile chemical contamination in subsurface soil or groundwater is identified in the vicinity of the buildings or future building site; or

ii. based on known prior industrial, commercial or other land uses, a source of volatile chemical contamination in subsurface soil or groundwater may be suspected.

2. A soil vapor investigation should be used to evaluate the potential for SVI into buildings on or near a site during the:

i. SC, only in the event where the SC would conclude that no further investigation is warranted, as set forth in subparagraph 3.1(a)3.i, and no RI is necessary; or

ii. RI, where the conditions identified by paragraph 2 above exist.

3. The sampling to evaluate exposures related to SVI detailed in this section is applicable to

any building or structure, whether in residential, commercial or industrial use. In evaluating the level of effort necessary for a given property, after consultation with DER and NYSDOH, the preparation of a site-specific work plan may consider:

i. occupational exposures which may result from current commercial or industrial processes within a building; and

ii. hobbies or other activities conducted in a residential property which require the storage or use of VOCs.

(c) The initiation of investigation activities for characterizing the nature and extent of contamination in soil vapor should be determined on a site-by-site basis, taking into consideration the factors identified by this subdivision.

1. If little is known about the current site conditions, then the evaluation of contamination in other environmental media, specifically groundwater and soil, should usually proceed first. The results of these initial investigations, as well as other site information, should then be used to guide an investigation of soil vapor intrusion, such as the selection of locations for subsurface vapor samples based on likely migration pathways.

2. At sites where the investigation of SVI is necessary, and the locations of suspected source areas are reasonably known, it is prudent to initiate sampling sooner rather than later, given the iterative nature of the sampling process.

3. When sampling is initiated subsurface vapor conditions should be characterized prior to collecting indoor air samples. However, soil vapor samples are not always reliable predictors of the concentrations of volatile chemicals beneath the slab or basement of nearby buildings. In many cases predictions based on soil vapor concentrations using currently available models may underestimate the concentration of volatile chemicals in nearby sub-slab vapor samples.

4. At least some confirmatory structure sampling will typically be needed during a RI to rule out SVI related exposures if volatile chemicals are detected at levels of concern in the soil vapor near buildings. Using the modeling of soil gas concentrations is not sufficiently predictive of concentrations of sub-slab vapor or indoor air levels.

(d) An investigation of the potential for SVI into buildings is required where volatile chemical vapors, such as from VOCs, some SVOCs and mercury, are a concern.

1. Subsurface sources of volatile chemicals include the following:

i. groundwater or subsurface soil that contains concentrations of volatile chemicals in excess of their appropriate SCGs;

ii. NAPL;

iii. buried wastes; and

iv. subsurface waste storage or holding structures, (e.g., underground storage tanks, gas holders, etc.).

2. Site-specific conditions and findings often warrant different approaches, for example if underground utilities or the trenches they are installed in act as preferential pathways for soil vapor migration.

3. The process of investigating and evaluating the SVI pathway during the RI is an iterative one. During the RI, multiple rounds of sampling of subsurface vapor or structures may be necessary to:

i. evaluate fluctuations in concentrations due to:

(1) seasonal effects of different weather or building conditions. where:
(A) at least one round of sampling is collected during the winter heating season; unless
(B) non-heating season sampling has indicated the need for installation of a soil vapor mitigation system in the building;
(2) changes in source strength; or
(3) soil vapor migration or contaminant biodegradation processes;

ii. confirm sampling results or the effectiveness of the mitigation/remedial systems installed; and

iii. characterize the nature and extent of subsurface vapor, when appropriate, or indoor air contamination, similar to the delineation of a groundwater plume.

4. Sufficient sampling should be completed to evaluate:

i. whether soil vapor is contaminated, the nature and extent of this contamination and, if possible, the source(s) of the contamination;

ii. current and potential exposures to the contaminated soil vapor; and

iii. what actions, if any, are needed to address exposures and to remediate soil vapor contamination.

5. An investigation involves the collection of the four types of samples which are discussed in detail in subdivisions (e) through (h) of this section. The samples comprising a SVI investigation are:

i. subsurface soil vapor samples not from beneath a foundation or slab of a building, should be determined on a site-specific basis in consideration of the site conceptual model and sampling objectives, area to consider for this sampling include:

(1) rights of way or other locations in the area of concern:
(2) paved or otherwise confined areas adjacent to buildings; or
(3) if paved areas are not present when collecting soil vapor samples around a building, samples should be located in native or undisturbed soils away from fill material surrounding the building (approximately 10 feet away from the building) to avoid sampling in an area that may be influenced by the building HVAC systems, fireplaces, or mechanical equipment (e.g., clothes dryers or exhaust fans/vents) which may increase the infiltration of outdoor air into the vadose zone adjacent to the building. As a result, soil vapor samples collected in uncovered areas adjacent to the building may not be representative;

ii. sub-slab vapor samples from beneath a building basement or foundation slab;

iii. indoor air from the lowest floor of potentially impacted buildings, including crawlspaces;

iv. outdoor (ambient) air from locations near the area under investigation for soil vapor intrusion; and

v. in buildings with sumps, water samples may also be collected to assess exposures associated with direct off-gassing of volatile chemicals from contaminated groundwater.

(e) Soil vapor samples. Samples of the subsurface soil vapor or soil gas are collected to characterize the nature and extent of subsurface vapor contamination in the vadose zone.

1. Soil vapor sampling results may be affected by a number of geologic and human-made factors; therefore they should not be considered definitive indicators of the potential for SVI related exposures.

2. Soil vapor samples should be viewed as a tool for focusing attention on structures which may be impacted by SVI rather than as a vehicle for determining the specific nature of the exposure. Consequently, soil vapor samples may not need to be collected at sites where other data are sufficient for identifying potentially impacted structures.

3. Subsurface soil vapor samples may need to be collected:

i. from both on-and off-site areas, as described in subdivision (c) above; and

ii. in the case of groundwater sources, from:

(1) the stratigraphic horizon immediately above the water table; and
(2) at a stratigraphic horizon thought to reflect potential conditions at nearby sub-slabs, not necessarily the foundation depth.

4. If available, existing environmental data (e.g., groundwater and soil data) and site background information should be used to select locations for sampling soil vapor. Soil vapor samples should be collected to get a general understanding of the nature and extent of soil vapor contamination. Samples should be considered in areas:

i. with either known or suspected subsurface sources;

ii. where elevated readings were obtained with field equipment (e.g., PID) during previous soil and groundwater investigations; and

iii. with varying concentrations of contamination in the upper groundwater regime, at appropriate depths, dependent upon site-specific conditions.

5. Subsurface soil vapor sample locations will vary depending upon:

i. surface features, such as the presence or absence of buildings, areas of pavement or

vacant lots;

ii. subsurface characteristics, such as soil stratigraphy, buried structures or clay lenses; and

iii. the specific purpose of the sampling.

6. The following must be included in all soil vapor sampling work plans:

i. a figure illustrating proposed sampling locations (with respect to both areal position and depth) and relevant on-site and off-site features; and

ii. the rationale for proposing the locations.

(f) Sub-slab vapor samples. Samples of sub-slab vapor are collected to characterize the nature of subsurface vapor contamination beneath buildings.

1. Investigations of sub-slab vapor contamination should proceed from known or suspected sources outward on an iterative basis, as far as necessary, until potential and current human exposures have been adequately delineated.

2. In cases of widespread soil. vapor contamination a "blanket mitigation" approach within a specified area of documented soil vapor contamination may be considered as the basis for making decisions. In such cases a representative number of buildings from an identified study area, rather than each building, may be sampled. Prior to implementing this type of sampling approach, it must be approved by DER.

3. Sub-slab vapor samples collected directly beneath buildings provide the most reliable and representative information regarding SVI potential, and should be collected when possible. The distribution of volatile chemical contaminants beneath a building slab:

i. may not be homogeneous (i.e., a sub-slab vapor sample collected from one area of a building may differ by as much as an order of magnitude from a sample collected in another area of the building); and

ii. sub-slab data from a particular sample should not be viewed in isolation, but rather, should be viewed in the context of results from other sub-slab samples from the same and/or nearby buildings and in the context of the results from sampling other environmental media.

4. Sub-slab vapor samples should be collected:

i. in a representative number of buildings directly above or adjacent to contaminated soil, groundwater or other known or suspected subsurface sources of soil vapor contamination; and

ii. at a minimum one sampling event must be during the winter heating season with windows and doors closed and the heating system operating, unless previous no-heating season sampling has already established the need for mitigation.

5. When selecting buildings for sub-slab vapor sampling, the buildings sampled should

include, at a minimum:

i. residential dwellings, located above or directly adjacent to known or suspected areas of subsurface volatile chemical contamination;

ii. those where positive responses with field equipment (e.g., PID) suggest a completed migration pathway; and

iii. those within known or suspected areas of subsurface volatile chemical contamination that are used or occupied by sensitive population groups (e.g., daycare facilities, schools, nursing homes, etc.).

6. Within a building, sub-slab vapor samples should be collected:

i. in a central location away from walls;

ii. from the soil or aggregate immediately below the basement slab or slab-on-grade; and

iii. from each representative foundation area or type the number of sub-slab vapor samples required in a building depends upon the size of the building and the number of slabs and/or foundation types or extensions. Multiple sub-slab vapor samples may also be considered if previous sampling results differ from the conceptual site model or from the results of nearby structures or in structures with unexpectedly high indoor air results.

7. Sub-slab vapor sampling is not applicable for buildings with earthen floors or unlined crawlspaces. In these instances, a case-by-case determination must be made to determine whether crawlspace air samples should be collected to evaluate the potential for human exposures.

(g) Indoor air samples from buildings. Indoor air samples are collected to characterize the nature and extent of air contamination within on- or off-site buildings and to evaluate current human exposure to volatile chemicals.

1. The considerations in selecting which buildings to sample indoor air should be similar to those for sub-slab vapor sampling set forth in subdivision (f) above.

2. A building questionnaire and product inventory must be completed during the sampling event to identify preferential pathways, building features, products containing volatile chemicals, etc. that may affect the interpretation of the sampling results.

3. Indoor air samples are usually collected concurrently with sub-slab soil vapor samples, and outdoor air samples, except when:

i. site-specific situations may warrant collecting indoor air samples prior to characterizing subsurface vapors. This is generally due to the need to examine immediate inhalation hazards in situations which include, but are not limited to:

(1) a response to a spill event (e.g., petroleum spill);
(2) high readings obtained in a building when screening with field equipment;

(3) the presence of significant odors (e.g., petroleum compounds); or
(4) contaminated groundwater where the building is prone to groundwater intrusion or flooding;

ii. if indoor air contamination has been documented prior to characterizing contamination in subsurface vapors, resampling of the indoor air simultaneously with sub-slab vapor and outdoor air (at a minimum) will most likely be necessary to evaluate the indoor air results adequately; or

iii. when confirming the effectiveness of a sub-slab depressurization system.

4. Indoor air sampling should also be considered for buildings where previous sub-slab vapor samples identified elevated concentrations of contaminants; however no indoor air samples were collected. This indoor sampling event should also include the collection of another concurrent sub-slab vapor sample.

5. Indoor air samples, when necessary, should be collected from the following locations:

i. crawlspace areas, depending upon building-specific conditions (e.g., mixed foundation types etc.);

ii. the building basement at a height approximately three feet above the floor to represent breathing zones, in the following areas:

(1) locations where soil vapor infiltration is identified or suspected; or
(2) absent apparent or identified areas of infiltration, in a central; and

iii. for a commercial setting, from multiple tenant spaces (where there is not a common basement) at a height approximately three feet above the floor.

6. Indoor air samples should always be collected simultaneously with an outdoor air sample (see subdivision (h) below) and with sub-slab vapor samples, where possible.

7. Based on the results of the indoor air samples from the areas described in paragraph 2. above, DER may require additional sampling.

(h) Outdoor air samples. Samples of the outdoor (ambient) air are collected from the immediate vicinity of any indoor air sampling to characterize ambient air conditions.

1. These samples must be collected simultaneously with indoor air samples, whenever indoor sampling is undertaken and may be collected at DER's request concurrently with subsurface vapor samples.

2. Outdoor air samples should be collected from locations which are:

i. upwind of the buildings being investigated;

ii. away from wind obstructions (e.g., trees or bushes);

iii. away from obvious sources of volatile chemicals (e.g., automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, etc);

iv. at a height approximately three feet above the ground, so as to represent breathing zones; and

v. for buildings with HVAC systems that draw outdoor air into the building, an outdoor air sample collected near the outdoor air intake may be appropriate.

3. With DER concurrence, one outdoor sample may be used for multiple buildings in the same vicinity when concurrent indoor air and sub-slab vapor sampling of the buildings is performed.

(i) For guidance on completing an investigation to determine whether actions are needed to address exposures related to soil vapor intrusion, New York State's most recent SVI guidance and associated updates should be used. For example, relative to recommended sampling protocols, quality assurance/quality control of sampling, analytical methods and the use of field laboratories/mobile gas chromatographs, as well as updates to the sampling requirements detailed above, the most recent NYSDOH guidance should be used.

3.7 Groundwater

3.7.1 Site Characterization

(a) At a minimum, each SC will require three cased overburden groundwater monitoring points to determine groundwater flow direction and quality. These wells are to be located, screened, developed and sampled in accordance with the approved work plan.

1. The results of any groundwater SC should be evaluated as follows, if:

i. the contaminant concentrations found in all groundwater samples are below the applicable groundwater SCGs, no further investigation is necessary for groundwater; or

ii. groundwater contamination is detected above applicable SCGs, unless solely attributable to an off-site source as set forth in 375-1.8(d)(2), a groundwater RI should be conducted.

2. When the contaminant concentrations found in any groundwater sample(s) exceed the applicable SCGs as set forth in subparagraph 1.ii above:

i. the groundwater may be re-sampled to confirm the presence of contamination;

ii. this sampling should consider at least one additional sample round, taking into account the seasonal variability (wet or rapid snow melt versus dry) of the site area; and

iii. an additional monitoring well or wells near the upgradient property line may be considered to evaluate a possible off-site source of the contamination.

3. Where no overburden groundwater is present and contamination is identified in the soil, the proximity of bedrock and nature of the contaminant (DNAPL) must be considered in evaluating the need for a bedrock well investigation in the SC or an RI should be proposed.

4. If a release directly to bedrock has occurred.

(b) The baseline considerations for remediation set forth in paragraphs 4.1(d) 2 through 4 are to be considered in assessing the need for further investigation.

3.7.2 Remedial Investigation

(a) When groundwater contamination is confirmed based on the SC at levels exceeding groundwater SCGs or significant contamination of soil by water-soluble contaminants is identified, a groundwater RI is necessary.

1. The purpose of the RI for groundwater is to:

i. delineate the nature and extent of any contaminant plume in the overburden and/or bedrock aquifers (LNAPL, DNAPL and dissolved) on an areal and vertical basis;

ii. identify actual or potential impacts to sensitive receptors;

iii. consider the physical and chemical properties of the contaminants of concern;

iv. determine whether the contaminant plume is expanding, contracting or stable; and

v. gather sufficient data to evaluate groundwater alternatives, including as appropriate MNA.

2. Groundwater RIs must also comply with the quality assurance and quality control requirements described in Chapter 2.

(b) The scope of work for the remedial investigation should include work tasks to address the applicable requirements of this subdivision.

1. Delineate the vertical and areal extent of groundwater contamination and the sources of such groundwater contamination, without regard to property boundaries. This includes, but is not limited to, the extent of both dense and light, non-aqueous-phase liquids (NAPLs). [Note: Volunteers in both the VCP and BCP need only gather sufficient data to perform an off-site exposure assessment.]

2. The RI must determine which on-site sources contribute to that contamination and should collect sufficient data to evaluate remedial measures to address that contamination.

3. The presence of NAPL should be considered when contaminant concentrations in groundwater exceed 1% of the solubility of the compound in question in water. In these instances, the investigation should include:

i. at a minimum, a boring to the first aquitard identified for visual observation and head space screening of soil samples, unless the contamination can be clearly associated solely with an LNAPL;

ii. if DNAPL is identified or remains suspected, a short-screened well should be placed directly on top of the aquitard for groundwater sampling and observation; and

iii. if LNAPL is identified or remains suspected, a well should be screened across the water table for groundwater sampling and observation.

4. Determine the direction of groundwater flow and impacts to groundwater as follows:

i. at a minimum, three groundwater monitoring wells or piezometers are required in each affected aquifer or water-bearing zone to determine the groundwater flow direction in that zone. The monitoring wells or piezometers must:

(1) be installed properly in accordance with the work plan; and
(2) be surveyed relative to a permanent surface structure to provide for adequate triangulation; and provide the survey data to DER in an acceptable format (e.g., North America Datum 83 [NAD83]);

ii. monitoring of multiple water-bearing zones (including bedrock aquifers if appropriate) may be needed to define the vertical hydraulic gradient and potential for migration of contamination in groundwater:

(1) for contaminants which are heavier than water; or
(2) where contaminants have migrated a significant distance from their sources, thus having a greater amount of time to be displaced downward;

iii. at least one round of synoptic static water levels, within the shortest time period practicable, must be obtained to provide a site-specific indication of the groundwater flow direction;

iv. if the site is located in an area that is influenced tidally or by human-made structures (dams which may greatly change the levels of surface water bodies), synoptic ground and surface water levels should be collected using data-logging pressure transducers (or similar devices) continuously for two tidal cycles from all applicable wells and the surface water, during a fair weather sampling event; and

v. water-level measurements and groundwater flow determinations must take into account activities in the area or human-made structures (dams which may greatly change the levels of surface water bodies), which affect flow direction, such as local dewatering activity and/or steady rate, variable rate or seasonally used pumping wells. The water levels should also be taken periodically to evaluate temporal or seasonal variations inflow direction.

5. Adequately characterize the impacted aquifer at the site. This may be accomplished by:

i. conducting aquifer tests which may include:

(1) pumping tests;
(2) packer tests;
(3) slug tests; or
(4) other appropriate analysis;

ii. where aquifer testing is conducted, it should include provisions for gathering the following data:

(1) the hydraulic gradient on, and in the vicinity of, the site;
(2) sustained well yield;
(3) hydraulic conductivity (K);
(4) permeability; and
(5) an estimate of the rate of groundwater and contaminant flow in the aquifer; and

iii. if pumping the aquifer is to be evaluated as an alternative for remediation, a pumping test to determine additional aquifer characteristics such as transmissivity and storativity should be considered.

6. DER relies on the proper characterization of groundwater impacts using groundwater analytical data. However, in some instances, groundwater analytical data may be supplemented with groundwater modeling to assess contaminant fate and transport. If a model is used to simulate groundwater flow and/or contaminant fate and/or transport, the remedial investigation report (see section 3.14) should include:

i. documentation that the model type and application where appropriate, along with a justification as to why the model was selected;

ii. specific details on the type of model, and the model application such as, but not limited to, input parameters used and referenced, boundaries and limitations, calibration and matching data and success, and application intent and/or strategy of the model;

iii. data presented graphically as groundwater gradient and contaminant plume maps. Electronic data files, in accordance with section 1.15, used to present the data, including the base map and all figures presenting investigation result, must be included with the report; and

iv. conclusions drawn from modeling should be verified with field data generated by the RI.

7. If there is a current or likely release of contaminants to off-site receptors, a well search must be conducted, including:

i. a file search using available DEC, NYSDOH, county health departments and if available, local records for all:

(1) monitoring wells and domestic wells potentially impacted by the site; and
(2) irrigation, industrial and/or public supply wells within one half mile of the site boundary;

ii. if applicable, the type of well and the status of the well (active, inactive or properly abandoned). Including if available, total depth, casing length, open bore hole or screened interval, sample analysis (if available), copies of well records and or well logs on file with DEC, NYSDOH, county health departments or appropriate county/local water authority, and any additional records available in county or municipal records should be included; and

iii. a listing of all sources referenced in performing the well search, including agencies that were unable to provide the information requested. If sufficient data cannot be obtained from existing

records to exclude the presence of potable, domestic or public supply wells within one-half mile of the site boundary, a door-to-door survey or well survey mailed to property owners in the area should be undertaken to provide the data. The limits of any survey may be expanded based on the findings of the extent of groundwater contamination.

8. Sample any existing potable and supply wells identified in the well search which are potentially impacted by the site.

9. Evaluate any surface water body that may be impacted by the contaminated groundwater in accordance with section 3.8.

10. The investigation should evaluate any subsurface utilities, structures (with both basement and slab on grade) and preferential pathways to identify additional sampling that may be warranted to determine whether actions are needed to address exposures associated with soil vapor intrusion, as a result of the groundwater contamination. Measurement of oxygen levels, lower explosive limits (LEL) and the presence of organic vapors should be included in this evaluation, as appropriate.

11. Consideration should be given to the collection of groundwater samples at the top of the water table as part of the evaluation of contaminant migration to soil vapor, to determine if the groundwater in this zone is contaminated. Clean groundwater in this zone, above deeper contamination, may eliminate the need for a SVI investigation.

12 Evaluate the current and potential groundwater uses.

13. The investigation of each area of concern should include at least one groundwater sample from each monitoring point.

(c) The RI of groundwater should be conducted according to the technical requirements identified by this subdivision.

1. The quality assurance requirements should be as set forth in section 2.3.

2. All monitoring wells should be installed in accordance with industry standards.

3. Groundwater samples may be taken pursuant to any generally acceptable sampling methods pursuant to subdivision 1.6(c). Sampling techniques generally acceptable to DER include, obtaining groundwater samples from monitoring wells, from well points, through slotted augers, using direct push, Geoprobe® or Hydropunch® techniques.

4. Monitoring wells, piezometers or other groundwater sampling points (e.g., Geoprobe® or Hydropunch® techniques) should be located in:

i. the excavation of any source(s) of contaminants, if possible, including without limitation, tanks, tank distribution systems, seepage pits, septic systems, dry wells or other injection wells;

ii. any suspected or confirmed source areas/AOCs; and

iii. the known or expected downgradient flow direction from the area identified in subparagraphs i and ii above.

5. Placement of monitoring wells, piezometers or other groundwater sampling points to evaluate the direction of ground water flow and contaminant migration in ground water should be placed:

i. in the expected down gradient flow direction of the area being evaluated and within 25 feet of the area of concern/source identified in paragraph 4 above. Groundwater flow direction should be predicted based on:

(1) topographic relief, the location of surface water bodies, structural controls in the bedrock or soils, location of pumping wells and subsurface conduits at or below the water table; or
(2) data from adjacent sites if groundwater flow direction at the adjacent site has been determined pursuant to paragraph 3.7.2(b)4;

ii. where groundwater flow direction is uncertain, it must be determined by the placement of at least three wells/piezometers in each affected aquifer or water-bearing zone to conclusively determine groundwater flow direction in that zone; and

iii. should also consider site related conditions, including but not limited to:

(1) topographic relief;
(2) the location of surface water bodies;
(3) structural controls in the bedrock or soils;
(4) location of pumping wells;
(5) the density of suspected contaminants (DNAPLs);
(6) subsurface conduits at or below the water table; and
(7) potential off-site sources of groundwater contamination.

6. The minimum number of groundwater samples collected should be as follows:

i. at least one groundwater sample for each area of concern which is classified as an underground injection control (UIC) unit as defined by the USEPA, including without limitation, a seepage pit, septic system, dry well or other injection well sampled pursuant to paragraph 3.9(e)3;

ii. for sites with leaking underground storage tanks and tank fields:

(1) containing up to three tanks, at least one groundwater sample location down gradient of the tanks;
(2) sites with more than three tanks, may require additional sample locations; and
(3) if a leaking tank is excavated, the groundwater sampling point should be located within the excavation;

iii. pump islands and associated piping greater than 25 feet from the tank field should be considered separate areas of concern and should require a separate groundwater sample location; and

iv. at least one groundwater sample for all other areas of concern, unless the area of concern is within 25 feet and hydraulically upgradient of another groundwater sampling location.

7. Drilling logs and well construction logs must be prepared and maintained for all monitoring locations.

8. Typically, a minimum of two rounds of groundwater samples are analyzed from each monitoring well installed as part of a RI:

i. the first round of groundwater samples should be analyzed for all suspected site-related contaminants;

ii. the second round of sampling may be modified to eliminate non-critical wells and/or eliminate specific parameters based on the analytical results of the first round, with DER approval; and

iii. where more than one round of sampling is needed, it is desirable to have sampling events coincide with seasonal high and low water;

9. The results of the RI groundwater analyses should be evaluated in accordance with subdivision 3.7.1(b).

(d) For contaminants that in their pure phase and at standard state conditions (20 degrees Celsius to 25 degrees Celsius and one atmosphere pressure) have densities greater than water, NAPL will be suspected to be present if the contaminant is detected in groundwater at concentrations equal to or greater than one percent of the water solubility of the contaminant if groundwater contains only that organic contaminant. If a mixture of such contaminants is present, then the effective water solubility of the contaminant should be estimated for this determination.

(e) Hydraulic conductivity and flow velocities should be determined using field tests and appropriate calculations.

3.7.3 Groundwater Background Evaluation

(a) This guidance is intended for site-specific groundwater background evaluations for a SC, RI, or other element of a remedial program.

1. If a suspected contaminant is identified in groundwater in excess of the applicable groundwater SCGs, the guidance in this subsection may be followed to demonstrate that the concentration of the element, chemical or contaminant in the soils is due to site-specific background conditions.

2. Area-wide groundwater background studies, intended to be applied to more than one site, may require an expanded level of effort to be determined after consultation with DER.

3 A background groundwater concentration is the concentration of:

i. chemical compounds or contaminants found in the groundwater which are attributable to either an upgradient source of contamination; or

ii. metals which represent natural conditions in the groundwater at the site.

4. Background groundwater contamination may include impacts to on-site groundwater which:

i. are solely attributable to an off-site upgradient source [6 NYCRR 375-1.8(d)(2)]; or

ii. the result of parent compounds of contaminants detected at off-site upgradient locations, where daughter products of these parent compounds are detected on the site.

(b) If groundwater contamination is detected above applicable SCGs the approach outlined by this subdivision may be used to demonstrate that all or part of the contamination is due to background groundwater contamination.

1. Groundwater flow direction should be determined pursuant to paragraph 3.7.2(b)4.

2. A minimum of one background monitoring well should be installed in each water bearing zone that is believed to contain background groundwater contamination.

3. Where an upgradient source impacting site groundwater is suspected, additional monitoring wells should be installed at sufficient locations in each zone identified in subdivision 3.7.2 (b) above to conclusively evaluate whether groundwater quality is being impacted by off-site sources and the contribution of the off-site groundwater to any on-site groundwater quality impacts. Such background monitoring wells should be located:

i. beyond the influence of all on-site areas of concern;

ii. at the upgradient property boundary of the site provided no on-site areas of concern are in the vicinity of, or extend beyond, the property boundary;

iii. such that the off-site groundwater impacting this well will migrate along a predicted groundwater flow path that will intercept the area of concern; and

iv. outside the zone of influence of any nearby pumping wells that would prevent up gradient groundwater from flowing onto the site.

4. Background monitoring well(s) should be sampled concurrently with collection of on-site groundwater samples for all on-site contaminants believed to be originating from background sources.

5. The results of a background groundwater investigation should be evaluated as follows:

i. no further investigation is required for groundwater if:

(1) there is no evidence of an on-site discharge; and

(2) contamination is present in the background monitoring well(s) at similar or greater concentrations than is present on the site; or

ii. additional investigation may be required when contamination is present in the monitoring well(s) in the area of concern but not in the background monitoring well, or contamination is present in both the area of concern and the background monitoring wells. In these cases, the evaluation should consider:

(1) the contribution of the background contamination in the determination of the

applicable groundwater SCGs for the site; and

(2) factors for determining the contribution of any upgradient off-site contamination to on-site contamination should include, but not be limited to, contaminant attenuation rates, contaminant degradation rates, and groundwater flow velocity.

(c) The remedial party must notify DER if it believes, pursuant to paragraph (b)5 above, that a source of groundwater contamination is identified upgradient of the site. DER will evaluate the data and determine if the groundwater contamination is attributable to background or if further investigation of an upgradient source is warranted.

3.8 Surface Water, Sediments and Wetlands

3.8.1 Site Characterization

(a) The remedial party should determine in the SC if there is any evidence that a surface water body or wetland is on or proximate to the site.

1. The following data should be collected to identify potentially proximate surface water or wetlands:

i. distance to the surface water body or wetland;

ii. likely location where the contaminants of concern from the site would discharge into a surface water body or wetland;

iii. flow direction and depth of any groundwater contamination plume(s) in relation to such water body or wetland;

iv. water body classification pursuant to 6 NYCRR Parts 700-705;

v. any known jurisdictional status and classification of the wetland (e.g., regulated by the State or federal government);

vi. lake or pond acreage or stream-flow rate; and/or

vii. any additional information to support this evaluation which may be identified in accordance with paragraph 3.3(b)2 and subdivision 3.10.1(b).

2. If a surface water body or wetland is determined to be on or proximate to the site, the characterization should evaluate whether:

i. contaminated soil is present at the surface of an AOC which is proximate to the water body or wetland;

ii. contaminated groundwater flows to the nearby surface water;

iii. discharges from the site have occurred (historic) or are occurring and are impacting such surface water body or wetland by way of:

(1) contaminated groundwater migration;
(2) subsurface NAPL migration;
(3) storm sewers, ditches or other methods of conveyance; or
(4) erosion of soil from the site;

iv. historic disposal from the site to the water body or wetland has occurred; or

v. contaminated sediment, soil or surface water are present within the water body or wetland, where the contamination may be attributable to a discharge or disposal per subparagraphs iii and iv above.

3. Where there are known, suspected historical or on-going discharges to the surface water body or wetland, determined pursuant to paragraph 2 above, the characterization should consider evidence of impacts to a surface water body or wetland as follows:

i. stressed vegetation, sheens, seeps, discolored soil or sediment along the shoreline, or on the bottom, or the surface, system hydraulics such as stream flux (the rate at which a stream is gaining or losing water);

ii. evidence of stream or wetland impacts from historical discharges including historical ecological studies documenting differences in organism population density and diversity in areas potentially impacted by the site relative to areas not impacted by the site;

iii. existing on-site groundwater contamination in excess of the applicable groundwater SCGs: or

iv. applicable soil, sediment and/or surface water SCGs are exceeded within the water body or wetland, where the contamination may be attributable to a discharge or disposal from the site as per subparagraphs 2.iii and iv above.

4. Where ongoing discharges are identified an IRM should be considered if impacts can be mitigated by immediate action.

(b) If there is evidence that discharges to the surface water body or wetland have occurred, pursuant to subdivision (a) above, then further investigation of either or both media is required in a RI.

3.8.2 Remedial Investigation

(a) Any surface water, wetlands or sediments which may have been impacted by contamination emanating from the site are to be investigated by the RI consistent with this subsection. Wetlands to be investigated include both regulated and unregulated wetlands.

1. Surface water and sediment investigations should be designed to:

i. account for tidal, seasonal or short-term flow, turbidity and water quality fluctuations due to dry versus wet-weather flow;

ii. system hydraulics, obtaining flow proportioned samples where applicable;

iii. potential contaminant characteristics, for example; density, solubility and hardness for metals analysis;

iv. define the vertical and horizontal extent of site-related contamination;

v. characterize the potential for exposure to receptors; and

vi. characterize patterns of erosion and sediment transport.

2. Sampling locations should be adjacent to and downstream of the contaminated site at any:

i. existing point source discharges from that site;

ii. zone of identified contaminated groundwater discharge;

iii. identified depositional areas;

iv. areas of disposal, proximate to the surface water or wetland;

v. areas of erosion, from AOCs proximate to the surface water or wetland;

vi. floodplain areas adjacent to impacted sediments or surface water; or

vii. other identified discharge locations.

3. Water and sediment analysis must include each constituent of concern disposed of at a site with at least one sample set taken during critical, low-flow conditions. All sediment samples should also be analyzed for total organic carbon.

4. Depending on site-specific conditions, additional samples or upstream locations may be necessary to define loads from other point sources, tributaries and/or other non-point sources.

(b) Surface water sampling. Surface water samples are required when there is evidence that surface water has or may have been impacted by contamination emanating from the site. The RI of surface water should be conducted according to this subdivision and the sampling, reporting and quality assurance requirements of Chapter 2.

1. Surface water sampling should be designed to evaluate:

i. either flowing or standing water bodies, considering tidal influence, as applicable;

ii. upgradient, downgradient and discharge point water samples, as appropriate;

iii. impact of turbidity on the results, particularly for metals; and

iii. if applicable, water quality near public/private surface water intakes.

2. Surface water sample locations. Samples should be considered in the surface water body

adjacent to any of the areas identified in paragraphs 3.8.1(a)2 and 3.

3. Where on-site groundwater contamination in excess of the applicable surface water criteria is proximate to a surface water body it should be delineated to the applicable surface water criteria. Groundwater plume delineation samples should be collected along the groundwater flow path between the AOC or plume and the surface water body and analyzed for applicable contaminants.

(c) Sediment sampling. As part of the RI, sediments in proximate surface water bodies or wetlands should be analyzed when there is reason to believe the sediments may have been impacted by contamination emanating from the site. The RI of sediments should be conducted according to this subdivision and the sampling, reporting and quality assurance requirements of Chapter 2.

1. Samples should be collected to meet the requirements of the appropriate fish and wildlife resources impact analysis, set forth in section 3.10 or, if appropriate human health exposure assessments to determine the nature and extent of the contamination and determine whether contaminants exceed appropriate SCGs. Samples should be taken:

i. for contaminant analysis; and

ii. to characterize sediment type, thickness of sediment layers and vertical extent of sediment.

2. Sediment sampling locations. At a minimum, sediment samples should be collected in the following locations:

i. as close as possible to discharge points, groundwater entry, erosional areas or other locations where contaminants were likely to have been released to the water body or wetland;

ii. adjacent to the border of the terrestrial portion of the site and the water body or wetland

iii. at the first most likely location of major sediment deposition, which will vary depending upon the type of water body from which the samples are collected. Samples collected from:

(1) lakes or ponds should be placed in an array moving away from the point source or site border;
(2) non-tidal streams should be placed in major depositional areas adjacent to or downstream of the site;
(3) tidal streams should be placed in major depositional areas immediately upstream, adjacent and downstream of the site; and
(4) wetlands should be placed:

(A) in an array moving away from the point source or site border;
(B) along any areas of probable flow through the wetland; and
(C) at any identifiable point where water discharges from the wetland.

iv. from any wetland or floodplain which may receive sediment from adjacent or upstream locations of potentially impacted sediment;

v. if applicable, samples should be collected at the points of entry and exit from the site if a water body crosses the site;

vi. the areas identified in paragraphs 3.8.1(a)2 and 3; or

vii. if it is necessary to evaluate human exposures to sediment in recreational areas, sampling depths, etc. for these samples will be determined in consultation with DER and NYSDOH.

3. Sampling depth for ecological assessments. Sediment samples should be collected:

i. from the 0 to 6-inch, 6 to 12-inch and 12 to 24-inch intervals, in areas where sediment depth allows;

ii. in areas of deep sediment, borings should be advanced and samples collected at regular intervals below the 24 inches identified in subparagraph i above;

iii. from distinct layers of sediments, thicker than six inches, which are identifiable by color, particle size or other physical characteristics; and

iv. from any interval where free product, NAPL or grossly contaminated media, as defined in paragraph 1.3(b)23, is identified.

4. Sediment analysis. In addition to the required chemical analyses, sediments will also be analyzed for total organic carbon to allow for the development of appropriate SCGs.

3.8.3 Sediment Background Evaluation

(a) This guidance is intended for surface water or wetland sediment background evaluations for either a SC, RI or other element of a remedial program.

1. If a suspected contaminant is identified in sediment in excess of applicable sediment SCGs, the guidance in this subsection may be followed to demonstrate to DEC that the concentration of the contaminant in the sediments is due to background conditions.

2. Area-wide sediment background studies, which are intended to be applied to more than one site, may require an expanded level of effort to be applicable. Such an expanded level of effort will be determined after consultation with DEC.

3. The purpose of a background evaluation is to allow a clear determination of the effects of site related contamination in areas where multiple sources of similar elements, chemicals, or contaminants may exist and overlap. In conducting such an evaluation, it is acceptable to include sampling in areas where other, diffuse sources of anthropogenic contamination may exist. Such sources would include atmospheric deposition or urban street runoff. Identifiable point sources, however, are not considered as background. Such sources would include SPDES outfalls, thermal discharges, or other areas of concentrated impacts.

(b) The remedial party may evaluate sediment background conditions at a site using the approaches discussed in this subdivision. This evaluation is not intended solely to develop site-specific cleanup objectives, but to assist in the characterization of site-related contamination.

1. The remedial party may use an existing DEC-approved background evaluation conducted generally in accordance with paragraph 2 below, which:

i. identified contaminant concentrations in sediment on a property near the site under investigation; and

ii. demonstrates that the sediment from the area of the background evaluation could reasonably be expected to occur at or be transported to the sediment at, or proximate to, the remedial site.

2. The remedial party may conduct a site-specific sediment background evaluation. This will include

i. evaluating whether:

(1) the contaminant(s) were used, stored or disposed on or near areas of the site proximate to the sediments in question, as documented pursuant to this guidance;
(2) there has been an impact by a discharge from the site to the sediments in question, via groundwater, erosion of soil from AOCs, subsurface NAPL migration, storm sewers, ditches or other methods of conveyance; and
(3) the distribution of the element, chemical or contaminant in the sediment follows a concentration gradient indicative of disposal or a discharge;

ii. conducting a sediment background evaluation by collecting and analyzing background surface water or wetland sediment samples from at least five background sample locations in the vicinity of the site. Samples for the background evaluation should:

(1) be collected from a depth or depths which conform to the same depths sampled during the sediment investigation conducted during the site RI;
(2). be collected at locations upstream, up gradient or otherwise outside the influence of the site and unaffected by current and/or historic site operations, as documented by the records search;
(3) not be collected from or adjacent to source areas in the site study area, including any of the following:
(A) areas where materials or wastes were loaded, handled, or stored;
(B) waste disposal areas;
(C) areas receiving runoff from areas identified in subclauses (A) or (B) above, or adjacent contaminated sites;
(D) storm drain outfalls or ditches receiving runoff from the site or adjacent contaminated sites;
(E) depositional areas within the influence of known site-related sources; or
(F) any other area of concern, as defined by section 1.8;
(4) not be collected from the following areas unless it can be demonstrated that the contamination in the area is due to generally occurring pollution related to the urban or industrial nature (anthropogenic) of the surrounding area. Samples from these locations should only be sampled in the background evaluation if similar conditions exist within the site-related area of impacts:
(A) areas near parking lots, roads, or roadsides;
(B) areas near railroad tracks;

(C) areas adjacent to historic fill material; or

(D) storm drain outfalls or ditches receiving runoff not impacted by the site or adjacent contaminated sites; and

iii. use of the same sampling and analytical methods as were used for other site samples; and

iv. in addition to identifying the background concentrations, the background evaluation should evaluate whether they are found in an area where transport to the site is likely.

3. If contaminant concentrations are found at any sampling location on the site exceeding the average concentration found in the background samples, the RI should delineate the extent of the contamination.

4. Samples collected for an investigation of an area of concern cannot be averaged for background comparisons.

(c) If a site-specific background sediment concentration identified by paragraph (b)3 above is to be proposed as a remediation level at the site, a more extensive sampling program to allow a statistical and/or chemical forensic analysis of background levels may be required.

1. The remedial party should, after consulting with DER, submit a work plan outlining the proposed methods and analyses for the additional sampling as well as the methods for any statistical and/or chemical forensic evaluation of samples.

2. In designing such an evaluation, where a grid or predetermined sample spacing is to be used, the limitations on the location of samples identified by clause (b)2.ii.(3) above are not applicable because the investigation is intended to assess the contribution of other potential sources of contaminants to the site-specific background.

3.8.4 Surface Water Background Evaluation

(a) This guidance is intended for site-specific surface water background evaluations for either a SC, RI or other element of a remedial program.

1. If a suspected contaminant is identified in surface water in excess of applicable surface water SCGs, the guidance in this subsection may be followed to demonstrate to DEC that the concentration of the element, chemical or contaminant in the surface water is due to site-specific background conditions.

2. Area-wide surface water background studies, intended to be applied to more than a one site, may require an expanded level of effort to be determined after consultation with DEC.

3. A background surface water concentration is the concentration of an element, chemical or contaminant found in the surface water body which may be attributable to:

i. an upgradient or non-point source of contamination;

ii. a permitted or unregulated discharge to the receiving surface water body; or

iii. for metals in particular, natural conditions of the surface water.

(b) If a suspected contaminant is found in excess of the applicable SCGs in surface water on, adjacent to or down-gradient of the site the collection of water samples may be considered, in accordance with this subdivision, to evaluate background conditions in the water body.

1. Two background surface water samples should be collected upstream or upgradient of the site and away from potential discharges from the site at times of low turbidity particularly if metals are a contaminant of concern.

2. Background surface water samples should be collected, preferably at the same time as the other surface water samples. If this is not possible, the samples must be collected during a period of similar turbidity conditions and flow regime as the original samples.

3. Samples should be collected as described in paragraph 3.8.3(b)2.

(c) If any RI surface water samples collected within the area that may be impacted by contaminant migration from the site exceed the background samples, a further investigation of the source of the impact should be undertaken.

3.9 Area Specific Requirements for Tanks, Storage Facilities, Water Treatment, Drainage Structures and Other Systems

(a) Storage tanks and appurtenances. The investigation of bulk storage tanks and appurtenances; should include, without limitation, all in use and out-of-service storage and associated piping, dispensers and fill ports.

1. Aboveground tanks over unpaved soil or broken pavement in contact with the soil. Sampling around tanks with shell or bottom in direct contact with soil now or in the past should meet all the following criteria:

i. a minimum of two surface soil samples should be collected to detect surface contamination around the base of each tank, in accordance with subdivision 3.5.1(b), as follows:

(1) from areas of contamination, based on soil discoloration/odors, history of repairs/replacement, soil beneath valves or low areas where spills or leaks from valves may accumulate;

(2) additional samples should be taken around larger tanks to ensure that there is at least one sample per 100 linear feet (from a depth of at least 6 inches if VOCs were stored) of tank perimeter; and

(3) unless the tank was installed and maintained in compliance with 6 NYCRR Parts 614 or 599:

(A) at least one boring should be located adjacent to or within two feet of the most down gradient tank with continuous two-foot split spoon sampling, or another DER approved comparable sampling technique, performed to four feet below the current water table, or deeper where appropriate; and

(B) the sample in each boring evidencing the highest apparent contamination based on soil discoloration, odor, field-screening result or other field indicator should be analyzed at a laboratory;

ii. if there is no evidence of soil contamination, a groundwater sample should be collected from the zero to one-foot interval below the current water table elevation. The sample should be collected within five feet of the tank on the expected downgradient side. It should then be analyzed following an appropriate laboratory method; and

iii. if there is evidence of groundwater contamination, the groundwater sample must be collected at this location.

2. Aboveground tanks elevated over unpaved soil or broken pavement. Elevated tanks where the shell or bottom is not in contact with ground:

i. require soil sampling when:

(1) there is any physical or documentary evidence of discharges;
(2) soil discoloration is observed; or
(3) field monitoring or other evidence indicates that a discharge has occurred; and

ii. at least one soil sample should be taken below tanks which store, or may have stored, contaminants that do not cause obvious soil discoloration such as VOCs:

(1) the samples should be collected in the area most likely to be contaminated, including without limitation, valve or former leak or rupture areas; or
(2) if samples cannot be obtained from below the tank because soils are not accessible to sampling equipment, the sample may be located within two feet of the tank.

3. Aboveground tanks over unbroken paved surfaces. Soil around aboveground tanks:

i. on paved surfaces or pads should be sampled pursuant to paragraph (b)1 below, if there:

(1) are stained soils adjacent to the paving or pad; or
(2) if the potential contaminant would not cause discoloration such as VOCs, if there is a history of spillage or other evidence that a discharge has occurred;

ii. within a paved containment area should be sampled at the drainage discharge point, if one exists, pursuant to subdivision (d) below (Drainage Areas);

iii. soil sampling below the pavement should be conducted when the pavement has deteriorated so as to allow potential contaminant contact with the soil, or if there is reason to believe that pavement was not present over the life of the tank or former tanks; and

iv. instead of sampling soil beneath pavement, samples around the pad may be taken pursuant to (b)1 below, subject to DER's review of documentation pursuant to subdivision 1.6(c) specifying why boring through pavement was not considered practical (for example, concrete slabs with berms, synthetic liners).

4. Underground storage tanks (USTs). USTs and distribution systems containing potential contaminants should be evaluated to identify any past or present discharges. All USTs must be in

compliance with applicable regulations, upgraded as necessary or closed in accordance with the requirements of section 5.5. All USTs not being closed should be evaluated as follows:

i. at least four soil samples should be collected from around each tank or group of tanks as noted in clause (a)3.i.(2) above. The soil samples should be collected within two feet of the tank with one sampling location located at each end, and additional sampling locations along the length of the entire tank:

(1) if sampling within two feet of the tank is not possible due to the presence of bedding gravel or there are safety considerations (e.g., danger of tank puncture) which have been identified through field investigations or review of as built plans:

(A) soil samples should be taken as close as possible to the tank, with no samples collected further than five feet from the tank or group of tanks; and

(B) a groundwater sample should be collected within five feet and down gradient of the tank or group of tanks; or

(2) when, due to safety considerations, the distance between adjacent tanks precludes locating soil samples between the tanks, a groundwater sample may be collected within five feet and down gradient of the tanks, at the appropriate depth in lieu of the required soil samples between the tanks. Where available, tank field wells may be sampled in lieu of a new well;

ii. the total number of sampling locations required per tank, or group of adjacent tanks, located within the length identified in Table 3.9 for the total tank capacity;

iii. soil samples collected for analysis should be taken at zero to two feet below the tank bottom unless the tank is within the saturated zone (see subparagraph iv below); and

iv. for underground storage tanks (USTs) within the saturated zone based on site-specific water levels:

(1) if the contents of the UST being evaluated have ever had a density less than water, a soil sample should be collected from one foot above to one foot below the current water table surface. A groundwater sample should also be collected at the appropriate depth pursuant to section 3.7. To verify tank contents for out-of-service tanks, one sample should be taken of any product or residue remaining in the tank and analyzed using an appropriate fingerprinting or other analytical method; or

(2) if the contents of the UST being evaluated have ever had a density greater than water, a soil sample should be collected from zero to two feet below the bottom of the tank. A groundwater sample should also be collected at the appropriate depth pursuant to section 3.7. To verify tank contents for out-of-service tanks, one sample should be taken of any product or residue remaining in the tank and analyzed using an appropriate fingerprinting or other analytical method; and

v. if a tank is located on bedrock, a bedrock monitoring well may be necessary.

Table 3.9 Sampling Frequency Based on Tank Capacity and/or Length [from Subparagraph 3.9(a)4.ii]		
Total Tank Capacity (Gallons)	**Approximate Tank Length (Feet)**	**Minimum Number of Samples**
56-2000	Up to 10	4
2001-10,000	Up to 30	6
10001 - 25,000	Up to 40	8
25,000+	Greater than 40	10

5. Above-grade piping. Sampling of soil beneath above-grade piping is necessary if there is evidence of a discharge (for example, discolored soil, etc.) or reports of past discharges. Any sampling conducted should be pursuant to subdivision (e) below (Discharge/Disposal Areas).

6. Below-grade piping. Below-grade piping should be evaluated to identify any past or present discharges using soil samples located zero to six inches below the piping and within two feet of the piping. Additional samples should be collected as follows, for:

i. a total piping length of 1to 15 feet, a minimum of one soil sample should be collected:

(1) an additional soil sample should be collected for each additional 20 linear feet of piping or portion thereof from 16 to 50 feet of piping length; and
(2) sample locations should be biased to include joints, dispensers and other potential discharge areas;

ii. pipe runs within two feet of another pipe run may be considered a single pipe run. Soil samples for multiple pipe lines should be collected midway between/among the lines or biased toward any pipe for which evidence of a discharge exists. For pipes that are separated by a distance greater than two feet vertically, soil samples should be collected below each pipe; or

iii. total piping lengths in excess of 50 feet, sampling frequency may be reduced subject to DER's approval of documentation pursuant to section 1.6 specifying why the reduced number was considered adequate.

7. Loading and unloading areas. For loading or unloading areas located:

i. over exposed soils which are associated with tanks, should be sampled at a minimum rate of one sample per fill connection or valved discharge point; or

ii. over impervious cover, sampling should be conducted pursuant to paragraph (b)1 below.

(b) Storage and staging areas. The investigation for all storage and staging areas, dumpsters and transformers, whether temporary or permanent, including exposed soil areas adjacent to aboveground vessels on pads; tank loading/unloading areas on pads; dumpster staging areas; electrical transformers,

heat exchanger and other outdoor equipment and drum storage pads, should also satisfy the requirements of this subdivision.

1. Pads. The investigation of a pad should:

i. have a minimum of one sampling location per side adjacent to exposed soil for sides:

(1) up to 30 feet long; or
(2) for sides greater than 30 feet long, one additional sample location is required for each additional 30 feet of length;

ii. locate each sampling point immediately adjacent to the pad and biased toward the suspected location of greatest contamination (e.g. joints);

iii. include soil samples beneath the pad, collected pursuant to subparagraph (b)2.ii below, if:

(1) the pad shows evidence of deterioration that may allow contaminant contact with the soil;
(2) the pad or its surface has been modified or repaved; or
(3) aerial photographs or site history indicate potential for previous discharges to the soil beneath the pad; and

iv. sample bermed pads and pads surrounded by impermeable cover at any drainage discharge point pursuant to subdivision (d) below (Drainage Systems).

2. Storage and staging areas over a permeable cover. Storage and staging areas with evidence of discharges which are or were used for storage of contaminants:

i. should be sampled pursuant to subdivision (e) below (Discharge and waste disposal systems);

ii. should be sampled at locations biased toward the suspected location of greatest contamination based on low points, drainage patterns, discoloration, stressed vegetation, field instrument measurements or other field indicators; and

iii. the sample frequency for these areas should be:

(1) at least one surface sample, in accordance with subdivision 3.5.1(b), per 900 square feet of surface area to characterize soils below a storage or staging area up to 300 feet in perimeter; and
(2) sample frequency may be reduced for larger areas subject to DER approval of documentation pursuant to subdivision 1.6(c) specifying why the proposed sample frequency is adequate.

(c) Surface impoundments. The investigation for all surface impoundments, including without limitation, lagoons, fire ponds, waste ponds or waste pits, storm water detention basins, excavations, natural depressions or diked areas, which are designed to hold an accumulation of liquid substances or

substances containing free liquids, should satisfy the requirements of this subdivision.

1. Sediments within any surface impoundments should be sampled if the impoundment receives runoff from areas of potential contaminant sources.

2. Sediment sample locations should be biased towards inflow/outflow areas, and areas where sediments may be expected to accumulate.

3. Core samples should be taken for contaminant analysis and to fully characterize sediment type, thickness of sediment layers and vertical extent of sediment.

4. Distinct layers of sediments thicker than six inches, as evidenced by color, particle size, or other physical characteristics, should be sampled individually.

5. Sediment quantity within the surface impoundment should be estimated.

6. Active surface impoundments with impermeable liners, which may be damaged as a result of sample collection, should have liner integrity verified by physical inspection and/or evaluation of monitoring well water quality data associated with the surface impoundment, if available.

(d) Drainage systems. The SC or RI for all drainage systems should satisfy the sampling requirements of this subdivision.

1. Floor drains and collection systems. If there is reason to believe contaminants were or may have been discharged into the floor drain or collection system:

i the point of discharge for any floor drain or collection system should be sampled if the system discharges were, or may have been, discharged to soil, groundwater or surface water;

ii. if the point of discharge is unknown, tracer tests (for example, dye or smoke) should be conducted to determine the discharge point(s);

iii. collection system integrity should be documented by representative soil sampling at potential leak areas, video inspection, hydrostatic test or pressure test. Other methods may be acceptable, subject to DER approval of documentation pursuant to subdivision 1.6 (c) specifying why the methods are effective; and

iv. sampling soil below floor drains or collection system laterals should be conducted when corrosives (if plastic piping is or was used, organic solvents are considered corrosive) are or were discharged to floor drains or the collection system or there has been a history of collection system discharges, rupture or repairs. In such cases, representative soil sampling at known or suspected leak areas is required for potential contaminants.

2. Roof leader discharge. Soil at each roof leader discharge point should be sampled if storage units or process operations using contaminants of concern vent, or may have vented, to the roof.

3. Swales and culverts. Sampling should be conducted when the swale or culvert receives or received runoff from other contaminated areas of concern:

i. sediment and soil sampling should be conducted at the points where contamination from runoff/spills enter or have entered the drainage system; and

ii. if flow could have scoured sediments from the receiving structure, sampling should be conducted at on-site down gradient structures laden with sediments.

4. Storm sewer and spill containment collection systems. Sampling should be conducted when the collection system is or was the runoff/spill discharge point from other contaminated areas of concern:

i. sediment sampling should be conducted at the manhole, catch basin, sump, or other structure where contaminated runoff or discharges enter the drainage system;

ii. sampling should be conducted in the soils around catch basins, manholes, sumps or other structures which contain or may have contained contaminants, and are not hydraulically sound (that is, water percolates through the floor and walls), through the use of adjacent soil borings:

(1) a single boring located within two feet of the downstream side of the structure should be sampled at a depth corresponding to the bottom of the structure; and

(2) if highly permeable soils are encountered and VOC sampling is required, sample at the next lower permeability soil horizon or zero to six inches above the saturated zone, or at 9.5 to 10 feet, whichever is encountered first; and

iii. groundwater discharging from storm sewer systems which contain dry weather flow (that is, five days following the most recent rainfall) should be sampled at the discharge point and analyzed for potential contaminants discharged or potentially discharged into the system.

5. Boiler and compressor discharges. For all boiler and compressor discharges if there is reason to believe that a potential contaminant discharge has occurred, sampling should be conducted pursuant to subdivision (e) below.

(e) Discharge and waste disposal systems. The SC or RI for all discharge and waste disposal systems and areas should satisfy the sampling requirements of this subdivision.

1. Discharge areas and areas of discolored soil or stressed vegetation. Where specific requirements are not otherwise provided in this section each distinct area should be evaluated independently as an area of concern:

i. initial surface soil samples, in accordance with subdivision 3.5.1(b), should be biased based on field indicators such as soil discoloration, stressed vegetation or field instrument measurements toward those areas of greatest suspected contamination;

ii. sample frequency should be at least 1 sample for every 900 square feet for areas up to 300 feet in perimeter; and

iii. sample frequency may be reduced for larger areas, subject to DER's review of documentation pursuant to subdivision 1.6 (c) specifying why the reduced sample frequency was considered adequate.

2. Aboveground treatment systems. Above ground treatment systems should be sampled pursuant to the requirements for the functional portions of the system pursuant to subdivision (a) above. For example, any aboveground waste treatment tanks over unpaved soil should be sampled pursuant to paragraph (a)1 above.

3. Below-grade wastewater treatment systems:

i. tanks, septic tanks, separators and neutralization pits:

(1) two samples, one aqueous and one sludge sample, should be collected from within the tank etc, for analysis unless documentation acceptable to DER pursuant to subdivision 1.6(c) is provided in the SCR (section 3.13) specifying why such sampling was not considered necessary to confirm that only sanitary waste was discharged to the system during the entire life of the system; and

(2) documentation, based upon diligent inquiry, should be provided to support that only sanitary waste was ever discharged to the system and that no present or former floor drains, sinks or other units in process areas were ever connected to the system;

ii. septic disposal fields:

(1) soil borings and/or test pitting should be completed as specified below for on-site disposal fields unless documentation acceptable to DER is provided as to why soil borings were not considered necessary to confirm that only sanitary waste was discharged to the system pursuant to subparagraph (e)3.i above;

(2) at least one boring or test pit per 500 square feet of field area should be completed, with a minimum of four borings per field;

(3) borings should be located within two feet of the edge of the bed area in active fields but should be angled so that samples are taken below the infiltrative surface and directly below laterals within abandoned fields;

(4) borings should be located to include the first five feet of the infiltrative surface and should be spaced so that samples are representative of the entire disposal field; and

(5) soil samples should be taken at a depth corresponding to zero to six inches below the bottom of the infiltrative surface.

iii. cesspools, seepage pits and dry wells:

(1) sampling should be conducted in accordance with clauses (2) through (5) below, unless documentation acceptable to DER, pursuant to subdivision 1.6(c), is provided in the SCR specifying why sampling was not considered necessary (e.g., to confirm that only sanitary waste or storm water was discharged to the system pursuant to subparagraph (e)3.i above);

(2) one representative sample of sludge/sediment in each pit should be obtained for laboratory analysis;

(3) a soil boring should be placed within the well, pit or pool:

(A) the soil should be cored and inspected for evidence of discharge and samples collected in accordance with paragraphs 3.2.1(c)1 and 2; or

(B) if not possible to core within the suspected structure, the boring should be placed within two feet of the downgradient side of the pit and should extend to a minimum of two feet below the pit bottom;

(4) for structures with perforated sidewalls, perforated rings, brick, block or stone construction, a boring should be placed immediately adjacent to the outside of the structure. If no other

field indicators (e.g., staining) identify a vertical zone to sample, a sample should be collected at the level of any sediment observed inside the structure;

(5) samples obtained for VOC analysis should be collected as follows:

(A) each core should be field screened with a properly calibrated photoionization detector or flame ionization detector (PID/FID) or other suitable instrument;

(B) if field measurement readings are detected above background, coring should be extended until background readings are achieved or groundwater or bedrock is encountered; and

(C) an undisturbed sample from the two-foot interval registering the highest field measurement reading should be collected and analyzed for VOCs;

(6) if the pit bottom is within two feet of the saturated zone or bedrock, a groundwater sample will be obtained within the pit or, if not possible, within two feet of the suspected downgradient side of the pit; and

(7) at a minimum, the laboratory analysis should target the contaminants suspected to have been discharged to the seepage pit.

iv. collection lines, should be sampled pursuant to paragraph (d)1 above.

3.10 Fish and Wildlife Resources Impact Analysis (FWRIA)

3.10.1 Fish and Wildlife Resources Impact Analysis Part 1: Resource Characterization

(a) The purpose of the FWRIA Part 1 is to identify actual or potential impacts to fish and wildlife resources from site contaminants of ecological concern. Refer to the document entitled *DFW&MR Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (1994)* for additional guidance and detail on how to conduct a FWRIA.

(b) When paragraphs 1 through 4 below apply at a site, it is assumed no FWRIA is needed.

1. The remediation is directed toward a specific discharge or spill event that does not adversely impact fish and wildlife resources.

2. The AOCs at the site consist solely of an underground storage tank(s) or an underground tank system, with no significant impact on surrounding groundwater or surface water.

3. The site is a point source of contamination to the groundwater (i.e. dry cleaner or gas station) which will be prevented from discharging to surface water, and there is no widespread soil contamination or habitat of an endangered, threatened or special concern species present.

4. There are no ecological resources present on or in the vicinity of the site, determined pursuant to paragraph (c)1 below (e.g. an urban site which is not proximate to a surface water body, wetland or other ecologically significant area).

(c) A resource characterization consists of the five steps detailed below and should be conducted by an individual with the qualifications set forth at subparagraph 1.5(a)3.ii in accordance with the RI work plan. These steps will also satisfy the ecological portion of the qualitative exposure assessment for the BCP, while for CERCLA and NPL sites, a USEPA Ecological Risk Assessment may also be required.

1. Identify all fish and wildlife resources based upon knowledge of the site and a search of DEC records and/or other sources. If no resources are identified on the site, adjacent to or down gradient from the site and the lack of resources is not due to contamination, no further work on the FWRIA is required. Any resources identified should be indicated on a site map. The base map may be derived from such sources as aerial photos, ground-level photos, USGS topographic maps or soils maps. Maps should be drawn to a scale that allows features to be easily discerned. The following site maps should be provided:

i. a topographic map showing any fish and wildlife resources within one-half mile of the site including, but not limited to:

(1) habitats supporting rare, threatened and endangered species;
(2) NYS regulated wetlands;
(3) waterways including all classified waters;
(4) wild, scenic and recreational rivers;
(5) significant coastal fish and wildlife habitats, streams and lakes; and
(6) state forests, forest or nature preserves, parks, or other designated open or green spaces; and

ii. a general cover type map for the area within one-half mile of the site showing any:

(1) terrestrial, marine or freshwater habitat, such as woodlands, fields, wetlands (tidal, freshwater),shellfish beds, weed beds or NYS significant habitats; and
(2) any rare NYS ecological communities.

2. Describe the resources on the site and within one-quarter mile of the site. Much of the information required for the description of resources may be based upon existing knowledge of the site and a search of DEC records or other sources. Field verification may be needed if the site is large or contains extensive resources. If resources that may be affected by site-related contaminants exist farther than one-half mile from the site, this information should also be provided. The description of the resources should include:

i. a description of cover types, typical vegetative species, rare or protected plants

ii. DEC freshwater wetlands and stream classifications, and tidal wetland types;

iii. typical fish and wildlife species to be expected for each cover type and endangered, threatened, rare species or species of special concern;

iv. observations of stress including leachate or other seeps, exposed waste, absence of biota and dead or dying vegetation;

v. recorded fish kills or other instances of wildlife mortality associated with the site;

vi. existing fish or wildlife consumption advisories;

vii. a qualitative assessment of the general ability of the area to support fish and wildlife or act as corridors for fish and wildlife movement; and

viii. the current and potential use of the resource by humans for hunting, fishing, wildlife observation, scientific research and other recreational or economic activities.

3. Identify contaminant migration pathways and any fish and wildlife exposure pathways. Fish and wildlife exposure pathways are considered:

i. complete pathways in all instances where contaminants are potentially available for exposure to fish and wildlife resources regardless of the total extent of the contaminant exposure area or number of individuals exposed. Where complete pathways are identified:

(1) they should be included in the conceptual site model described in subdivision 3.2.2 (a); and

(2) any site or near-site features that could act as exposure pathways on or off the site, such as drainage ditches, lagoons, outfalls and seeps, should be included on the site maps; or

ii. incomplete pathways, if no exposure pathways are present. Where no complete pathways are identified, no further work on the FWRIA is needed.

4. Identify contaminants of ecological concern. Contaminants of potential ecological concern are:

i. those contaminants that have been identified by the investigation as having been discharged or disposed at a site, which have been determined to exist in areas of identified fish and wildlife resources at concentrations that are known to:

(1) bioaccumulate or biomagnify in the aquatic, marine or terrestrial food chain;
(2) result in toxic effects in biota; and/or
(3) potentially contribute to the need for a health advisory for the consumption of fish or wildlife; and

ii. identified at a site by:

(1) comparing site contaminants to SCGs for the protection of biota in each medium of concern (surface water, sediments, soil or biota); or

(2) if such SCGs do not exist, criteria should be derived using methods established in SCGs (e.g., 6 NYCRR Part 706 for surface water) and/or by a toxicity assessment. A toxicity assessment should:

(A) be conducted using applicable state or federal guidance;
(B) be based on available scientific literature; and
(C) compare levels of site contaminants to the reference toxicity values developed; and

iii. are considered to be present at a site when the contaminant concentrations exceed the applicable SCGs or the developed reference toxicity values, identified by subparagraph ii above.

5. Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern, the FWRIA Part 1 should draw conclusions regarding the actual or potential adverse impacts to fish and wildlife resources.

(d) All documentation and results of a FWRIA Part 1 should be submitted to DEC. The remedial party may elect to submit a work plan for a FWRIA Part 2 consistent with subdivision 3.10.2 (c), with this data submission.

1. Based on the information provided by the FWRIA Part 1data submission, DEC will:

i. determine whether the fish and wildlife resources identified constitute an important component of the environment at or in the vicinity of the site; and

ii. whether there are actual or potential impacts to the resources.

2. For sites where further evaluation or definition of ecological impact is necessary, DEC will identify the need for a FWRIA Part 2 ecological impact assessment, and request a work plan which includes provisions for gathering the necessary data identified in subsection 3.10.2 to define and evaluate the adverse impacts to the resources.

3.10.2 Fish and Wildlife Resources Impact Analysis Part 2: Ecological Impact Assessment

(a) The remedial party should complete a FWRIA resource characterization (Part 1) according to subsection 3.10.1 before proceeding with this section. If the results of the resource characterization indicate that further assessment is needed, an ecological impact assessment (Part 2) is required to further define and evaluate the adverse impacts to fish and wildlife resources.

(b) The ecological impact assessment should follow applicable State and federal guidance or scientific literature and should be conducted pursuant to a DEC-approved work plan by a person with the qualifications set forth at subparagraph 1.5(a)3.ii.

(c) Additional data collection needed to complete the ecological impact assessment should be identified in a work plan prepared by the remedial party. As appropriate for the contaminated media and contaminants of ecological concern identified by the FWRIA resource characterization, the work plan should detail the collection of additional data as set forth in this subdivision.

1. Additional soil, sediment and/or surface water sampling to further delineate or characterize the contaminants of ecological concern identified in paragraph 3.10.1(c)4.

2. Use of passive in-situ concentration/extraction samplers (PISCES) to identify sources of organochlorine compounds with extremely low solubility in surface water.

3. Toxicity testing or bioassays of contaminated soils, sediments or surface water according to the latest EPA, ASTM or other approved methods for assessing acute and chronic effects.

4. Biota tissue sampling and analysis.

5. Terrestrial, aquatic or marine population and/or community assessment.

6. Ecological assessments or other evaluations as requested by DEC.

(d) Using the results of paragraphs (c)1 through 6 above, the remedial party should conduct a detailed toxicity assessment incorporating information from subsection 3.10.1 and describe the actual or

potential adverse impacts to fish and wildlife resources from the site.

1. The results of the FWRIA should be reported as a separate section of the remedial investigation report.

2. The FWRIA section should:

i. summarize the information and findings of the FWRIA parts 1 and 2;

ii. develop appropriate ecologically based, site-specific cleanup objectives for site contaminants of ecological concern; and

iii. recommend measures for incorporation into the remedy selection report to eliminate or mitigate actual and potential adverse impacts.

3.11 Historic Fill Material

(a) If historic fill material (HFM) is identified at a site during development of the RI work plan or in the course of the soil investigation being undertaken pursuant to subsection 3.5.2, the additional steps outlined in this section may be applicable to characterize the HFM.

(b) The RI of HFM is intended to identify the location and extent of the historic fill on and around the site, as well as to characterize the nature of the fill material, including a determination of the presence of any contaminated non-HFM and any free product and/or NAPLs as defined in section 1.3.

1. The RI of HFM should be conducted to identify the location, vertical limits, and physical characteristics of the HFM using borings, test pits, trenches and/or appropriate geophysical techniques. The investigation should include:

i. the logging and mapping of all contaminated fill material encountered, including both historic and non-historic fill;

ii. at least four borings or test pits per acre of HFM with a minimum of four borings or test pits. The location of the borings or test pits should be representative of the areal extent of the fill and should be advanced through the fill material to native soil, meadow mat or bedrock so that the vertical limit of the fill material is established; and

iii. if the contaminated fill material extends below the water table, borings or test pits should extend below the water table as necessary to establish the vertical limit of the fill material;

2. The RI of HFM should identify the horizontal boundaries of the contaminated fill material area as follows:

i. a minimum of four borings or test pits should be installed in non-fill areas spaced equidistantly around the perimeter of the contaminated fill material area;

ii. if fill material is known to be ubiquitous in the vicinity of the site, aerial photos or other applicable documentation may be submitted in lieu of perimeter borings or test pits to verify that historic fill is site-wide; and

iii. delineation of HFM is not required beyond the property boundary; however this should not be construed to limit the necessary delineation of any off-site contamination due to migration from the site.

3. The HFM may be characterized by collecting and analyzing contaminant characterization samples from each type of historic fill present (e.g. ash and demolition debris are considered to be different types of fill material) to determine the site-specific contaminant levels, as follows:

i. at least four samples per acre, per fill type are required;

ii. the actual number and location of samples collected should be based on the variability of fill types and contaminant ranges present in a historic fill area and selected in accordance with section 3.2; and

iii. at least one sample for laboratory analysis should be collected from each boring and analyzed as follows:

(1) analysis of rubble, ash, cinders and dredge spoils should be conducted for:

(A) total petroleum hydrocarbons;

(B) priority pollutant metals in all samples;

(C) carcinogenic and noncarcinogenic polycyclic aromatic hydrocarbons (per EPA Priority Pollutant List); and

(D) PCBs on 25 percent of the samples, biased to samples having the highest total petroleum hydrocarbon levels;

(2) field screening for VOCs should be conducted during the installation of all exploratory borings and test pits with volatile organic laboratory analysis performed on all samples with elevated field instrument measurements (greater than five times background);

(3) any other fill material should be analyzed for total petroleum hydrocarbon in all samples, and Priority Pollutant plus 40 analysis or EPA Target Compound List/Target Analyte List analysis should be conducted for 25 percent of all samples;

(4) in addition to the contaminant analysis required in clauses (b)3.iii.(1) and (2) above, samples should also be analyzed for any other suspected contaminants based on diligent inquiry of the origin of the fill material and site history; and

(5) if more than one type of HFM is encountered in any boring or test pit, one sample is required for each type of fill material encountered. For example, if ash and demolition debris are encountered in the same boring, one sample of each is required from that boring.

4. Areas of concern, as defined in section 1.8, located in HFM should be investigated independently of the HFM. To differentiate between contaminants in fill and those from site discharges, an evaluation of the contaminant type and concentration gradient in each area of concern and the contaminant distribution in the fill should be conducted. If this evaluation is not conclusive DER may require additional data or information.

5. If the remedial party encounters materials that do not meet the definition of HFM because it includes material which meets the definition of a source in paragraph 1.3(b)70, drums or other containerized waste, the remediation of each such area should be conducted as(a) separate area(s) of concern.

6. An appropriate number of groundwater samples (minimum of one sample) are needed to

document that ground water is not contaminated, including, without limitation, if the historic fill site is in an area where groundwater is used for potable water. Any ground water sampling should be consistent with the requirements of section 3.7.

3.12 Records Search Report

(a) If no areas of concern are identified which require characterization or RI, the remedial party is to prepare a records search report which meets the requirements of this subdivision.

1. The records search report should:

i. present and discuss all of the information identified, evaluated or collected pursuant to subparagraph 3.1(a)1.i;

ii. be presented in a format that corresponds to the outline of Appendix 3A; and

iii. include the following:

(1) scaled site plans detailing lot and block numbers, property and leasehold boundaries, construction or destruction of buildings, areas where fill or cover material has been brought on-site, paved and unpaved areas, vegetated and unvegetated areas, all areas of concern and active and inactive wells; and

(2) scaled historical site plans and facility as-built construction drawings, if available;

(3) a copy of the United States Geologic Survey (USGS) 7.5-minute topographic quadrangle that includes the site and an area of at least a one-mile radius around the site. This map should be the most recent USGS revision and should clearly note the facility location and property boundaries. When a portion of the USGS quadrangle is used, the scale, north arrow, contour interval, longitude and latitude and the name and date of the USGS quadrangle must be noted on the map; and

(4) a summary of the data and information evaluated in all phases of the work, as set forth in Appendix 3A, should be presented by area of concern.

2. For each area of concern identified at the site, which has not been remediated under DER oversight, the records search report should contain a recommendation that either:

i. one or more contaminants have been identified at the area of concern or are suspected of being present, the area of concern has not been previously remediated under DER oversight indicating additional investigation or remediation is required; or

ii. the area of concern is not believed to contain contaminants, pursuant to subdivision 3.1(a), in which case the records search report should detail the basis for the recommendation including references to all documentation relied upon in making the recommendation.

(b) If areas of concern are identified which require further characterization or a RI, a separate records search report need not be prepared. The information obtained in the records search, should be incorporated into the SCR described in section 3.13 or the RI report described in section 3.14.

(c) Upon written request of the remedial party DER will determine the extent to which prior submissions or completions may satisfy the specific items required for the records search report. If DER

approves any such prior work, that work may be included as part of the records search report.

(d) Electronic submissions. The remedial party is to provide the records search report, prepared in accordance with section 1.15, as a stand-alone submission unless otherwise approved in a work plan.

3.13 Site Characterization Report

(a) The site characterization report (SCR) should be prepared in accordance with this subdivision, where the SC concludes that a RI is not required for the site, or the remedial party will not proceed with the RI of the site. The SCR should present and discuss all of the information identified or collected pursuant to subsections 3.2.1, 3.4,3.5.1, 3.6, 3.7.1 and 3.8.1.

(b) A full SCR is not required if the remedial party or DER determines that a RI is necessary, in accordance with subdivision 3.1(b), or if one is planned by the remedial party.

1. When the remedial party elects to transition the SC to a RI the information identified by:

i. subdivisions (e) and (f) below, should be incorporated into either:

(1) the RI work plan; or
(2) submitted as a site characterization investigation data summary, as described in paragraph 2 below; and

ii. the discussion in subdivision (d) below should be included in the remedial investigation report.

2. Site characterization investigation data summary. If the SC determines that a RI is necessary, the remedial party may proceed directly to this level of investigation and the SCR may be limited to a summary of the following:

i. the information identified in:

(1) paragraphs (d)2 and 4;
(2) subdivision (e); and
(3) in the stand alone electronic data summary, any applicable data identified for inclusion in subdivision (c) below; and

ii. a scope of work for the RI, consistent with subdivision 3.1(c), which will be the basis for a development of the RI work plan pursuant to section 3.3 may be included in the summary.

(c) Electronic data summary (EDS). The SCR is not to include, either as an appendix or an attachment, any of the information identified in paragraphs 1 through 5 below. The remedial party is to provide this information, in accordance with section 1.15, as a stand-alone data submission unless otherwise approved. The EDS is to include the information identified by this subdivision. An EDS will be included in accordance with this guidance for all other report or document submissions which include similar data.

1. Results of all analyses;

2. Copies of all validated laboratory data sheets;

3. Required laboratory data deliverables pursuant to sections 2.2 and 2.3 and Appendix 2B;

4. Well development logs and, if applicable, well as-built specifications. The following information, where applicable, should be reported for each monitoring well sampled for each groundwater sampling event:

i. before purging, the:

(1) date, time and weather conditions;
(2) well identification number;
(3) photoionization detector (PID) and/or flame ionization detector (FID) reading taken from the well immediately after the cap is removed;
(4) thickness of NAPL, if present;
(5) pH, dissolved oxygen, temperature and specific conductance;
(6) total depth of the well from the top of casing or surveyors mark if present;
(7) depth from the top of the casing to the water; and
(8) estimated water volume in the well;

ii. after purging, the:

(1) start and end time for purging;
(2) purge method;
(3) purge rate(s);
(4) total volume purged;
(5) depth from the top of the casing to the water after purging; and
(6) pH, dissolved oxygen, temperature, turbidity and specific conductance;

iii. before sampling, the depth from the top of the casing to the water prior to sampling; and

iv. after sampling, the:

(1) start and end time for sampling;
(2) sampling method; and
(3) pH, dissolved oxygen, temperature, turbidity and specific conductance.

v. any comments concerning field observations during the groundwater sampling event, such as slow recharge, turbidity, odor, sheen, PID and/or FID readings, model number and ionization potential of PID and/or FID used, should also be reported; and

vi. all measurements should be to the nearest 0.01 feet.; and

5. All supporting information typically provided in the records search report detailed in section 3.12, if this report is combined with the SCR. If a separate records search report was provided this should not be included in the SC report but remain a standalone document, summarized in the SC report.

(d) When a SCR is prepared it should document the findings of the records search and the site setting in accordance with this subdivision.

1. Historical information pursuant to section 3.12 should be reported, unless:

i. the investigation is directed at either a specific discharge event rather than a particular area of a site, or any underground tank or underground tank system; or

ii. a site history report has already been prepared.

2. Unless the remedial program is directed at a specific discharge event, rather than a particular area of concern or any underground tank or underground tank system, a physical setting section should include descriptions of the:

i. physical conditions of the site and surroundings, including a general description of soils, geology, hydrogeology and topography;

ii. use of, distance to, flow direction, classification of and names of surface water bodies within one-half mile of the site with emphasis upon water bodies topographically or hydraulically down gradient of the site that may receive site discharges or runoff; and

iii. presence of any public/private potable water, irrigation or process water wells within one-half mile.

3. A technical overview which should present a general profile of the SC results. The following items should be discussed in the technical overview:

i. reliability of laboratory analytical data as indicated by compliance with sample holding times, ability to achieve method detection limit or minimum reporting limits and precision and accuracy criteria for the analytical method, and other indicators of data quality;

ii. a summary of the general nature of contamination on the site to the extent investigated by the SC including, without limitation, the numbers of areas of concern requiring further investigation and/or remediation; and

iii. any significant events or seasonal variation which may have influenced sampling procedures or analytical results.

4. Findings/recommendations which should include, by area of concern, a summary of the following items:

i. any changes in sampling protocols, locations, etc. due to field conditions, from that set forth in the work plan;

ii. a description of each area of concern identified, including dimensions, suspected and actual contamination and suspected source of discharge or disposal;

iii. recommendations for either additional investigation in the RI, remediation or no further action for each area of concern; and

iv. all available results of the FWRIA.

(e) The SCR should present the data and information gathered by the characterization scope of work in accordance with this subdivision.

1. A summary table of analytical methods and quality assurance indicators pursuant to section 2.2 as an appendix to the SCR.

2. A table summarizing all sampling results, including sample location, media, sample depth, field and laboratory identification numbers, analytical results and comparison to applicable SCGs, for the media in question, organized by area of concern:

i. all contaminant concentrations exceeding the applicable media-specific SCGs should be identified in accordance with paragraph 2.2(b)1;

ii. samples with detection limit or minimum reporting limits (MDLs) exceeding the applicable remediation standard should be identified and an explanation provided in the table key;

iii. soils/solids sample results should be reported in milligrams per kilogram on a dry-weight basis, and aqueous sample results should be reported in micrograms per liter;

iv. all groundwater data for the same aquifer zone should be located in the same section of the table; and

v. a table which identifies all contaminants of ecological concern, applicable SCGs, any reference toxicity values developed during the toxicity assessment and representative concentrations of those contaminants at the site.

3. Stratigraphic logs, which include soil/rock physical characteristics and field instrument readings detected during drilling for each soil boring, test pit and monitoring well. If sediment sampling was conducted, logs which describe grain size, color, cohesion, odor and stratigraphy, if evident, should be included.

4. Stratigraphic cross sections of the site using information from monitoring wells, test pits and borings, as well as public/private drinking water well information, if available.

5. All soil boring, piezometer and monitoring well logs.

6. Any other data and information relevant to the nature and extent of contamination obtained pursuant to subsections 3.2.1, 3.5.1, 3.7.1 and 3.8.1.

(f) The SCR should include legible maps and diagrams in accordance with this subdivision.

1. Site and area of concern base maps pursuant to subparagraph 3.12(a)1.iii should be scaled at one inch to 200 feet or less (sample location maps may be keyed to and superimposed on base maps) and consistent with the specifications for maps and diagrams in accordance with this subdivision.

2. Sample location map(s), including:

i. all sample locations, sample depths and contaminant concentrations should also be plotted on the map. Where an entire contaminant class is not detected or is less than the applicable SCG, contaminants need not be listed individually;

ii. map scale and orientation;

iii. field identification numbers for all samples; and

iv. if more than one map is submitted in paragraph(d)1 above, the maps should be presented as overlays, keyed to the base map with sample locations superimposed on the site or area of concern map. Alternatively, individual maps may be submitted which have a common coordinate system and common scale, provided each map details the features of the base map.

3. If applicable, a map of the distribution of surface water, sediment, structure and airborne contaminants, including sample location numbers and contaminant concentrations.

4. Photos may be submitted to document the location of all soil and sediment sample locations.

(g) Electronic submissions. All required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

3.14 Remedial Investigation Report

(a) The remedial investigation report (RIR) incorporates the information collected by the investigations conducted pursuant to sections 3.1 through 3.11 by all approved RI work plans, addenda or supplements. Where the RI was conducted in several phases, the RIR is to be a comprehensive report of all data collected during the RI and the conclusions drawn from that data. The RIR is to provide the information identified by this subdivision and should use available RIR template(s) provided on DEC's website identified in the table of contents, as directed by the DER project manager.

1. Identify and characterize the source(s) of contamination.

2. Describe the amount, concentration, environmental fate and transport, including as necessary, phase (e.g., gas, solid, liquid), location, and other significant characteristics of the contaminant(s) present.

3. Define hydrogeological factors, as needed, to include: grain size analysis, soil permeability, nature of any bedrock, depth to saturated zone, hydraulic gradients, depth to bedrock, bedrock permeability, proximity to a drinking water aquifer, surface water, floodplains and wetlands.

4. Provide a qualitative human exposure assessment, in accordance with paragraph (c)17 below.

5. Identify actual or potential adverse impacts to fish and wildlife resources and to other environmental resources (mining, recreational etc.).

6. If present, identify surface water classifications and existing use designations.

(b) Electronic data summary (ESD). The RIR must not include, either as an appendix or an attachment, any of the information identified in paragraphs 1 through 4 below. The remedial party is to provide this information as set forth in paragraph (c)20 below as a stand-alone submission, unless otherwise approved by DER.

1. All data identified in subdivision 3.13(c).

2. Records Search report, site history or SCRs.

3. RI work plan.

4. Copies of any laboratory data sheets and the required laboratory data deliverable documentation pursuant to sections 2.2 and 2.3 and Appendix 2B.

(c) The RIR should build upon the information obtained by the SC (if one was performed for the site) and report specifically on the items identified by this subdivision as well as any site-specific data gathered pursuant to the RI work plan.

1. All of the relevant information obtained pursuant to paragraphs 3.3(b)1 and 2 should be reported.

2. Provide a technical overview and findings along with a description of the work completed under the approved RI work plan and the results of that completed work. The technical overview and findings should include:

i. the results of the DUSR;

ii. a summary of the overall nature and extent of contamination using the state standards, criteria, and guidance identified in subdivision 3.2.2(e). for comparison;

iii. a summary of any ecological assessments conducted in accordance with section 3.10; and

iv. any significant events, observations or seasonal variation which may have influenced sampling procedures or analytical results.

3. SCGs which pertain to the site location and site contaminants as well as potential remedial action objectives must be identified and listed in the RIR. The RI should determine the extent to which the unrestricted use SCGs have been exceeded or contravened. In addition, the remedial party may evaluate the extent to which the use-base SCGs under consideration for the site have been exceeded or contravened.

4. All sampling results which exceed unrestricted soil SCGs, the groundwater standards or other applicable unrestricted SCGs should be summarized in tables (organized by areas of concern) which include sample location, media sampled, sample depth, field/laboratory identification numbers, analytical results and the applicable unrestricted SCG for comparison. The results of any QA/QC samples analyzed should also be included. Universal Transverse Mercator (UTM) coordinates (North American Datum [NAD] 83) should be identified for each sample location; appropriate GPS accuracy is

acceptable.

5. Stratigraphic logs which include soil/rock physical descriptions, well installation details, well development data including volumes purged, and field instrument readings detected during drilling for each soil boring, test pit and monitoring well. This data, where available, for any public/private drinking water wells in the area of groundwater impact should also be included.

6. If sufficient subsurface investigation was completed, stratigraphic cross sections of the site using information from monitoring wells, test pits, borings, geophysical data, or other historical information.

7. Site and area of concern base maps scaled at one inch to 200 feet or less (sample location maps may be keyed to and superimposed on base maps) and consistent with the specifications for maps and diagrams included in subdivision 3.13(f).

8. Sample location maps, appropriate to the area of the site and consistently used, with the sample points located by a surveyor or by GPS to include all groundwater, soil, sediments and other sample locations with sample depth and contaminant concentrations indicated on the map, if possible.

9. Groundwater elevation contour maps with flow direction specified for each set of static water level measurements for each aquifer where monitoring wells/piezometers were installed for flow direction. Groundwater elevation, for each monitoring well/piezometer, must be to the nearest hundredth (0.01) foot relative to a permanent, on-site datum.

10. Top of bedrock contour or low-permeability unit (e.g., aquitard, clay or aquiclude) map if bedrock or the unit was encountered in a sufficient number of borings to prepare a map.

11. At a minimum, site maps should show groundwater contaminant concentrations for each sampling round. Isopleth maps for groundwater contaminant concentrations for each round of sampling and isopleth maps for soil sample results should also be provided.

12. Maps depicting the areal and vertical (thickness) extent of any NAPL zones in groundwater or soil.

13. If completed during the investigation, results of any treatability, bench scale or pilot studies or other data collected to support remedy selection. This would include documentation acceptable to DER indicating that a groundwater model used to evaluate potential groundwater remedies was appropriate. The study and supporting documentation should be provided as part of the EDS identified in subdivision (b) above or as a stand-alone document, not as an appendix to the RIR.

14. Any data collected to develop discharge limitations.

15. A section of the RI should present the results of the Fish and Wildlife Resources Impact Analysis documenting the results of the Resource Characterization and Ecological Impact Assessment or fish and wildlife exposure assessment consistent with section 3.10, if required.

16. Any other pertinent data obtained from implementing the work plan, including any IRMs done prior to or during the RI.

17. A qualitative human health exposure assessment completed in accordance with paragraph 3.3(c)4 and Appendix 3B, which identifies areas of concern and chemicals of concern, evaluates actual or potential exposure pathways, characterizes the potentially exposed receptors (residents, workers, recreational users, etc.), and identifies how any unacceptable exposures might be eliminated/mitigated. An exposure assessment should identify:

i. exposure pathways, which is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are the:

(1) source of contamination;
(2) environmental media and transport mechanisms;
(3) point of exposure;
(4) route of exposure; and
(5) receptor population;

ii. the elements of an exposure pathway identified in subparagraph i above, are based on past, present or future events; and

iii. the potentially exposed receptors and how any unacceptable exposures may be eliminated are determined from an assessment of the primary use of the area (e.g., residential, industrial, or recreational), actual and potential use of ground and surface waters that are impacted or threatened, and how any potential routes of exposure may be eliminated. The current, proposed or reasonably anticipated future use of the area should be used in this assessment.

18. A quantitative risk assessment consistent with CERCLA may be requested by DER, based upon the exposure assessment, described in paragraph 17 above, unless the remedial program is undertaken by volunteer in the BCP.

19. Conclusions and recommendations which summarize the extent of the areas of concern, identifies any unacceptable exposure pathways, and recommends any future work (e.g., none, additional investigation, or an evaluation of remedial alternatives). This should include an updated conceptual model of the site and may also include remedial action objectives selected from those provided on the DEC website identified in the table of contents.

20. Electronic submissions. All required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

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CHAPTER 4 REMEDY SELECTION

4.1 Remedial Goals, Objectives and Factors to Consider

(a) The purpose of remedy selection is to identify, evaluate and select a remedy or alternative remedies to address the contamination identified by the RI of the site or an operable unit of a site.

(b) Remedial goals. The statutory or regulatory remedial action goals for remedial actions undertaken pursuant to this guidance are set forth in the applicable regulations identified in section 1.2.

(c) Remedial Action Objectives (RAOs). RAOs are medium or operable unit-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific SCGs to address contamination identified at a site. Where applicable, the generic RAOs identified on the DEC website identified in the table of contents are to be used for the various media.

1. RAOs are established for the remedy selection process:

i. from the generic RAOs identified, as applicable to the contaminants identified by the RI; or

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ii. by developing a site-specific RAO, where the generic RAOs provided on the DEC website do not address a unique site condition. Such RAOs may be proposed by the remedial party or required by DER.

2. The following must be identified and considered when establishing RAOs:

i. applicable SCGs, considering the current, intended and reasonably anticipated future use of the site and its surroundings [see subdivision 4.2(i)];

ii. all contaminants exceeding applicable SCGs;

iii. environmental media impacted by such contaminants;

iv. extent of the impact to the environmental media;

v. all actual or potential human exposures and/or environmental impacts resulting from the contaminants in environmental media identified in subparagraph iii above; and

vi. any site-specific cleanup levels developed pursuant to subparagraph 3.10.2(d)2.ii or paragraph 3.14(c)18.

(d) Baseline considerations. The remedial party will evaluate the following baseline considerations, unless they are not applicable to the site conditions, when developing alternatives in accordance with section 4.3. These baseline considerations are applicable without regard to the use of the site.

1. Protection of public health and the environment. All remedial alternatives developed must eliminate or mitigate threats to public health and the environment presented by the contaminants through the proper application of scientific and engineering principles. Notwithstanding, a

no action alternative; or where (an) IRM(s) has/have been implemented, a no further action alternative is also to be developed for a state superfund, federal superfund or ERP site regardless of protectiveness

2. Sources of contamination. An identifiable source of contamination shall be addressed by the remedial program in accordance with the following hierarchy of preference:

i. removal and/or treatment - All free product, concentrated solid or semi-solid hazardous substances, dense non-aqueous phase liquid, light non-aqueous phase liquid and/or grossly contaminated media should be removed and/or treated. If the removal and/or treatment of all such contamination is determined not to be feasible, such contamination shall be removed or treated to the greatest extent feasible;

ii. containment - Any source remaining following removal and/or treatment in accordance with subparagraph i above should be contained. If full containment is determined not to be feasible, the remedy should provide containment to the greatest extent feasible;

iii. elimination of exposure - Exposure to any source remaining following removal, treatment and/or containment should be eliminated through additional measures, including but not limited to, provision of alternative water supplies and the elimination of vaporization into buildings. If such elimination is not feasible such exposure shall be eliminated to the greatest extent feasible; or

iv. treatment of source at the point of exposure - Treatment of the exposure resulting from sources of contamination at the point of exposure, including but not limited to, wellhead treatment or the management of volatile contamination within buildings, may be considered as a last resort.

3. Bulk storage tanks and containment vessels. Where petroleum or chemical storage tanks, subject to the applicable DEC bulk storage regulations, are discovered on site during the course of the remedial program or any product or contaminant is found to be stored on the site in containment vessels other than storage tanks (such as drums, transformers, sumps and pits), the remedy for the site will include provision to:

i. all known tanks on the site, which are under the ownership or control of the remedial party, shall be registered in accordance with the applicable statutory and regulatory requirements, as follows;

(1) petroleum bulk storage, as set forth in 6 NYCRR Part 612; or
(2) chemical bulk storage, as set forth in 6 NYCRR Part 596;

ii. all such known tanks that are out of service or out of compliance and which are under the ownership or control of the remedial party, shall be closed in accordance with the applicable statutory and regulatory requirements, as follows:

(1) petroleum storage tanks, as set forth in 6 NYCRR Part 613; or
(2) chemical storage tanks, as set forth in 6 NYCRR Part 598; and

iii. where such tanks or vessels identified in paragraph ii above are out of service or out of compliance and they contain any product or contaminants, such product or contaminants shall be removed and disposed of in accordance with all applicable state and federal requirements:

(1) as an IRM in accordance with section 1.11; or

(2) if DER has not required expedited action as an IRM, will be addressed by the alternatives developed for the site.

4. Groundwater protection and control measures. All remedial programs will consider the protection of groundwater in the development and evaluation of remedial alternatives and will consider DEC guidance including, any groundwater remediation strategy issued pursuant to ECL 15-3109. While the current use of groundwater as drinking water may be considered, the absence of such use shall not exclude the need for remediation Where the RI has identified groundwater contamination as set forth below, the remedial program must consider measures to address:

i. any source of on-site groundwater contamination which was identified at the site. In doing so the remedy selection must consider:

(1) source removal or control as set forth in paragraph 2 above;

(2) groundwater quality restoration by evaluating the feasibility of measures to restore groundwater quality to meet applicable SCGs; and

(3) plume containment/stabilization to prevent, to the extent feasible, the further migration of groundwater plumes whether on or off site, by developing and evaluating the feasibility of remedial alternatives that can achieve groundwater plume containment/stabilization. Note however, a volunteer in the Brownfield or Voluntary Cleanup programs is only required to evaluate the feasibility of containing the plume on-site.

ii. on-site groundwater contamination which may be attributed to both an on-site and an off-site source, where there is off-site migration of groundwater contamination. In doing so the remedy selection must:

(1) identify a remedy for the site which includes removal, containment or treatment of the on-site sources contributing to the groundwater contamination, as set forth in paragraph 2 above; and

(2) develop and evaluate remedial alternatives which eliminate or mitigate on-site environmental impacts or human exposures, to the extent feasible, resulting from any off-site contamination entering the site.

iii. off-site source of groundwater contamination with no on-site source (or contribution):

(1) the on-site groundwater contamination may be attributed to an off-site source if DER determines that:

(A) no act of the remedial party has contributed to the upgradient contamination, or caused such contamination to become worse;

(B) one or more off-site source(s) of contamination, located on one or more upgradient locations, are impacting on-site groundwater as a result of the migration of the contaminated groundwater to the site; and

(C) no on-site source(s) may have caused, or may be causing or contributing more than inconsequential amounts to the groundwater contamination; and

(2) where DER has determined that the criteria in clause (1) above have been satisfied, the remedial party will:

(A) except as provided in subclause (B) below, have no remedial

responsibilities with respect to such groundwater contamination migrating under the site; and

(B) develop and evaluate remedial alternatives which eliminate or mitigate on-site environmental impacts or human exposures, to the extent feasible, resulting from the off-site contamination entering the site; and

iv. the impact of contaminated groundwater discharging to surface water on surface water quality.

(e) Other considerations for soil contamination. The remedial party will address the considerations and media identified by this subdivision, where applicable to the site conditions identified by the RI, in each of the alternatives developed for evaluation and analysis in accordance with section 4.3. These considerations, where applicable, will be considered without regard to the use of the site.

1. Soil vapor and soil vapor intrusion. Where soil vapor contamination is identified by the RI, the development of remedial alternatives shall address, as set forth at 6 NYCRR 375-6.7(a) the contamination in this environmental medium, as well as, the migration of contaminants in soil and groundwater at levels which have the potential to impact the indoor air of buildings or areas where buildings are likely to be constructed, resulting in actual or potential human exposures. The remedy selection process is to consider whether the remaining contamination will or may have the potential to impact soil vapor or result in the need to take actions to address exposures related to soil vapor intrusion, the site-specific remedy will evaluate measures in addition to addressing the source pursuant to subdivision (d) above, to address soil vapor intrusion through:

i. additional remedial actions to address soil contamination;

ii. additional remedial actions to address contaminated groundwater. The consideration of additional remedial actions to treat on-site groundwater is necessary because the exemption to the general applicability of the protection of groundwater soil SCGs, set forth at 6 NYCRR 375-6.5(a)1, is not applicable in this instance;

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iii. engineering controls to address environmental or building factors (e.g. new slab);

iv. the mitigation of the impact (e.g., installation of a sub-slab depressurization system); or

v. the implementation of a monitoring program to evaluate the potential for human exposures related to soil vapor intrusion.

2. Adjacent residential properties. Where residential properties as set forth in paragraphs 1.12(b)1 and 2, or other uses appropriate to such residential use categories (e.g., schools), are adjacent to a site where a commercial or industrial soil cleanup is proposed, additional considerations are necessary during remedy selection. Specifically, the development of remedial alternatives must address, as set forth at 6 NYCRR 375-6.7(c), the migration of soil with remaining contamination which could impact these adjacent residential properties. The remedy selection process will consider, based on the findings of the RI:

i. whether contamination remaining after the application of commercial or industrial soil SCGs will, or may have the potential to, impact adjacent residential properties by one of the following pathways:

(1) through migration of soil as fugitive dust; or
(2) transportation of the soil by erosion through surface water runoff; and

ii. where the pathways identified in paragraph 1 above are a concern, the remedy must include provisions to protect the occupants of the adjacent residential properties from exposure through such pathways. Such provisions are based upon site-specific conditions, especially those conditions proximate to the residential properties; and may include, but are not limited to, the following:

(1) requiring the exposed surface soils, or any cover for exposed surface soils, meet residential soil SCGs across the site or in an appropriate buffer zone(s) proximate to the residential properties;
(2) additional remedial actions to address soil contamination in the soils which are subject to transportation. Such additional actions may be taken site-wide or in buffer zones (areally or vertically);
(3) requiring any exposed surface soil at the site to be vegetated or otherwise stabilized to control erosion; and/or
(4) exposure control measures, including but not limited to the application of a storm water pollution prevention plan consistent with the *New York State Guidelines for Urban Erosion and Sediment Control* (dated 1997), or updated version.

3. Surface water and sediments. When surface water and/or sediments are present on or proximate to a site and the RI has identified an impact the development of remedial alternatives, as set forth at 6 NYCRR 375-6.7(b), must consider and include provisions to protect the resource and eliminate or mitigate the threat to public health and the environment from the contaminated surface water or sediments. The remedy selection process will also consider:

i. whether contamination remaining in soil after the application of the applicable soil SCGs is impacting, or will have the potential to impact, surface water/sediments proximate to the site by one of the following pathways:

(1) through the migration of soil as fugitive dust;
(2) by the transportation of the soil by erosion through surface water runoff; or
(3) by the discharge of contaminated groundwater to a surface water body or wetland; and

ii. where the pathways for soil impacts to surface water/sediments identified in paragraph 1 above are a concern, the remedy must consider, in addition to addressing the source as provided in paragraph (d)2 above, additional remedial measures to prevent the migration of contaminants in soil at levels which could impact the water quality or adversely impact the sediments of a surface water body on or adjacent to the site. Such additional measures include, but are not limited to:
(1) additional remedial actions to address soil contamination in the soils which are subject to transportation. Such additional actions may be taken site-wide or in buffer zones (areally or vertically);
(2) additional remedial actions to address contaminated groundwater that is likely to reach the surface water body at levels which could adversely impact the water body or sediments;
(3) engineering controls to stabilize the soil and control erosion (e.g., vegetated soil cover);
(4) mitigation of the impact; for example, removing, containing or treating

impacted surface water and sediments resulting from any discharge addressed in accordance with subparagraph i above based upon the RAOs for surface water or sediments identified for the remedial program; and/or

(5) exposure control measures, including but not limited to the application of a storm water pollution prevention plan consistent with the *New York State Guidelines for Urban Erosion and Sediment Control* (dated 1997), or updated version.

4. Aquatic ecological resources. Where the FWRIA has identified actual or potential impacts to aquatic ecological resources in a surface water body, wetlands or sediments present on, or proximate to, a site, in the development of remedial alternatives the remedial party is required to:

i. evaluate the need for provisions to protect the aquatic resource and eliminate or mitigate threats to public health and the environment from contaminated surface water or sediments; and

ii. include in the alternative(s) evaluated necessary provisions:

(1) additional remedial actions to address soil contamination in the soils which are subject to transportation. Such additional actions may be taken site-wide or in buffer zones (areally or vertically);

(2) additional remedial actions to address contaminated groundwater that is likely to reach the surface water body at levels which could adversely impact the water body or sediments;

(3) engineering controls (e.g., vegetating the cover system);

(4) mitigation of the impact; for example, removing, containing or treating impacted surface water and sediments based upon the RAOs for surface water or sediments identified for the remedial program; and/or

(5) exposure control measures, including but not limited to the application of a storm water pollution prevention plan consistent with the *New York State Guidelines for Urban Erosion and Sediment Control* (dated 1997), or updated version.

(f) Soil cover. A soil cover is required as an element of any remedy where contamination is present in the exposed surface soil above the appropriate use-based soil SCG. Exposed surface soil is the soil which will be present at the surface of a site which is not otherwise covered by the development at the site (e.g., buildings, pavement, etc.). Soil covers as part of a site remedy to address exposed surface soil will be in accordance with this subdivision.

1. Soil to be used for the construction of a soil cover must be suitable to sustain the growth of appropriate vegetation and have concentration of contaminants which for:

i. sites in the BCP, will not exceed the applicable contaminant-specific soil cleanup objectives as set forth in 6 NYCRR 375-6.7(d)(1); or

ii. all other programs identified by subdivision 1.2(a), should not exceed the applicable contaminant-specific soil cleanup objectives as set forth in 6 NYCRR 375-6.7(d)(1) unless the site-specific background concentration for surface soil, as determined by subdivision 3.5.3(c), exceeds the soil cleanup objectives. In this latter event, the soil cover material imported or reused from the site in accordance with subdivision 5.4(e) may not exceed the site-specific background concentrations.

2. The depth of the exposed surface soil and hence the required soil cover will be dependent on the use of the site or the identification of ecological resources. Where the exposed surface soil at a

site exceeds the applicable SCO for protection of human health and/or ecological resources, the soil cover:

i. for residential or restricted residential use, is to be two feet;

ii. for commercial or industrial use, is to be one foot; or

iii. when an ecological resource has been identified, as set forth at 6 NYCRR 375-6.6:

(1) is to be a minimum of two feet; and
(2) when such a concern is identified by DEC, consideration should be given to supplementing the demarcation layer (see paragraph 3 below) to serve as an impediment to burrowing,.

3. A demarcation layer will generally be provided for soil covers. Approval of DER is required to dispense with a demarcation layer. For example, a demarcation layer may not be required where the soil remaining at the site is at or below background levels. This layer will be located between the soil cover, or fill meeting the soil cover requirements, and the soil where contamination will remain at the site.

4. The requirements for soil imported to the site for use, or site soils to be reused, in the soil cover are addressed in subdivision 5.4(e) and appendix 5.

4.2 Remedy Selection Evaluation Criteria

(a) In accordance with section 4.3, the remedial party should evaluate alternatives using the evaluation criteria set forth 6 NYCRR 375-1.8(f) in conjunction with the additional guidance provided for each criterion in subdivisions (b) through (j) of this section.

1. When performing this evaluation:

i. the first two evaluation criteria, subdivisions (b) and (c) below, are threshold criteria and must be satisfied in order for an alternative to be considered for selection; and

ii. the next six evaluation criteria, subdivisions (d) to (i) below, are primary balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives, provided the alternative satisfies the threshold criteria.

2. After the decision document is subject to public comment, the final criterion, subdivision (j) community acceptance, is considered. This modifying criterion is evaluated after any public comments on the remedy have been received, prior to DER selection of the remedy.

(b) Overall protectiveness of the public health and the environment. This criterion is an evaluation of the ability of each alternative or the remedy to protect public health and the environment.

1. How each alternative would eliminate, reduce or control through removal, treatment, containment, engineering controls or institutional controls any existing or potential human exposures or environmental impacts identified by the RI.

2. The ability of each alternative to achieve each of the RAOs.

3. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs.

(c) Standards, criteria and guidance (SCGs). The remedy must conform to officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance as appropriate.

1. Conformance with standards and criteria is required, unless good cause exists why conformity should be dispensed with. Such good cause exist if any of the following are present:

i. the proposed action is only part of a complete program or project that will, as a whole, conform to such standard or criterion upon completion;

ii. conformity to such standard or criterion will result in greater risk to the public health and the environment than alternatives;

iii. conformity to such standard or criterion is technically impracticable from an engineering or scientific perspective; or

iv. the program or project will attain a level of performance that is equivalent to that required by the standard or criterion through the use of another method or approach.

2. Consideration is also given to guidance which through the application of scientific and engineering judgment, is determined to be applicable to the alternative evaluation.

3. All SCGs for the site are identified along with a discussion of whether or not the remedy will achieve compliance.

4. For those SCGs that will not be met, acceptable documentation of the basis must be submitted to DER for approval.

(d) Long-term effectiveness and permanence. This criterion is an evaluation of the long-term effectiveness and permanence of an alternative or remedy after implementation.

1. If contamination will remain on- or off-site after the selected remedy has been implemented, this evaluation will assess the impact of the remaining contamination on any of the following:

i. human exposures;

ii. ecological receptors; or

iii. impacts to the environment.

2. The evaluation of institutional and/or engineering controls performed in accordance with subdivision 4.3(b) is considered.

(e) Reduction of toxicity, mobility or volume of contamination through treatment. This criterion is an evaluation of the ability of an alternative or remedy to reduce the toxicity, mobility and volume of site contamination. Preference should be given to remedies that permanently or significantly reduce the toxicity, mobility or volume of the contamination at the site.

(f) Short-term impact and effectiveness. This criterion is an evaluation of the potential short-term adverse environmental impacts and human exposures during the construction and/or implementation of an alternative or remedy.

1. Identify the potential human exposures, adverse environmental impacts and nuisance conditions, at the site resulting from the implementation of the remedy or alternative. Identify how they would be controlled and the effectiveness of the controls. The potential short-term impacts to be evaluated include, nuisance conditions or potential exposures resulting from increased traffic, including truck trips, detours or loss of the use of access to property; odors; vapors; dust; habitat disturbance; run off from the site and noise.

2. A discussion of engineering controls that would be used to mitigate the short-term impacts (i.e. dust control measures) should be included.

3. The length of time needed to implement the remedy or alternative including time to achieve the remedial objectives should be estimated.

4. While sustainability will be a consideration in remedy selection, as set forth in section 1.14, it will not change any existing statute, regulation or guidance.

(g) Implementability. This criterion is an evaluation of the technical and administrative feasibility of implementing an alternative or remedy.

1. Technical feasibility includes the difficulties associated with construction and the ability to monitor the effectiveness of an alternative or remedy.

2. Administrative feasibility is evaluated, which includes:

i. the availability of the necessary personnel and material; and

ii. potential difficulties in obtaining specific operating approvals, access for construction, etc.

3. The evaluation of the reliability and viability of implementation of the institutional or engineering controls necessary for a remedy, as detailed in subdivision 4.2(b).

(h) Cost effectiveness. This criterion is an evaluation of the overall cost effectiveness of an alternative or remedy.

1. A remedy is cost effective if its costs are proportional to its overall effectiveness. To evaluate cost effectiveness:

i. the overall effectiveness of an alternative or remedy is determined by evaluating the criteria set forth in subdivisions (d), (e) and (f) above; and

ii. a comparison of the overall effectiveness is then made to the cost of the alternative or remedy; and

iii. an assessment is made as to whether the cost is proportional to the overall effectiveness, to determine whether it is cost effective.

2. Capital costs and costs associated with site management for each alternative are estimated in accordance with subparagraph 4.3(a)5.iii.

(i) Land use. This criterion is an evaluation of the current, intended and reasonably anticipated future use of the site and its surroundings, as it relates to an alternative or remedy, when unrestricted levels would not be achieved.

1. The evaluation must consider the following land use factors:

i. current use and historical and/or recent development patterns:

(1) understanding the current and reasonably anticipated future land use is a critical element in this determination; and

(2) the current use of the site, if it is presently being fully used is the best guide for future use;

ii. consistency of proposed use with applicable zoning laws and maps;

iii. brownfield opportunity areas;

iv. consistency of proposed use with applicable comprehensive community master plans, local waterfront revitalization plans as provided for in article 42 of the executive law or any other applicable land-use plan formally adopted by a municipality;

v. proximity to real property currently used for residential use and to urban, commercial, industrial, agricultural and recreational areas;

vi. any written and oral comments submitted by members of the public on the proposed use as part of citizen participation activities;

vii. environmental justice concerns, which for purposes of this evaluation, include the extent to which the proposed use may reasonably be expected to cause or increase a disproportionate burden on the community in which the site is located, including low-income minority communities, or to result in a disproportionate concentration of commercial or industrial uses in what has historically been a mixed use or residential community;

viii. federal or state land-use designations relating to the property;

ix. whether the population growth patterns and projections support the proposed use;

x. accessibility to existing infrastructure;

xi. proximity of the site to important cultural resources, including federal or state historic or heritage sites or Native American religious sites;

xii. natural resources, including proximity of the site to important federal, state or local natural resources, including waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species;

xiii. potential vulnerability of groundwater to contamination that might migrate from the site, including proximity to wellhead protection and groundwater recharge areas and other areas identified by the state comprehensive groundwater remediation and protection program;

xiv. proximity to floodplains;

xv. geography and geology; and

xvi. current institutional controls applicable to the site.

2. The final use determination for a site must be made to complete the remedy-selection stage of the remedial program. With DER approval, areas of a site or operable units may have different uses and restrictions provided each is clearly identified and defined by the institutional control and/or engineering control.

3. DER may approve:

i. an unrestricted-use remedial program which requires no restrictions placed on use of the site; or

ii: a restricted-use remedial program which relies upon restrictions on the use of the site. The following represents the hierarchy of the range from the least restrictive to the most restrictive land uses:

(1)	residential	Least Restrictive Use
(2)	restricted residential	⇕
(3)	commercial	
(4)	industrial	Most Restrictive Use

4. DER's determination of the allowable use of a site:

i. is not an acceptance of a site-specific post-remedial development plan for the site. Site-specific development proposals require compliance with the State Environmental Quality Review Act. In other words while the remedy may allow a certain category of use at a site (e.g., commercial) it does not authorize any particular development representing that use;

ii. is the least restrictive use of the site allowed by such remedial program and would allow all more restrictive uses to occur on the site (e.g., a site cleanup to a commercial use would also be protective for industrial use); and

iii. must be consistent with existing zoning laws or maps, unless it:

(1) is based on a cleanup level that would allow a less restrictive use of the site

than would be allowed based upon current zoning laws or maps (e.g., DER may approve a cleanup to residential levels for a property which is zoned for commercial use); or

(2) can be shown to DER's satisfaction that zoning changes are or will be sought, in which event DEC will conditionally approve the remedy but will not issue a certificate of completion or closure letter until such use is consistent with existing zoning laws or maps.

(j) Community acceptance. This criterion is evaluated after the public review of the remedy selection process as part of the final DER selection/approval of a remedy for a site.

1. Any public comment relative to these criteria will be considered by DER after the close of the public comment period.

2. Documentation of the public comments received is to be consistent with the citizen participation plan identified for a remedial program in accordance with applicable DEC policy..

4.3 Development and Evaluation of Alternatives

(a) The steps in the development and evaluation of alternatives to support the selection of a remedy for the applicable programs identified in section 1.2 are set forth in this subdivision.

1. Step 1. Identify the remedial goals for the site in accordance with subdivision 4.1(b) for the applicable program identified in subdivision 1.2(a).

2. Step 2. Establish RAOs in accordance with subdivision 4.1(c).

3. Step 3. Identify general response actions based on the RAOs, which:

i. include an estimate of the areas and volumes of contaminated media to be addressed;

ii include non-technology specific categories such as treatment, containment, excavation, extraction, disposal, institutional controls or a combination of such;

iii. are medium specific (e.g., soil, groundwater, etc.), similar to the development of RAOs, and should identify:

(1) the volumes or areas to be remediated for that alternative, for each medium addressed, characterized with respect to the requirements for the identified use of the site; and

(2) take into account the contaminant and geologic characterization of the site or operable unit;

iv. give preference to presumptive remedies where they are available to address the contamination identified. If a presumptive remedy is applicable:

(1) the list of presumptive remedies provided in applicable DER guidance should be used to identify the appropriate presumptive remedy; and

(2) this step is streamlined with the only requirement being the estimating of the volumes/areas of contaminated media to be addressed before proceeding directly to paragraph 5 below;

v. consider the use of innovative technologies, where available and applicable to site

contamination; and

vi. identify and discuss technologies which are clearly not appropriate for the site due to site-specific factors or constraints and eliminate them from further consideration .

4. Step 4. Identify and screen technologies for effectiveness and implementability. In this step of the process:

i. technology types and process options that are appropriate to the site-specific conditions and contamination are identified for each of the general response actions identified above:

(1) technology types include, but are not limited to, general categories such as chemical treatment, enhanced bio-degradation, thermal destruction, immobilization, capping, de-watering and

(2) process options that correspond with the technology types; for example chemical treatment would include, but not be limited to, precipitation, ion exchange, oxidation/reduction or others as other technology process options are identified;

ii. identified technologies are then screened, on a medium specific basis to identify those that are:

(1) technically implementable; and
(2) can, either alone or in combination with other technologies, meet the RAOs.

iii. pilot tests may be conducted or more data collected to support the feasibility of a technology, if applicable or requested by DER;

iv. technologies that are not technically implementable shall be dropped from further consideration; and

v. technologies that remain are used in the next step to assemble alternatives.

5. Step 5. Assemble the technologies remaining after Step 4, unless DER elects or agrees to limit the number of alternatives to be evaluated, into operable unit(s) or site wide alternative(s). In this step, the potential technologies are assembled into media-specific or site wide remedial alternatives. The identified alternatives should:

i. use the description of the alternative or remedy set forth in applicable DER guidance, where it is described in that guidance;

ii. be developed and defined to a level of detail such that each alternative is clearly defined with respect to:

(1) size and configuration of process options;
(2) time for remediation;
(3) spatial requirements;
(4) options for disposal;
(5) substantive technical permit requirements [see definition in paragraph 1.3(b)72];
(6) limitations or other factors necessary to evaluate the alternatives; and

(7) beneficial and/or adverse impacts on fish and wildlife resources. Refer to Appendix 4 FWRIA Part 3 ecological effects of remedial alternatives; and

iii. develop estimates of the remedial action costs including all costs associated with the development and implementation of a remedial action, which include:

(1) all direct and indirect capital costs and engineering costs for the construction of all facilities and process equipment, labor, materials, construction equipment and services, land purchase and land preparation/ development and relocation expenses;

(2) costs associated with the institutional controls required for a remedy - While the initial or capital cost of an institutional control may be minimal, the long-term costs must be estimated. Costs for securing the institutional control must be included in the estimate, such as payment for the easement however effects on the value of the property are not included;

(3) costs for system start up and testing, facility operation, maintenance and repair, continuous performance and effectiveness monitoring, periodic site condition reviews; and

(4) costs for legal, administrative and capital costs associated with the placement of institutional controls on a property and other site management activities and/or certifications;

iv. also present the net present worth of all remedial action costs over time by discounting all future costs to the current calendar year. The present worth costing analyses will use a current discount rate as specified by DER at the time of remedial action selection, which should be applied before taxes and after inflation. The period of performance evaluated should not exceed 30 years to allow consistent evaluation of costs only. It does not imply that the site management of a remedy will end after the cost estimating period, if applicable the remedy should note if it will exceed 30 years; and

v. at the conclusion of this step eliminate alternatives that are not technically implementable or prove not to be cost effective relative to the other alternatives developed from further consideration.

6. Step 6. Analyze the alternative(s) pursuant to the evaluation criteria in section 4.2. In this step:

i. each of the identified alternatives is evaluated pursuant to the eight evaluation criteria in subdivisions 4.2(b) to (i);

ii. where more than one alternative is developed, conduct a comparative analysis of each alternative to the other alternatives using the same criteria identified in subparagraph i above;

iii. the evaluation of institutional and engineering controls detailed in subdivision 4.2(b), is considered; and

iv. the criteria in subdivision 4.2(j), community acceptance of the remedy, is evaluated after any public comment period in accordance with DER 23 - *Citizen Participation Handbook.*

7. Step 7. Recommend a remedy for the site. Except for a State funded feasibility study, this step results in the identification of a recommended remedy and summarizes the reasons for the recommendation utilizing the criteria in section 4.2.

(b) Evaluation of institutional and/or engineering controls. DER may approve a remedy for a site

where the remedial program is being implemented pursuant to subdivision 1.2(a) that includes institutional controls and/or engineering controls as components of a proposed remedial program, provided the remedy selection report detailed in section 4.4 includes an evaluation of the institutional and/or engineering controls in accordance with this subdivision.

1. A complete description of any proposed use restrictions and/or institutional controls and the mechanisms that will be used to implement, maintain, monitor and enforce such restrictions and controls, by the remedial party and by state and local government.

2. A complete description of any proposed engineering controls and any site management requirements, including the mechanisms that will be used to continually implement, maintain, monitor and enforce such controls and requirements, both by the remedial party and by the state and local government.

3. An evaluation of the reliability and viability of the long-term implementation, site management and enforcement of any proposed institutional or engineering controls and an analysis of the long-term costs of implementing, maintaining, monitoring and enforcing such controls, including costs that may be borne by state or local government.

4. Sufficient analysis to support a conclusion that effective implementation, maintenance, monitoring and enforcement of institutional and/or engineering controls can be reasonably expected and will be sufficiently protective of human health and the environment.

5. Where appropriate, as set forth in 6 NYCRR 375-1.11(c), DER may require financial assurance to ensure the long term site management and enforcement of any such controls.

6. Any engineering control must be used in conjunction with an institutional control to ensure the continued integrity of any such control.

4.4 Remedy Selection Reporting Requirements

(a) The purpose of the reports outlined in this section are to document the process identified in subdivision 4.3(a) for the development and evaluation of remedial alternatives for the programs identified in subdivision 1.2(a).

1. Consistent with the level of documentation required by the site remedial program these reports will document:

i. the development of alternative remedies for a site;

ii. the evaluation of the alternatives based on the criteria presented in section 4.2; and

iii. recommendations for an appropriate final remedy.

2. Remedial selection reporting requirements for the applicable programs are as follows:

i. State or federal superfund programs. A feasibility study (FS) report prepared in accordance with subdivision (b) below;

ii. Environmental Restoration Program (ERP). An alternatives analysis (AA) report

prepared in accordance with subdivision (c) below;

iii. Brownfield Cleanup Program (BCP). An alternatives analysis (AA) report or the section of the remedial work plan presenting the alternatives analysis, prepared in accordance with subdivision (c) below;

iv. Voluntary Cleanup Program (VCP). An alternatives analysis (AA) report or section of the remedial action work plan presenting the alternatives analysis, prepared in accordance with subdivision (c) below, unless the site is a class 2 site where an FS (see subdivision (b)) is required; or

v. petroleum remediation site - an alternatives analysis (AA) report or the section of the remedial work plan presenting the alternatives analysis, prepared in accordance with subdivision (c) below.

3. The feasibility study and alternatives analysis, detailed in subdivisions (b) and (c) below, must be signed and stamped by a professional engineer licensed to practice in NYS in accordance with section 1.5.

(b) Feasibility Study (FS). The FS is the required remedy selection report for a site in any of the programs identified by subdivision 1.2(a), which is listed as a class 2 site on the NYS Registry of Inactive Hazardous Waste Disposal (Registry) Sites. The FS develops and evaluates options for a remedial action in accordance with CERCLA [40 CFR 300.430(e)] and a remedial party in any of the programs may also elect to prepare a FS to document the remedy selection process.

1. The FS emphasizes data analysis and is generally performed in an iterative fashion with the RI using data gathered during the RI to:

i. identify the goal of the remedial program;

ii. define the nature and extent of contamination to be addressed by the alternatives developed;

iii. identify the RAOs for the site, in accordance with subdivisions 4.1(b) and (c);

iv. develop remedial action alternatives; and

v. undertake an initial screening and detailed analysis of the alternatives.

2. The FS is an engineering report which documents the decision-making process for the evaluation of a remedy includes:

i. the RAOs established for the site in accordance with subdivision 4.1(c);

ii. each of the steps of the remedy evaluation outlined in subdivision 4.3(a) for the development and selection of alternatives;

iii. the evaluation of institutional controls and/or engineering controls in accordance with subdivision 4.3(b).

3. The FS is to identify and evaluate alternatives which are capable of achieving the goal, which is cleanup to pre-disposal or unrestricted condition. However the FS may also evaluate alternatives to achieve a cleanup necessary to meet an identified use of the site. This results in the FS developing a range of alternatives, as follows:

i. a no action or, where an IRM may already have addressed the disposal, no further action alternative;

ii. one or more alternatives capable of achieving unrestricted use, one of which is to be carried beyond step 5, as set forth in subdivision 4.3(a) into the final evaluation of alternatives;

iii. one or more alternatives capable of achieving the most feasible and least restrictive use of the site, as set forth in subparagraph 4.2(i)3.ii, as follows:

(1) either a residential or restricted-residential alternative is to be developed;
(2) followed by a commercial use alternative if this is within the intended and allowable use of the site; and
(3) may end with an industrial use alternative, if that is the intended and allowable use of the site; and

iv. the use of the site, however, must be consistent with local zoning in accordance with 6 NYCRR 375-1.8(g)(4) and (5) for the alternatives developed, unless it can be shown to DER's satisfaction that zoning changes are or will be sought. In that event, DEC will:

(1) conditionally approve the remedy; and
(2) will not issue a certificate of completion or closure letter until such use is consistent with existing zoning laws or maps.

4. The FS report should include the following sections:

i. introduction;
ii. site description and history;
iii. summary of RI and exposure assessment;
iv. remedial goals and remedial action objectives;
v. general response actions;
vi. identification and screening of technologies;
vii. development and analysis of alternatives, which
(1) assembles technologies into alternatives;
(2) evaluates alternatives with respect to the criteria in section 4.2; and
(3) evaluates the institutional/engineering controls for the selected remedy, in accordance with subdivision 4.3(b); and
viii. recommended remedy, with a discussion supporting why it is recommended, except as set forth in paragraph 4.3(a)7.

(c) Alternatives Analysis Report (AA). The AA is a report, or portion of a remedial work plan, which identifies one or more alternatives and evaluates the effectiveness of each with respect to the criteria in subdivision 4.2(a). The AA is generally prepared by the remedial party for all sites other than class 2 Inactive Hazardous Waste Disposal Site Registry sites (see subdivision (b) above).

1. The analysis and considerations for an AA should be as set forth in paragraph (b)1 above.

2. The AA is an engineering report that documents in sufficient detail to support the decision-making process for the selection of a remedy, including:

i. the RAOs for the site, in accordance with section 4.1 above;

ii. the type and number of alternatives required to be evaluated for the applicable remedial program, in accordance with subdivision (d) below;

iii. the recommended remedy's compliance with the criteria identified in section 4.2;

iv. only those steps in subdivision 4.3(a), required by the program for which the AA is prepared, in accordance with subdivision (d) below;

v. if applicable, the evaluation of institutional/engineering controls detailed in subdivision 4.3(b) in accordance with subdivision (d) below, if applicable;

vi. a detailed description, equivalent to an engineered conceptual model, of the recommended remedy along with a demonstration that the remedy can achieve the remedial action objectives for the site or area of concern; and

vii. the use of the site must be consistent with local zoning in accordance with 6 NYCRR 375-1.8(g)(4) and (5) for the alternatives developed, unless it can be shown to DER's satisfaction that zoning changes are or will be sought. In that event, DEC will

(1) conditionally approve the remedy; and
(2) will not issue a certificate of completion or closure letter until such use is consistent with existing zoning laws or maps.

3. The AA report should include the following sections:

i. introduction;
ii. site description and history;
iii. summary of RI and exposure assessment;
iv. remedial goals and remedial action objectives;
v. development and analysis of alternatives, which
(1) assembles technologies into alternatives;
(2) evaluates alternatives with respect to the criteria in section 4.2; and
(3) evaluates the institutional/engineering controls for the selected remedy, in accordance with subdivision 4.2(b); and
vi. recommended remedy, with a discussion supporting why it is recommended.

(d) Alternatives to be evaluated by the AA. The number of alternatives to be evaluated by an AA will vary for each program.

1. The AA for an ERP site will develop, at a minimum:

i. the no action or, where an IRM may already have addressed the disposal, no further action alternative;

ii. an alternative that achieves the unrestricted soil cleanup objectives;

iii. sufficient additional alternatives to perform an alternatives analysis consistent with paragraphs 4.3(a)5, 6 and 7, and subdivision 4.3(b); and

iv. an alternative which can be recommended to satisfy the requirements of 6 NYCRR 375-4.8(d) and (e).

2. The AA for a BCP site will develop, at a minimum:

i. one alternative, if the alternative proposed will achieve unrestricted use relative to soil contamination without the use of institutional/engineering controls (Track 1);

ii. two or more alternatives, if the proposal is for restricted use, where:

(1) one alternative will achieve unrestricted use relative to soil contamination, without the use of institutional/engineering controls; and

(2) such other alternatives proposed by the remedial party which would achieve the cleanup Track and intended use identified for the site; and

iii. significant threat implications for the alternatives analysis:

(1) if the site has been determined by DER to represent a significant threat pursuant to 6 NYCRR 375-1.7, DER may require the remedial party develop and evaluate additional alternatives which would achieve the cleanup Track and intended use identified for the site; or

(2) if the site had been determined by DER not to constitute a significant threat; DER may require a Track 2 evaluation if one has not already been evaluated after considering the following factors:

(A) the degree to which the remedy selection criteria would be better satisfied by a Track 2 cleanup;

(B) the degree of impact a Track 2 cleanup would have on the applicant's ability to successfully cleanup and/or redevelop the property;

(C) the benefit to the environment to be realized by the expeditious remediation of the property; and

(D) the economic benefit to the State to be realized by the expeditious remediation of the property.

3. The AA for the a VCP or petroleum bulk storage site subject to subdivision 1.2(b) will develop at least one alternative:

i. unless DER requests that additional alternatives be evaluated and documented; or

ii. the remedial party elects to evaluate and document additional alternatives.

4. Petroleum remediation sites, subject to subdivision 1.2(b). The AA for petroleum remediation sites will develop, document and evaluate multiple alternatives sufficient to address the scope of the site contamination, unless DER agrees to the development of a single alternative.

4.5 Remedy Selection Decision Documentation

(a) DER will prepare and issue an agency decision document (DD) for the applicable programs identified in subdivisions 1.2(a) and (b).

1. For State Superfund and ERP sites. DER will prepare a Proposed Remedial Action Plan (PRAP) which identifies the DER-proposed remedy for the site or operable unit(s), which summarizes the contamination identified by the RI, and the alternatives considered and discusses the reasons for proposing the remedy. The PRAP will:

i. include the information required by:

(1) 6 NYCRR 375-2.8(e) for a SSF site; or
(2) 6 NYCRR 375-4.8(e) for an ERP site;

ii. be made available for review and subject to public comment for no less than:

(1) 30 days for SSF sites; and
(2) 45 days for ERP sites; and

iii. result in DER preparing and issuing a Record of Decision (ROD), after completion of the public comment period,. The ROD will:

(1) select the remedy; and
(2) include a responsiveness summary to public comments and concerns raised during the public comment period.

2. Except as set forth in subdivision 4.5 (b) for BCP, VCP, petroleum remediation sites and bulk storage sites subject to this guidance, DER will prepare a draft DD which summarizes the contamination identified by the RI and detail the components of the site remedy. The DD will:

i. be made available for review and public comment for a period of no less than:

(1) 30 days for VCP/petroleum sites managed pursuant to subdivision 1.2(b); or
(2) 45 days for BCP sites; and

ii. after completion of the public comment period, DER will prepare and issue a final DD.

(b) For Class 2 sites in either the VCP or BCP, paragraph (a)1 above will apply for the DD.

CHAPTER 5 REMEDIAL DESIGN/REMEDIAL ACTION

5.1 General

(a) This chapter provides guidance for the remedial design and remedial action elements of the remedial program, including all interim remedial measures (IRMs) and underground storage tank (UST) removals. The section index is provided below.

1. Section 5.2 Preparation of a Remedial Design (formal plans and specifications level of detail), including the remedial design work plan.

2. Section 5.3 Preparation of a Remedial Action Work Plan.

3. Section 5.4 Remedial Action Implementation Compliance.

4. Section 5.5 Underground Storage Tank Closure.

5. Section 5.6 Institutional Control Implementation.

6. Section 5.7 Remedial Construction Schedules and Reporting Requirements for the Remedial Action.

7. Section 5.8 Construction Completion and Final Engineering Reports (FERs).

(b) Schedule and notices. Schedule and/or notice requirements apply to the design and implementation of a remedial program.

1. The remedial party will comply with the schedule of submissions and notice provisions of the oversight document.

2. If not already expressly addressed by paragraph 1 above, the remedial party must:

i. provide any notices identified in subdivision 1.4(c);

ii. notify DER at least 7 business days prior to the initiation of any field investigations conducted in support of the remedial design; and

iii. notify DER at least 30 days before initiating:

(1) an underground storage tank closure in accordance with section 5.5; or
(2) a remedial action for which DER oversight is to be provided.

3. A schedule for conducting the:

i. remedial design will be included in the remedial design work plan; and

ii. remedial action will be provided with the submission of the remedial design or the remedial action work plan, in accordance with section 5.7.

(c) Common elements. Documents for each remedial program, developed in accordance with sections 5.2 or 5.3, should incorporate the common elements presented in this subdivision.

1. If a remedy was selected pursuant to Chapter 4, the design and construction work plans will be prepared in accordance with sections 5.2 and 5.3 prior to implementation.

2. The remedial action design and implementation should comply with the remedy selected by the approved DER decision document, unless a subsequent modification has been approved by DER in accordance with applicable DER policies (see, for example, DER-2 *Making Changes to Selected Remedies*).

3. The remedial action should be designed to:

i. comply with applicable federal, state and local laws, regulations and requirements;

ii. prevent any uncontrolled, or unapproved discharge or transfer of contaminants from one medium to another during its implementation or operation;

iii. provide specifications and data necessary for the development and implementation of a health and safety plan, as described by section 1.9, to include, at a minimum, a site-specific:

(1) community air monitoring plan (CAMP), prepared in accordance with the generic CAMP guidance in Appendix 1A; and
(2) fugitive dust/particulate monitoring component of the CAMP, prepared in accordance with Appendix 1B;

iv. where institutional or engineering controls are required, provide for development of an appropriate SMP in accordance with Chapter 6; and

v. provide the remedial design/remedial action documents detailed in this section, in accordance with the certification provision in section 1.5.

4. Access. Documentation of the necessary property access to implement and maintain the remedial program, including specific milestones to obtain the access, if required.

5. Institutional controls. Documentation of the remedial party's ability to implement the necessary institutional controls (e.g., environmental easements, deed restrictions), where necessary.

6. Permits or other authorizations. Permits or other authorizations necessary to implement the remedial program, or for which the permit exemption provisions of section 1.10 apply, should be identified, along with any information necessary for demonstrating compliance with the substantive permit/other authorization requirements. Permit or other authorizations exemptions are discussed in section 1.10.

7. Sustainability. DER will foster the use of best management practices (BMPs) for green remediation at contaminated sites. Sustainable practices result in cleanups minimizing the environmental and energy "footprints" of all actions taken during a project life. BMPs of green remediation emphasize a "whole-site" approach that closely evaluates core elements of a cleanup project:

i. energy requirements;

ii. air emissions;

iii. water requirements and associated impacts on water resources;

iv. impacts on land and ecosystems;

v. material consumption and waste generation; and

vi. impacts on long-term stewardship of a site.

(d) Protection of identified fish and wildlife resources. For sites where fish and wildlife resources have been identified as impacted by site-related contamination and require remedial action or are likely to be impacted by the remediation of other areas of the site, the remedial design or remedial action work plan must include appropriate measures for delineating and protecting the identified resource or habitat and for monitoring related impacts during the implementation of the remedial action.

1. The steps necessary to comply with this subdivision are collectively identified as a FWRIA Part 4, resource considerations for design and construction.

2. Any ecological resources identified by the FWRIA Part 1, completed in accordance with subsection 3.10.1, should be delineated in the field and shown on the construction drawings if they:

i. will be impacted by the remedy;

ii. are in areas to be disturbed to implement the remedy; and/or

iii. are subject to regulation.

3. Regional Division of Fish Wildlife and Marine Resources (DFW&MR) and/or the NYS Natural Heritage Program representatives should be contacted to arrange delineation of:

i. NYS regulated wetlands. A wetland field delineation may be required as part of the design development to provide a reference for restoration and/or mitigation of wetlands disturbed or filled in as part of the remedial action; or

ii. endangered, threatened or special-concern species or their habitat and rare ecological communities. The remedial design and remedial action (RD/RA) should avoid incidental or construction related impacts to these resources.

4. The substantive technical requirements of applicable resource-related permits (e.g., 6 NYCRR Parts 608, 661, 663) must be identified during the design and complied with for the site either during the design or construction of the remedy.

5. Where resources will be disturbed during remediation, or if loss of wetlands or other ecological resources is unavoidable, design elements and specifications for resource restoration and/or mitigation should be included in the remedial design document.

6. Procedures for protection of seasonal fish and wildlife resources such as construction windows to avoid fish spawning, bird nesting, animal migrations, etc., must be considered and identified during the design and incorporated in the remedial design documents, as appropriate.

7. A plan for any required baseline or post-remedial fish and wildlife resource monitoring should be developed during the remedial design and included in the monitoring plan included as a component of the SMP developed according to subsection 6.2.2. Any required baseline monitoring of the site and/or reference locations should be completed prior to the start of construction activities on site, in accordance with the schedule developed pursuant to paragraph (b)3 above.

8. All fish and wildlife and natural resources-related restrictions, special provisions, restorations, erosion control or other protective measures should be included on the construction drawings.

9. Construction related impacts must be monitored during implementation of the remedy according to the specifications and procedures contained in the RD/RA work plan. Construction monitoring may include:

i. implementation of soil and sediment erosion and storm water management and monitoring procedures developed in accordance with sections 5.2 or 5.3 to ensure protection of terrestrial, aquatic and marine habitats potentially affected by runoff or discharge from the construction area;

ii. surface water monitoring for turbidity, particulates, sheens and contaminants of concern, including the use of passive in-situ contaminant extraction samplers (PISCES) or semi-permeable membrane devices (SPMDs);

iii. monitoring water levels and/or vegetation in wetlands or water bodies affected by water management activities such as temporary dewatering facilities;

iv. periodic observation of behavior or health of endangered, threatened or special concern species or rare ecological communities; and/or

v. biota tissue sampling.

(e) Remedial action monitoring plan (RAMP). For sites where the remedial action may require a significant amount of monitoring during the action, the remedial design should consider including a RAMP.

1. A RAMP details the monitoring needs by:

i. identifying the frequency of sampling/monitoring;

ii. describing the specific steps involved;

iii. providing or referencing an applicable quality assurance/quality control plan; and

iv. detailing how the information will be reported.

2. A RAMP may be necessary for, the following type of projects or project elements:

i. dredging projects to include upstream and downstream water quality monitoring;

ii. sediment or sludge dewatering facilities;

iii. storm water management facility discharge monitoring;

iv. noise monitoring; and/or

v. monitoring of downstream or downgradient public water supplies.

(f) Community and environmental response plan (CERP). For certain sites where the remedial action will require controls, monitoring or work practices to address the potential for short-term impacts to the surrounding community or environmental resources, the remedial design or remedial action work plan should consider the development of a CERP. A CERP, while not appropriate for many sites, may be helpful by providing the measures to protect the community and environment during the remedial action in one location in the document. This has been shown to facilitate citizen participation efforts and provide information on required protective measures to contractors and subcontractors.

1. For sites where only a CAMP is required, a standalone CERP should not be prepared.

2. A CERP should be considered for sites where concerns have been raised relative to the protection of the public during the implementation of the remedial action, due to the proximity of adjacent properties or other sensitive receptors and/or where the public will continue to have limited access to a site during the remedial action.

3. The CERP should be a concise summary of the controls, monitoring or work practices and how they combine to provide the necessary protection of the community and ecological resources, the details of how these are to be implemented will be included in the technical specifications of the design.

4. The elements of a CERP should include, as applicable to the site, the following:

i. a summary of the CAMP;

ii. identification of any temporary measures to be erected or installed to protect the public on or adjacent to the site, from exposure;

iii. vapor/odor management plans, which identify the measures to be undertaken during the remedial action to monitor, prevent or control the generation of vapor or odors during the remedial action. This element of the CERP should identify the triggers which will require action to mitigate vapor/odors or which may trigger the need for alternative construction methods or shut down of the operation resulting in the odors or vapors;

iv. noise and vibration mitigation, which identifies the measures to be undertaken during the remedial action to monitor for and control noise and/or vibration resulting from activities at the site. This should include levels of measurable noise or vibration which may trigger the need for alternative construction methods or shut down of the operation resulting in the noise or vibration;

v. measures to secure the site from trespassers;

vi. erosion and sediment control measures to comply with the substantive requirements of a storm water management permit;

vii. waste management measures, which identify the steps to be undertaken by the contractor or remedial party to manage the waste storage, treatment or disposal resulting from the implementation of the remedy;

viii. water management and treatment measures, which identify the steps to be undertaken to manage the storage, treatment or disposal of contaminated water generated by the implementation of the remedy;

ix. traffic control and site access plans, which identify the measures to be undertaken to control traffic, deliveries and waste transport from the site;

x. decontamination of trucks and equipment leaving the site, which describes the procedures and equipment necessary to prevent cross-contamination from the excavation to public areas (highways, roads, support trailer, vehicles, etc.); and/or

xi. off-site trucking routes and emergency procedures.

(g) Protection of cultural resources. For sites where cultural resources have been identified which may be disturbed or otherwise impacted by the implementation of the remedy, the design document should include measures to address or mitigate the disturbance or impact. The DEC website identified in the table of contents includes links to applicable guidance identifying the measures necessary for compliance.

5.2 Remedial Design

(a) This section applies where a formal remedial design is required by DER or the remedial party elects to perform this level of detail. Where a formal remedial design is not prepared, a remedial action work plan should be completed, as detailed in section 5.3.

(b) The first step in a formal design is the preparation and submission of a remedial design work plan (RDWP) according to the schedule in the oversight document. The RDWP should be in a format that is consistent with the outline and substance of this subdivision.

1. Introduction. The first section of the RDWP must summarize the nature and extent of contamination identified by the RI and the selected remedy to be implemented by the design. If the RI and remedy selection reports were previously approved as part of a DER remedial program, a copy of the decision document may be provided in lieu of this summary. The identification of all applicable SCGs is included in this section.

2. Design investigations. The second section of the RDWP must identify any data needed to complete the design and include work plans for any investigations to gather this information. This section of the RDWP should include:

i. a summary table of the number, required analytical procedures and any special considerations (such as depth of the sample) for any samples to be collected and analyzed as part of the design effort;

ii. the locations of these samples should be identified on an accompanying figure;

iii. a scope of work, as needed to clarify the intent and goals of the sampling; and

iv. if the same figures developed during previous investigations at the site cannot be used:

(1) a QAPP, including proposed sampling and analytical methods, in accordance with section 2.4;

(2) HASP with a CAMP, in accordance with section 1.9; and

v. a schedule which identifies the documents to be prepared as part of the design and the timing for their submission, as well as for conducting any design investigation.

3. Design scope. The third section of the RDWP must provide a detailed description of the remedial action and the remedial technology(ies) for which the design is to be provided, detailed by OU or AOC. Consideration should be given to the need for the inclusion of a RAMP or CERP in the final design, as set forth in subdivisions 5.1(e) and (f) respectively.

4. Permits or other authorizations. The fourth section of the RDWP must identify all required permits and/or exempted permits or other authorizations, in accordance with section 1.10, to be addressed by the design including the identify all substantive conditions to be addressed in the design.

5. Schedule. The fifth section of the RDWP is to be a detailed schedule for the completion of the design, including any necessary design investigations. This section should also identify and discuss, to the extent necessary, the proposed steps and timing for procurement of the remedial action contractor

6. Post construction plans. To the extent necessary, a sixth section of the RDWP should outline:

i. the requirements for the SMP, to be developed in accordance with Chapter 6 including a schedule for the submission of the SMP, which takes into account:

(1) the proposed initiation of any portion of the remedy subject to such plan and the items identified in paragraph 5, above; and

(2) that the SMP must be approved by the DER prior to the approval of the FER;

ii. the scope of the required surveys and documents to support the development of the environmental easement or deed restriction and a schedule for the steps needed to complete this requirement;

iii. describe the institutional controls to be implemented. Where the remedial party is not the owner of the site on which the institutional control will be placed, the work plan should require a written agreement from the property owner committing to the necessary environmental easement prior

to the design completion; and/or

iv. post-construction sampling to verify that a sub-slab depressurization or soil vapor extraction system meets the design standards (e.g., verify the radius of influence).

7. Site figures. The last section of the RDWP is to include a scaled site map identifying all areas where remedial actions will be conducted, which should specify, as appropriate or identified at this point in the project, the following:

i. the proposed location of remedial treatment units;

ii. the areas, with volumes if applicable, for each environmental medium to be remediated;

iii. the vertical and horizontal extent of area to be remediated;

iv. the location, depth and concentration of all contaminants in excess of the remedial action objectives;

v. sample locations, depths and parameters for all confirmation and/or documentation samples in accordance with subdivision 5.4(b); and

vi. wetlands, streams or other habitats potentially disturbed by the remedial action.

(c) A remedial design should incorporate all of the elements of the remedy into a set of biddable quality plans and specifications.

1. Preliminary design. A preliminary design, which is typically submitted at a point from the 50-75% completion level, may be required by the RDWP based on the complexity of the project. The appropriate completion level for the submission is determined by the RDWP.

2. A 95% completion submission of the design plans and specifications is typically required by the RDWP. This submission does not have to be stamped by a professional engineer, unless the remedial party will use the 95% design to procure a contractor who then produces certain plans, based on the remedial party's performance specifications, to provide the final design. In this event, the 95% submission is to be stamped and signed by a professional engineer as set forth in section 1.5.

3. A final design submission of the plans and specifications which is signed and stamped by a professional engineer licensed to practice in NYS and includes the required certification set forth in subdivision 1.5(b).

4. A cost estimate of the remedial actions at:

i. State Superfund sites; or

ii. ERP sites.

(d) The remedial design should incorporate provisions for the preparation, at the completion of the remedial action, of a set of “as-built” drawings to be stamped by a professional engineer licensed to

practice in New York State as set forth at section 1.5 and include the appropriate certification set forth in subdivision 1.5(b), in addition to a CCR or FER, as set forth in section 5.8.

(e) Electronic submissions. The remedial design and all required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

5.3 Remedial Action Work Plan

(a) If a remedial design in accordance with section 5.2 is not required, a remedial action work plan (RAWP) in a format that conforms with the outline of subdivision (b) below is to be provided in accordance with the schedule contained in the applicable oversight document.

1. The RAWP should address the requirements of sections 5.1 and 5.2, however with less detail than anticipated by a formal design.

2. The final RAWP must be stamped and signed by a professional engineer licensed to practice in New York State in accordance with section 1.5 and include the certification as set forth in subdivision 1.5(b).

(b) The RAWP must include, at a minimum, the elements identified and detailed in this subdivision.

1. A detailed description of the remedial action and the remedial technology to be conducted for each area of concern. This must be of sufficient detail for a contractor to delineate any areas targeted for removal, construct necessary engineering controls, or design and install necessary treatment systems.

2. The location and description of any temporary construction facilities or treatment units required to implement the remedial action. A listing of all applicable SCGs relating to the construction of on-site remedial units, including inspection and professional engineer certification.

3. A description of soil and sediment erosion control, storm water management and monitoring and dust, odor and organic vapor control and monitoring procedures to be implemented during remedial activities, if applicable. Consideration should be given to the need for a CERP as set forth in subdivision 5.1(f).

4. A health and safety plan pursuant to section 1.9, to include the CAMP.

5. A detailed description of confirmation and documentation sampling, as set forth in subdivision 5.4(b).

6. A description of procedures for dismantling and removing remedial structures and equipment, if applicable, as well as site restoration plans to comply with subdivision 5.4(d).

7. A cost estimate of the remedial action for remedial actions at:

   i. State Superfund sites; or

   ii. ERP sites.

8. A schedule in accordance with section 5.7.

9. A description of institutional controls to be implemented. Where the remedial party is not the owner of the site on which the institutional control will be placed, the work plan must include a written agreement from the property owner committing to the necessary environmental easement or deed restriction prior to the design completion.

10. A requirement to submit a SMP in accordance with section 6, including a schedule for the submission of the final plan, taking into account the items identified in paragraph 5.2(b)7.

11. Drawings and figures, as needed, to define the elements of the remedial construction in satisfaction of paragraphs 1 through 6 above.

(c) The remedial design should incorporate provisions for the preparation, at the completion of the remedial action, of a set of "as-built" drawings, in addition to a construction completion or FER, as set forth in section 5.8 in accordance with subdivision 5.2(b).

(d) Electronic submissions. The RAWP and any required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

5.4 Remedial Action Implementation Compliance

(a) Compliance with community air monitoring plan (CAMP), dust monitoring or other controls identified by the CERP, if required for the remedial action. The approved CAMP and the fugitive dust/ particulate monitoring program, which is a component of the CAMP, are critical elements in the evaluation of RA compliance.

1. Guidance for monitoring compliance of:

i. the CAMP is provided in Appendix 1A; and

ii. the fugitive dust/particulate monitoring plan is provided in Appendix 1B.

2. The monitoring data gathered by the implementation of these plans is to be provided to DER on a regular basis. The frequency is identified in the approved construction schedule and/or RAMP prepared in accordance with subdivision 4.1(e). Real time or web based reporting may be required by DER on a case-by case basis.

3. Any monitoring results which exceed the action levels set by the CAMP are to be:

i. reported, or notice provided by another arrangement acceptable to DER:

(1) when identified, when a DER representative is present at the site; or
(2) within two hours by phone call or e-mail, to DER project manager when no DER representative is on the site; and

ii. summarized in a weekly, or other period identified by DER, CAMP report, including the duration and actions taken in response to any such exceedance. A template of the CAMP

report is available on DEC's website identified in the table of contents.

4. If applicable for the remedial action, a report on any other controls identified by a CERP.

(b) Compliance with site-specific soil cleanup levels. Evidence of compliance with a remedy=s achievement of the soil cleanup levels identified for the site will be through the collection and analysis of compliance samples during the implementation of the remedy. These compliance samples, either documentation or confirmation samples, are discussed in paragraphs 1 and 2 below and are determined based upon the endpoint defined for the remedial action by the decision document.

1. Documentation samples, as defined in paragraph 1.3(b)12, are generally required by a site remedy when the soil cleanup is based on (an) excavation(s) to pre-specified excavation limits described in the remedy decision document and delineated during remedial design. Documentation samples are collected and analyzed to document the soil levels achieved by the remedy.

2. Confirmation samples, as defined in paragraph 1.3(b)3, are required when the limits of soil removal are to be determined by achieving a soil cleanup level in the field. Confirmation samples are to demonstrate that the remedy has achieved the soil cleanup levels identified by the decision document, determined as follows:

i. the use of averages, means or other statistical techniques are generally not allowed, however, recognizing the heterogeneity of contaminated sites and the uncertainty of sampling and analysis of samples, the DER project manager may judge that remediation is complete for sites when:

(1) there is a large number of confirmatory samples;
(2) the vast majority of confirmation samples indicate that the soil cleanup levels for the site have been achieved; and
(3) those that do not achieve the SCO exceed it only by a small amount; and

ii. should the remedial party disagree with the professional judgment of the DER project manager, the remedial party may submit a justification that there is a 95% confidence level that the soil cleanup levels have been achieved using the procedure defined in the EPA guidance document *Supplemental Guidance to RAGS: Calculating the Concentration Term. USEPA Publication 9285.7-081* (May 1992). DER will evaluate this information and make a determination whether the sampling adequately documents that the objectives have been achieved.

3. All sample collection should be in accordance with sections 3.2 through 3.5.

4. All sample analysis and the reported results should be consistent with sections 2.1 through 2.3.

5. The following are minimum confirmation sampling frequencies for soil excavations of:

i. less than 20 feet in perimeter, include one bottom sample and one sidewall sample biased in the direction of surface runoff;

ii. 20 to 300 feet in perimeter, where the remedy is seeking to achieve:

(1) surface soil levels, one sample from the top of each sidewall for every 30

linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area; and

(2) subsurface soil cleanup levels, one sample from the bottom of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area;

iii. greater than 300 feet in perimeter, should be in accordance with either:

(1) subparagraph ii above; or

(2) a DER-approved reduced sampling frequency, where the remedial party submits a proposed sampling frequency, with supporting rationale, in accordance with section 1.6;

iv. in an excavation where multiple layers of contamination have been visually or analytically identified, additional side wall samples in the horizon in which contamination was identified are necessary;

v. each excavation within a larger excavation will be considered a separate excavation and should comply with subparagraphs i through iii above; and

vi. for side or bottom samples, for volatile organic compounds in an excavation:

(1) within 24 hours of excavation, they should be taken from the zero to six-inch interval at the excavation floor; or

(2) after 24 hours, the samples should be taken at six to twelve inches; and

vii. no water should be present in the excavation bottom where bottom samples are collected.

6. For tank excavations. When tanks are excavated, if contaminated soil is removed, confirmation soil samples for laboratory analysis should be taken:`

i. immediately after contaminated soil removal, pursuant to paragraph 5.4(b)5; and

ii. if the excavation is enlarged horizontally beyond the immediate tank removal area, additional soil samples will be taken pursuant to paragraph 5.4(b)2 or in accordance with subdivision 5.5(c) when a site characterization in accordance with subdivision 3.1(a) is determined necessary by this subdivision.

7. Confirmation and/or documentation sample locations and depth should be biased toward the:

i. areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated; and

ii. locations and depths of the highest expected contamination.

(c) Compliance for in-situ treatment technologies. A sampling program should be undertaken for sites where an *in situ* remediation technology is a component of the remedial program.

1. The work plan for the sampling program is to be approved by DER and is to be consistent with the investigation work plan requirements of section 3.3 and the applicable media specific requirements of the sections 3.5, 3.7 or 3.8.

2. The sampling program must:

i. determine whether the design parameters of the treatment system are being achieved;

ii. determine whether any discharges are compliant with identified permit or exempted permit, limits established for the site; and/or

iii. document the effectiveness of the system, in accordance with subdivision 6.2.2 (c).

(d) Compliance with site restoration activities. All areas of the site or adjacent areas which are disturbed or otherwise used during implementation of the remedial program should be subject to the site restoration requirements of the site decision document or approved remedial design/RAWP.

1. Site restoration should include:

i. restoring the site and/or adjacent areas to pre-remediation conditions with respect to topography, hydrology and vegetation, to the extent practicable;

ii. restoration related to an approved development plan for the site (e.g., increasing soil cover depth to account for a 100 year flood elevation); or

iii. where development is planned and a final restoration has not been identified or approved, the RD or RAWP will provide for, at a minimum, restoration sufficient to ensure the effectiveness and compliance with the remedial program.

2. It should be noted that some site restoration measures for remedial activities within or adjacent to wetlands, flood plains or other environmentally sensitive areas may have further requirements under the following DEC regulations (e.g., 6 NYCRR Parts 182, 500-502, 608, 661 & 663).

3. Where site restoration calls for the abandonment of monitoring, recovery, injection or other wells installed as part of the remedial program, the decommissioning should be approved by DER and performed in accordance with DEC guidance, e.g. CP-43 *Commissioner's Policy on Groundwater Monitoring Well Decommissioning*, available on DEC's website identified in the table of contents.

(e) Compliance for soil which exists at or is imported to a site. Soil which exists at, or is imported to, a site which is used to construct a soil cover, site cap system or as excavation backfill must meet the requirements of 6 NYCRR 375-6.7(d) and;

1. Soil imported to a site for use in a soil cap, soil cover or as backfill will:

i. comply with any RAOs which may be identified for a soil cover or the soil comprising a cap, by a remedy selected pursuant to Chapter 4.

ii. be free of extraneous debris or solid waste;

iii. be recognizable soil or other unregulated material as set forth in 6 NYCRR Part 360 and materials for which DEC has issued a beneficial use determination, which comply with the requirements of paragraph 2 below;

iv. not exceed the allowable constituent levels for imported fill or soil as described in paragraph 2 below, unless a site-specific exemption is provided by DER in accordance with paragraph 8 below; and

v. be tested as described in paragraph 3 below.

2. The fill material should not exceed the allowable constituent levels for imported fill or soil for the use of the site which are provided in Appendix 5, taking consideration that where the protection of ecological resources SCO is required for the site, the protection of ecological resources SCO must also be considered in selecting the lowest of the applicable SCGs. Where a compound is detected which is not on the Appendix 5 table the remedial party should:

i. determine if the constituent of concern is included on the supplemental soil cleanup objective tables in CP-Soil and if so use the CP-Soil values as the allowable constituent level; or

ii. consult with DER to determine an allowable constituent level.

3. Sampling is required for all imported soil for use as backfill or cover material. Sampling frequency of the material will be determined by the remedial design or remedial action work plan:

i. considering Table 5.4(e)10 and paragraph 10 below, and sampling will be performed consistent with sections 2.1 through 2.3;

ii. with a minimum one sample analyzed from every new source, at the following sampling frequency for:

(1) soil or sand imported from a virgin mine/pit, at least one round of characterization samples for the initial 100 cubic yards of material, in accordance with Table 5.4(e)10 below;

(2) material sources other than a virgin mine/pit (e.g., a former manufacturing site), in accordance with Table 5.4(e)10; or

(3) sites where large amounts of cover material/backfill are required, the sampling frequency can be reduced from that specified in Table 5.4(e)10 once a trend of compliance is established; and

iii. the DER project manager may modify the number of samples required by subparagraph ii above based on the site being remediated and the source of the material, in accordance with the modification provisions set forth in section 1.6.

4. Reuse of soil from the site. Soil originating on the site may be reused on the site or exported for reuse provided sampling demonstrates compliance with SCGs as detailed in Table 5.4(e)4. Soil which is not going off-site for reuse will be disposed in a permitted treatment, storage or disposal facility, unless paragraph 10 below provides for such export.

Table 5.4(e)4 Reuse of Soil [for Paragraph 5.4(e)4]		
Soil on the Site Meets:	**Reuse on the Site:**	**Off-site Export & Reuse:**
Unrestricted Soil SCGs	Without restrictions	Without restrictions
Meets the Applicable Use-based and Groundwater Protection SCG and where Appropriate Protection of Ecological Resources Soil SCGs for a Site w/ an IC & SMP.	In the soil cover/cap or as backfill within the area of the site subject to the IC.	Not Allowed, unless going to a site with IC subject to a 6 NYCRR Part 360 Beneficial Use Determination (BUD).
Meets Site-Specific Background Soil Levels.	Without restrictions. (Does not apply to sites in the BCP.)	Not Allowed, unless going to a site with IC subject to a 6 NYCRR Part 360 BUD.
Site-specific cleanup goals for subsurface soil	Placement below the soil cover/cap within the area of the site subject to the IC.	Not Allowed, unless going to a site with IC subject to a 6 NYCRR Part 360 BUD.

5. Material other than soil imported to a site. The following material may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of:

i. gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or

ii. recycled concrete or brick from a DEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation *Standard Specifications Construction and Materials Volume 1* (2002).

6. The remedial party must provide documentation of the source of fill to DER for approval of the source of the material before it is used on the site, which should include:

i. the name of the person providing the documentation and relationship to the source of the fill;

ii. the location where the fill was obtained;

iii. identification of any state or local approvals as a fill source; and

iv. if no prior approval is available for the source, a brief history of the use of the property which is the source of the fill.

7. Bills of lading should be provided to DER to document that the fill delivered was from a DER-approved source(s).

8. For all remedial programs except those developed pursuant to the BCP, DEC may issue a

site-specific exemption for one or more of the requirements set forth in this section, based upon site-specific conditions, such as:

i. use and redevelopment of the site;

ii. depth of the placement of the backfill material relative to the surface or subsurface structures;

iii. depth of the placement of the backfill material relative to groundwater;

iv. volume of backfill material;

v. potential for odor from the backfill material;

vi. presence of historic fill in the vicinity of the site;

vii. DEC-issued beneficial use determination, pursuant to 6 NYCRR Part 360; or

viii. background levels of contamination in areas surrounding the site.

9. For remedial programs pursuant to the BCP, DEC can only provide a site-specific exemption for backfill consistent with the provisions of paragraph 8 above as follows:

i. for Track 2 and Track 3 cleanups, for soils greater than 15 feet below ground surface; or

ii. for Track 4 cleanups, for soils beneath buildings, pavement and other improvements or for soils beneath the soil cover system or soil cap over exposed surface soils.

10. Sampling fill imported to or exported from a site. The remedial party will sample and analyze the fill being imported to the site in accordance with this subdivision and Table 5.4(e)10. Samples of the fill will be collected based on the soil quantity and type of constituents identified in the table and will be a combination of discrete and composite samples, handled as follows:

i. for VOCs only, grab samples are allowed. These grab samples are one or more discrete samples taken from the fill, with the number as specified in the volatile column of Table 5.4(e)10 for the soil quantity in question, and analyzed for the VOCs identified in Appendix 5; or

ii. for SVOCs, inorganics and PCBs/pesticides:

(1) one or more composite samples are collected from the volume of soil identified in Table 5.4(e)10 for analysis, with each composite from a different location in the fill volume;

(2) each composite is prepared by collecting discrete samples from 3 to 5 random locations from the volume of soil to be tested; and

(3) the discrete samples are mixed, and after mixing, a sample of the mixture is analyzed for the SVOCs, inorganic and PCBs/pesticide constituents identified in Appendix 5.

Table 5.4(e)10 Recommended Number of Soil Samples for Soil Imported To or Exported From a Site			
Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

(f) Compliance for soil exported from a site for reuse. For soil that is being exported from a site to locations other than permitted disposal facilities, the handling requirements are set forth in this subdivision and in paragraph 5.4(e)4.

1. Levels of contamination must not exceed the lower of the groundwater and residential use levels as shown in Appendix 5, absent a beneficial use determination issued by DEC. DER will coordinate with the Division of Solid & Hazardous Materials (DSHM), prior to the start of the remedial action, relative to whether the exported soil can be used beneficially in accordance with 6 NYCRR 360-1. The sampling and analysis requirements are set forth in paragraph 5.4(e)10.

2. The number of required samples are specified in Table 5.4(e)10 and paragraph (e)10 above, which may be modified by the DER project manager based on various factors, including the location of the site receiving the soil.

(g) Compliance for the decommissioning of monitoring wells. All monitoring wells not required for site management should be decommissioned in accordance with paragraph (d)6 above prior to DER approval of the FER.

5.5 Underground Storage Tank Closure

(a) The first step for underground storage tank (UST) closure is the identification, removal, treatment, containment and/or stabilization of the contents to prevent contaminant exposure to receptors and to prevent further movement of contaminants through any pathway as set forth herein.

1. A health and safety plan for the site is developed, as described in section 1.9, by a qualified individual in accordance with subparagraph 1.5(a)3.i.

2. Underground tank closures not performed in accordance with this section will require a certification of the closure report by a professional engineer, as described in section 1.5.

3. Minor variances and field adjustments may be approved, in accordance with section 1.6.

4. DEC is required to be notified if a spill is discovered. The notification is made to the Spill Hotline (1-800-457-7362) within two (2) hours of discovery.

5. For more information relative to the technical requirements for closure of a tank, see the applicable DEC guidance document, *Permanent Closure of Petroleum Tanks* (1987/1998/2003).

(b) The procedures set forth in this subdivision should be followed for the closure of all USTs regulated in NYS and any other tank found to have caused a release to the environment.

1. DER must be provided ten (10) days notice prior to the closure of a regulated UST or other tank for which DER oversight is sought or mandated, unless otherwise directed by DER.

2. Provide the petroleum bulk storage modification form required by 6 NYCRR 612.2(d) or for chemical bulk storage tanks 6 NYCRR 596.2(f).

3. A determination must be made whether the tank is to be abandoned in place or removed. Removal of the tank and excavation of associated contamination is the preferred method. Abandonment in place should be considered only when the physical constraints of the site prevent the excavation of an underground tank. Abandonment in place may be prohibited if:

i. local regulations specify removal;

ii. the tank is suspected of having leaked as a result of evidence, including local impacts, inventory records and/or tank test results; or

iii. during the tank closure, grossly contaminated media or groundwater containing product-related contaminants are discovered, in which case, DER will make the determination whether the tank has to be removed for a SC and/or to cleanup contaminated soil.

4. Deactivate or remove the tank and ancillary equipment, if feasible, in accordance with applicable SCGs.

5. A tank closure report should be prepared following the format presented in section 5.8 for a CCR, unless a SC is required in such case it may be included in the SCR.

(c) Site characterization resulting from a tank closure.

1. A SC must be conducted of the tank area if any of the following situations is identified during the tank closure:

i. a tank has evidence of a leak;

ii. DER has made a determination in accordance with subparagraph (c)2.ii below;

iii. all tanks that require a site assessment tank closure by state or federal;

iv. an existing tank is replaced with a new one;

v. a tank has been temporarily out-of-service for more than one (1) year; or

vi. the product stored in the tank is switched from a regulated substance to an unregulated substance.

2. When a SC is being undertaken in conjunction with a tank closure: where the tank:

i. will be closed in place, the SC should be completed before the actual closure; or

ii. is to be removed, the SC should be performed during or after the tank closure.

3. For tank and pipe removals, the following field observations should be made and documented during the SC:

i. a description and photographic documentation of tank and pipeline condition (e.g., pitting, holes or leak points);

ii. the excavation floor and sidewalls should be:

(1) examined for any physical evidence of soil or groundwater contamination;
(2) field screened with an appropriate and properly calibrated field screening tool or kit along transects spaced no more than five feet apart, so that sampling may be biased to the suspected location of greatest contamination; and

iii. if there is no evidence of a discharge, confirmation soil samples for laboratory analysis should be taken to demonstrate that the remaining soils meet SCGs immediately after tank removal if there is:

(1) no groundwater in the excavation, discrete center line soil samples from the bottom of the excavation are required as follows:
(A) at a frequency equal to the total length of the tank in feet divided by five (minimum of one sample);
(B) samples are to be spaced equidistantly;
(C) the outermost samples obtained should be greater than 2.5 feet from each respective end of the tank;
(D) if the total length of a tank in feet is not evenly divisible by five, one additional sample should be obtained for any fraction remaining; and
(E) a minimum of one groundwater sample(s), using a DER approved technique, must be taken within 25 feet hydraulically down gradient from the tanks that are not co-located if the product stored is gasoline and groundwater is within 20 feet of the surface or otherwise requested by DER.
(2) groundwater in the excavation and the contents of the UST have ever had a density less than or equal to water, soil samples should be taken as follows:
(A) one sample biased based upon field screening to the suspected location of greatest contamination should be taken near or above the water table from each excavation sidewall for every 30 linear feet of sidewall (minimum of one sample per sidewall);
(B) for heating oil tanks of 550 gallon capacity or less, one sample biased to the suspected location of greatest contamination may be taken from one excavation sidewall near or

below the water table and one at the bottom of the excavation;

(C) where seasonal fluctuations in the water table elevation can submerge and smear product over a range of several feet, additional samples should be considered in this "smear zone"; and

(D) a sample of the water in the excavation should also be collected pursuant to section 3.7;

(3) groundwater in the excavation and the contents of the UST had a density greater than water, soil samples should be taken as follows:

(A) grab samples should be taken of the excavation at a depth from zero to two feet beneath the tank in accordance with subclause 3.iii.(1) above, across the length of the excavation;

(B) these samples should be field screened with an appropriate tool or test kit;

(C) the four samples with the highest field screening results should be submitted for the appropriate laboratory analysis; and

(D) A sample of the water in the excavation should also be collected pursuant to section 3.7; and

(4) groundwater in the excavation and the contents of the UST consisted of mixed substances, such that some contaminants had a specific gravity of more than one, and some contaminants had a specific gravity of less than one (e.g., No. 6 fuel waste oil potentially contaminated with chlorinated solvents). Samples in this case should be taken pursuant to both clauses (2) and (3) above;

iv. if there is evidence of a discharge, excavation should continue until all contaminated soil is removed or until further excavation is no longer feasible. If excavation is not feasible, *in-situ* treatment may be appropriate. Once excavation is complete and if no groundwater is encountered, confirmation soil samples should be taken to demonstrate that contamination has been removed, as follows:

(1) a minimum of 5 soil samples should be taken, consisting of 4 sidewall and 1 bottom sample for each 15 linear feet of trench;

(2) the samples should be biased based upon field screening toward the suspected location of greatest contamination. If the action is an IRM and contaminated soil would remain in place after excavation and further soil remedial action will occur, refer to section 3.9 for sampling guidance; and

(3) if there is evidence of further contamination, but there is insufficient soil to conduct a soil remedial action, (for example, tank is located in bedrock), or any portion of the tank is located within or immediately above the groundwater table, a groundwater sample should be taken pursuant to subsection 3.7, unless an alternative is approved by DER;

v. if there is any evidence of groundwater contamination, including without limitation, a sheen or odor or if groundwater is within 20 feet of the surface, a groundwater sample should be collected pursuant to subsection 3.7 and soil samples collected in accordance with subparagraph iv above; and

vi. in all cases, a description of product type and quantity spilled from a tank or tank system during excavation.

(d) Tanks abandon in place. For a tank to be abandoned in place, the tank should be deactivated

pursuant to paragraph (b)3 and above must comply with the closure requirements of 6 NYCRR 613.9.

1. As part of the closure of a tank abandon in place, after it is cleaned of any residuals:

i. the tank should be inspected and any areas of questionable integrity including, without limitation, any cracks or corrosion or evidence of discharge, should be documented. Photographs should be submitted to document that the integrity of the system has not been breached, if the evidence is clearly visible in the photograph;

ii. soil sampling should be conducted by completing borings through the bottom of the tank, as follows:

(1) along the centerline, at a frequency equal to the total length of the tank divided by five (minimum of one sample);
(2) the samples should be collected to a depth of 10 feet below the tank bottom, to groundwater or bedrock;
(3) the samples should be spaced equidistantly with the outermost samples obtained no greater than 2.5 feet from each respective end of the tank; and
(4) if the total length of a tank is not evenly divisible by five, one additional sample should be obtained for any fraction remaining;

iii. if groundwater has been determined to be in contact with the tank , or if the product stored is gasoline and groundwater is within 20 feet of the surface, and there is no evidence of a discharge, sampling should be conducted in accordance with paragraph 3.9(a)4; and

iv. tank abandonment should comply with any state, federal and local laws, regulations and ordinances.

2. If the underground storage tank is located under a permanent structure or is physically inaccessible or a certification is submitted, signed and sealed by a licensed New York professional engineer, stating that the sampling requirements of subparagraphs 1.ii through iv, above, for closure of the underground storage tank will cause damage to an adjacent structure, an alternate method for documenting the integrity of the tank may be submitted for DER approval pursuant to subdivision 1.6(d).

5.6 Institutional Controls

(a) When an institutional control (IC) is required by the site decision document to restrict activities on the site or protect the engineering controls and/or current and future users from environmental contamination, the remedial party is responsible for ensuring that an IC is placed on the site. The necessary process should commence during the remedial design phase so that the IC will be in place in time to allow for timely approvals of submissions for which the IC is a prerequisite and to otherwise avoid delaying project completion.

1. The IC will be in the form of:

i. an environmental easement, pursuant to Title 36, Article 71 of ECL, for the programs identified in paragraphs 1.2(b)1 through 3 and 6;

ii. a deed restriction for the program identified in paragraph 1.2(b)4; or

iii. any other DEC-approved mechanism.

2. When an institutional control is required, documentation is to be submitted to DER establishing that the remedial party has notified the site contact list of the intent to establish the institutional control. This notification should describe the:

i. type and areal extent of the contamination to be addressed by the institutional control;

ii. proposed remedial action and its projected duration; and

iii. limitation on site use that will be necessary based on the proposed remedial action.

3. Templates for the environmental easement and deed restriction are available on the DEC website identified in the table of contents.

(b) Environmental easement. An environmental easement is an institutional control that is used to impose land use limitations or requirements needed to protect current or future users from environmental contamination. Activities or uses that may be limited or required include prohibition of use of groundwater for potable purposes, restrictions on property uses, prohibition of certain uses of sites such as construction of basements or trenches, and/or operation or maintenance of engineering controls and reporting.

1. The easement will reference the SMP to be approved by DER and at a minimum:

i. identify the allowable use(s) of the site;

ii. identify any groundwater use restrictions, if any;

iii. incorporate the SMP by reference, including a provision for future modifications to addresses changes to the site management requirements; and

iv. set forth the requirements for the periodic certification that the institutional and engineering controls for the site:

(1) remain in place;
(2) are in a DEC-approved form; and
(3) nothing has occurred that would impair the ability of the controls to protect public health and the environment.

2. For an environmental easement to be executed by DEC, the remedial party must provide:

i. a title report, current within 6 months;

ii. a written commitment from a New York State-licensed title insurance company indicating that it will issue the necessary title insurance policy, naming the state as an insured party, upon the recording of the environmental easement;

iii. a metes and bounds description of the site differentiating areas of varying restrictions, if any, required by the remedial program;

iv. a survey of the site, in a form approved by DEC and prepared by a New York State licensed surveyor with current registration or an American Land Title Association (ALTA) standard survey. The survey will:

(1) show the limits of the area of the site subject to the environmental easement relative to the BCP site as identified by the executed brownfield cleanup agreement;
(2) delineate any areas within the site subject to the easement, with differing use or other restrictions; and
(3) be presented so as to allow the metes and bounds description to be matched to the survey;

v. if requested by DEC, a survey endorsement current to within 3 months;

vi. the property owner's agreement to establish and maintain the easement in a form which is expressly made enforceable by the state set out in such form as to be recordable pursuant to Real Property Law Section 291; and

vii. other relevant documentation as specified by DER.

3. After DEC accepts the environmental easement and returns a fully executed document to the remedial party, the remedial party will:

i. file the easement with the recorder of the county in which the site is located within 30 days of execution of the environmental easement by DEC;

ii. provide a copy of the recorded easement to the affected municipalities; and

iii. provide DEC with a copy of the easement, along with a certification by the recording officer that it is a true and faithful copy and a certification that a copy has been provided to the affected municipalities. The institutional control requirement is not fulfilled until this proof of filing is received by DEC.

4. The environmental easement is to be executed prior to DER approval of the final engineering report.

5. When the required EE cannot be obtained from the owner of the site, DER may elect to execute and record an environmental notice, in accordance with subdivision (d)below, which will then be included in the SMP for the site.

(c) Deed restriction. A deed restriction should identify the restrictions and requirements for the use of the site as set forth in the SMP necessary to assure the continued protectiveness of the site remedy.

1. A deed restriction should, at a minimum identify:

i. the allowable use(s) of the site;

ii. any groundwater use restrictions, if any;

iii. incorporate the SMP to be approved by DER by reference, including, a provision for future modifications to addresses changes to the SMP requirements; and

iv. set forth the requirements for the periodic certification that the institutional and engineering controls for the site:

(1) remain in place;
(2) are in a DEC-approved form; and
(3) nothing has occurred that would impair the ability of the controls to protect public health and the environment.

2. After DEC accepts the deed restriction language, the remedial party will:

i. enter the restriction on the deed with the recording officer of the county in which the site is located within 30 days of DEC approval; and

ii. provide a copy of the recorded restriction to DEC.

3. The deed restriction is to be in place prior to DER approval of the final engineering report.

4. When the required deed restriction cannot be obtained from the owner of the site, DER may elect to execute and record an environmental notice, in accordance with subdivision (d)below, which will then be included in the SMP for the site.

(d) Environmental notice (EN). ENs are informational documents that may be filed with the County Clerk or the Registrar in New York City (NYC). ENs may be used at the discretion of DEC, when an environmental easement or deed restriction cannot be obtained from the owner of a site.

1. The EN will inform prospective purchasers of the property that:

i. contamination exists on the property;

ii. a cleanup occurred at the property, to a level that restricts certain uses of all or part of that property; and

iii. a SMP is available which contains requirements relative to the use of such property.

2. The property owner does not need to approve or sign the EN. DER prepares and records the EN at the appropriate county clerk (or Registrar in NYC).

3. A receipt from the appropriate county clerk (or Registrar in NYC) which will typically consist of a copy of the EN that is stamped with the book and page number in the upper right hand corner of every page of the document including attachments or exhibits, indicating where and when the EN is recorded DER will provide it to the remedial party for inclusion in the SMP.

(e) Templates of the institutional control documents, as well as additional information relative to preparing and recording the institutional controls discussed in subdivisions (b) to (d) above are available on DEC's website identified in the table of contents.

5.7 Remedial Action Schedule and Progress Reports

(a) A projected schedule for the remedial action phase of the project, starting with the procurement process for the construction contractor(s), must be developed prior to the start of construction. This schedule may be required by the remedial design, the remedial action work plan and/or the oversight agreement, as set forth in subdivision 1.2(b). The remedial action schedule should be reviewed and revised during remedial construction, as discussed in paragraph 5.7(b)2 below.

1. The remedial action schedule should incorporate the following:

i. dates for submission of deliverables to DER, such as:

(1) progress reports, groundwater monitoring reports, other monitoring reports (e.g., soil vapor, etc.), post-remediation data reports for individual areas of concern, construction submissions or other construction design reports;
(2) other construction related milestone dates; and/or
(3) other milestone activity dates, such as the start and completion of construction contracts, where multiple contractors are involved;

ii. time frames for the contractor procurement process;

iii. time frames to allow for DER review of deliverables/contractor submission, corresponding revisions of deliverables/submissions per DER comments/recommendations, and DER approvals as appropriate;

iv. time frames/deadlines for

(1) permit applications/issuance; and/or
(2) permit or other authorization equivalent substantive requirement reviews;

v. time lines for obtaining any requisite site access agreements;

vi. dates for finalization of the institutional controls (as described in section 5.6); and

vii. time lines and dates for the preparation and submission of the:

(1) SMP, and
(2) construction completion report (CCR) or FER;

2. The remedial action schedule should identify those tasks, such as specific DER approvals, that are prerequisite to subsequent tasks (sometimes referred to as critical path items).

3. The major assumptions reflected in the remedial action schedule, such as the amount of time it will take for DER to review a given deliverable or how long it will take for a laboratory to turn

around analytical data and to validate the data, should be provided as a note or attachment to the schedule.

4. The remedial action schedule must be consistent with any oversight document between the remedial party and DEC. For example, a consent order may require remedial construction work to start by a specified date. If this is the case, the remedial action schedule must adopt this milestone date and all other prerequisite tasks must allow for compliance with this date.

5. The remedial action schedule should be reviewed and revised, during remedial construction at a frequency acceptable to DER, as set forth in paragraph (b)2 below. For schedule revisions:

i. the details and process for any schedule revisions should be as specified in the oversight document, approved remedial design or approved RAWP; and

ii. the approved remedial action schedule can only be modified by approval of DER.

(b) Periodic progress reports should report on the progress of the remedial actions accomplished during the reporting period and, at a minimum, discuss the items in this subdivision. Unless otherwise set forth, progress reports must be submitted to DER monthly and as soon as practicable before the close of the specified reporting period.

1. Any request for modifications to the approved remedial action work plan must be identified in the progress report, along with the status of the requested modifications.

2. The periodic progress report should include:

i. a discussion of project progress and significant activities during the reporting period, including the status of any requisite permits;

ii. a discussion of pending/planned significant project activities during the next two months, unless another time frame is authorized;

iii. the approved remedial action schedule and proposed modifications to the remedial action schedule, resulting from new information and/or unforeseen conditions;

iv. a discussion of any problems or delays in the implementation of the remedial action relative to the work and/or the remedial action schedule;

v. proposed actions to correct any identified problems, including how to mitigate any adverse schedule impacts; and

vi. any additional, pertinent documentation that is available (e.g., photographs) that helps communicate progress/issues facing the project.

3. If required in a work plan, the following will be provided pursuant to section 3.3:

i. a tabulation of all sample results received during this period pursuant to paragraph 3.14(c)4 and submission of a report summarizing the data and presenting conclusions;

ii. a tabulation of waste classification and/or characterization samples collected including the physical state of the material (solid, liquid, sludge), the volume of material, number of samples collected, analyses performed and results; and

iii. a listing of all types and quantities of contamination generated by the remedial action during the reporting period and to date, as well as the name of the disposal facilities, transporters' dates of disposal and, if appropriate, the manifest numbers of each waste load.

4. Electronic submissions. All required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

5.8 Construction Completion Report and Final Engineering Report

(a) All remedial actions undertaken, including interim remedial actions, will be documented in either a construction completion report (CCR) or the final engineering report (FER). These reports are to be certified as set forth in section 1.5.

1. A CCR is prepared to document the implementation of any remedial action undertaken as an IRM, a remedy for an operable unit or where multiple contracts constituting a portion of the overall remedial program for a site which is not the final action under the remedial program. The CCRs submitted for a site will be incorporated/referenced in the FER when issued.

2. The FER is prepared to document implementation of the complete remedial program and is a mandatory prerequisite to the issuance of a certificate of completion or closure letter. The FER also includes the necessary FER certification for the remedial program provided in section 1.5. The scope of the FER will vary depending on the manner in which the remedial program was implemented for a site, as follows:

i. only for sites in the BCP, where the RI has resulted in a DEC determination that no action is required, the FER will:

(1) describe the activities completed in accordance with the approved RI work plan; and

(2) provide the FER certification for the remedial program;

ii. one or more IRM(s) were undertaken prior to the issuance of the decision document for the site, which resulted in a DEC determination that no further action is required, the FER will:

(1) summarize the results of all IRM CCR(s);

(2) describe any institutional controls required, including mechanisms to implement, maintain, monitor and enforce such controls. Include data and figures identifying where contamination remains at the site that needs to be addressed in the SMP;

(3) identify the site boundaries and include by reference the SMP; and

(4) provide the FER certification for the remedial program;

iii. only a single remedial action was required to implement the remedy identified by a decision document, the FER will:

(1) summarize the results of all IRM CCR(s);

(2) provide all data and information describing the final remedial action implemented in accordance with subdivisions (b) and (c) below;

(3) include data and figures identifying where contamination remains at the site that needs to be addressed in the SMP;

(4) describe any institutional controls required, including mechanisms to implement, maintain, monitor and enforce such controls;

(5) identify the site boundaries and include by reference the SMP; and

(6) provide the certification for the remedial program; or

iv. multiple IRMs, remedies for multiple operable units (OU) or multiple contracts were undertaken to implement the remedial actions identified by one or more decision documents, which together constitute the overall remedial program for a site, the FER will:

(1) summarize the results of all IRM and remedial action CCR(s);

(2) where more than one OU is involved, the FER must identify each OU and describe how the overall remedial program for the site, including any interim remedial measures, has addressed the OU;

(3) provide all data and information describing the final remedial action implemented in accordance with subdivision (b) below;

(4) include data and figures identifying where contamination remains at the site that needs to be addressed in the SMP;

(5) describe any institutional controls required, including mechanisms to implement, maintain, monitor and enforce such controls;

(6) identify the site boundaries and include by reference the SMP; and

(7) provide the FER certification for the remedial program; and

3. The SMP must be approved and the environmental easement or deed restriction executed prior to DER approval of an FER.

(b) CCR/FER requirements. A CCR, or that portion of the FER which documents the final remedial action at the site, must describe the activities completed in accordance with the approved remedial design or remedial action work plan, in addition to providing the data to support the construction activities completed and a discussion of the items identified below. The FER and CCR are to address the items noted below and be prepared in a format based on available templates on the DEC website identified in the table of contents.

1. A final CCR or FER submitted to DER for approval is to be prepared, stamped, certified and signed by an individual licensed or otherwise authorized in accordance with article 145 of the Education Law to practice the profession of engineering using the appropriate certification provided in Table 1.5.

2. A description of the remedy, as constructed, pursuant to the decision document or IRM work plan;

3. A summary of all remedial actions completed, which includes:

i. a description of any problems encountered during construction and a description of their resolution;

ii. a description of changes to the design documents and a description as to why the changes were made;

iii. quantities and concentrations of contaminants removed or treated;

iv. a listing of the waste streams, quantity of materials disposed and facility where such materials were disposed;

v. boundaries of the real property subject to the environmental easement or deed restriction or other institutional controls; and

vi. restoration actions.

4. A list of the remedial action objectives applied to the remedial action.

5. Tables and figures pursuant to section 3.14 (Remedial Investigation Report) containing all pre- and post-remedial data keyed appropriately so that completion of the remedial action is documented. The figures should clearly indicate the volume of contaminated soil or sediment which was remediated, as well as contamination remaining at the site to be managed by the SMP.

6. A detailed description of the applicable areas of remedial action compliance identified in section 5.4.

7. A detailed report of actual costs including bid tabulations and change orders, if any state funding is provided.

8. "As-built" drawings bearing a NYS professional engineer's stamp and signature on each drawing should be provided, which include:

i. any permanent structures including, without limitation, caps, slurry walls, treatment units, piping and instrumentation diagrams or other remedial structures which will remain in place after completion of the remedial action, as well as document areas of changed conditions or removals, as well as mitigation measures in place to address exposures related to soil vapor intrusion;

ii. all soil removals, indicating the surveyed limits of the excavation and location of all final documentation samples;

iii. all underground storage tank removals. A site plan showing the location, including GPS level of accuracy for latitude and longitude, of the tanks removed or abandoned in place and the extent of any soil removal as per subparagraph ii above; and

iv. any permanent survey markers for horizontal and vertical control needed for site management are to be shown on a site survey prepared by a NYS licensed land surveyor and include with the "as builts".

9. Identification of the applicable institutional controls employed along with a copy of the environmental easement or other institutional controls that apply.

10. For active groundwater remedial actions, the FER should also include figures representative of flow conditions immediately preceding initiation of the remedial action and flow conditions representative of pumping conditions during the remedial action.

(c) The following documentation, as applicable to the project, is to be submitted with the CCR or FER. This information is to be included by reference and provided as an ESD, in accordance with section 1.15, and is not to be included as an attachment or appendix to the CCR or FER.

1. All fully executed manifests documenting any off-site transport of waste material.

2. The approved SMP for the project which is the subject of the report.

3. Results of all analyses, including laboratory data sheets and the required laboratory data deliverables pursuant to sections 2.2 and 2.3 and Appendix 2B.

(d) Additional FER requirements. In addition to complying with the CCR as set forth in subdivision (a) above, an FER must also include the documentation for the remedial program necessary to support the certification requirements of the FER. The certifications are discussed in this subdivision, and the required certification language is provided in section 1.5.

1. For those sites where the decision document for the site, remedial work plan or other document identifies such a time frame, the following certification is to be made: “The data submitted demonstrates that the remediation requirements set forth in the decision document for the site have been, or will be, achieved in accordance with the time frames, if any, in the decision document, or any subsequently approved work plans”. Where this certification applies, the FER must identify the applicable time frame, the data evaluated and discuss how the data supports this certification.

2. For all sites with institutional controls, the FER must:

i. describe any institutional controls required, including mechanisms to implement, maintain, monitor and enforce such controls; and

ii. document that any institutional controls, engineering controls and/or any operation and maintenance requirements applicable to the site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 or any other DEC-approved process, and that any affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded”; and

3. For all sites where a SMP is required, reference the plan.

4. For all sites where financial assurance is required, describe the financial assurance mechanisms.

(e) Certificate of completion (COC). Upon approval of the FER, DEC will issue a COC for the remedial programs identified by paragraphs 1.2(a)1 through 3.

1. Issuance of the COC initiates the site management phase of the remedial program, which proceeds in accordance with the approved SMP developed in accordance with section 6.2.

2. The first periodic review of the site, as set forth in paragraph 6.3(a)1 will be due within

18 months of the issuance of the COC.

3. The schedule for the second and subsequent periodic reviews will be set by DER on a site-specific basis, in accordance with 6 NYCRR 375-1.8(h)(3), as part of the approval of the periodic review.

(f) Closure letters. Upon approval of the FER, DEC will issue a closure letter for the remedial programs identified by paragraphs 1.2(a)4 through 6. A closure letter may be in the form of a no further action determination, a release and covenant not to sue letter or such other letter indicating a remedial party has satisfied the requirements of the applicable oversight document.

1. Issuance of the closure letter initiates the site management phase of the remedial program, which proceeds in accordance with the approved SMP developed in accordance with section 6.2.

2. The first periodic review of the site, as set forth in paragraph 6.3(a)1, will be due within 18 months of the issuance of the closure letter

3. The schedule for the second and subsequent periodic reviews will be set by DER on a site-specific basis, in accordance with 6 NYCRR 375-1.8(h)(3), as part of the approval of the periodic review.

(g) Electronic submissions. The CCR/FER and all other required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

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CHAPTER 6 SITE MANAGEMENT, PERIODIC REVIEW and CLOSEOUT

6.1 Site Management

(a) Site management overview. Site management is the last phase of a remedial program, which begins with the issuance of the COC or closure letter. The purpose of site management is to ensure the safe reuse of properties where contamination will remain in place and is accomplished as outlined by this overview. The success of such use-based cleanups depends on effective site management.

1. Use-based remedies rely on institutional controls (ICs) and engineering controls (ECs) identified as a component of the remedial program. When an EC is required, there will always be a corresponding IC; however an IC (e.g., a groundwater use restriction) does not require a corresponding EC.

2. IC/ECs are implemented by a SMP, developed in accordance with section 6.2, to ensure that the use of the site does not disturb any remaining contamination or the required engineering controls or otherwise compromise the protectiveness of the use-based site remedy.

3. A site will have only one SMP which will encompass all site management activities identified by the remedy or remedies (including IRMs) selected for the site. The only exception would be a BCP site remedial program implemented by a volunteer, where off-site contamination has been determined to represent a significant threat as set forth in 6 NYCRR 375-3.7. For such sites, two SMPs may be applicable:

i. one SMP will address the site management for the on-site remedial program which was completed under the BCP for which the volunteer is responsible; and

ii. a second SMP will address the site management for the off-site remedial program which was implemented either by a responsible party or DER under the SSF.

4. For those sites where the remedial party is not the site owner, both parties can be jointly responsible for ensuring that all site management responsibilities identified in the SMP, environmental easement or deed restriction and the oversight document are performed.

5. Guidance is provided for the design, periodic review and discontinuance (closeout) of the SM phase, which includes:

i. development, implementation and management of the institutional and engineering controls (subsection 6.2.1);

ii. development and implementation of the monitoring requirements (subsection 6.2.2);

iii. design of a plan to operate and maintain treatment, containment, collection or recovery systems, etc. and preparation of an operation and maintenance (O&M) manual (subsection 6.2.3);

iv. periodic review and reporting of the implementation of the SMP, including the IC/EC certification and any corrective actions (section 6.3);

v. termination of treatment system operations (section 6.4); and

vi. completion of the remedial program and closeout of the site (section 6.5).

(b) Interim site management. Monitoring or operation and maintenance activities may need to begin with the completion of an IRM or an operable unit remedy, the COC or closure letter has not yet been issued for the site. For these sites, interim site management in accordance with this subdivision is required.

1. An interim SMP, as applicable for the site, will:

i. comply with the applicable provisions of subdivision 6.2.1(b) for any necessary plans, including a HASP and CAMP;

ii. include necessary monitoring in accordance with the applicable monitoring provisions of subdivisions 6.2.2(a) to (c);

iii. if required, report on the interim SM in accordance with subdivision 6.3(b); and

iv. include applicable excerpts from manufacturer catalogs which describe the equipment, specifications, operation and maintenance procedures, etc. (e.g., equipment catalog-cuts).

2. All applicable interim plans developed in accordance with this subdivision will be incorporated into the SMP upon completion of the remedial program, where any requirement of the interim plan is still required.

3. Periodic reviews and the IC/EC certification, in accordance with section 6.3, will not be required until the COC or closure letter is issued.

4. Exemption to the need for an interim SMP. An interim SMP will not be required where a SMP is not required, in accordance with paragraph 6.2(a)3.

(c) Implementing the SMP. As appropriate for the site remedial program, implementation of the SMP should include the activities described below which are necessary for the proper and effective management of the remedial program.

1. Inspection. Inspections of the site must be conducted to assure the remedy remains in place and effective. Inspections by the person responsible for the site management should:

i. occur at a frequency set forth in the SMP with inspection reports submitted with the PRR, as noted in paragraph 6.3(b)10, unless:

(1) a change of use, pursuant to 6 NYCRR 375-1.11(d), is identified by the inspection, if this change of use was not previously reported to DER by the person responsible for site management; or

(2) an inspection identifies damage to a component of the engineering controls in place at the site which may affect the effectiveness or protectiveness of the remedy. In such case, it shall be reported to DER as set forth in paragraph 6.1(d)3;

ii. occur whenever a severe condition (e.g., major erosion, flooding) which could affect engineering controls or a breakdown of the treatment or mitigation system occurs; and

iii. be documented on an inspection form developed for the site, to compile sufficient information to document an assessment of compliance with the SMP, including but not limited to:

(1) compliance with all institutional controls;
(2) site conditions, including an evaluation of the condition and continued performance and effectiveness of any engineering controls, including all treatment system(s) or structures associated with the treatment/mitigation systems;
(3) site management activities being conducted, including, where appropriate, performance and effectiveness sampling and a health and safety inspection;
(4) compliance with permits and schedules included in the O&M plan or manual; and
(5) currency of site records.

2. Reporting. The results of all inspections and evaluations for the reporting period identified for the site will be reported in the PRR, with the associated inspection forms provided as an electronic submission in the EDS provided with the PRR.

(d) Site management related notices. In addition to the notice requirements identified in section 1.4, during site management the remedial party or the site owner is also to provide notice to DEC as set forth in this subdivision.

1. The information detailed in this paragraph is to be provided, in an electronic format in accordance with section 1.15, for any institutional control in place at the time of the initial periodic review and is to be updated if the information changes at any time during the review period, within 30 days of such change. Such notification is to provide the name and contact information of the current person(s):

i. responsible for implementing the SMP;

ii. responsible for providing the PRR for the site; and

iii. knowledgeable of the easement.

2. At least 60 days in advance of a change in the ownership of the site, which constitutes a change in the use of the site pursuant to 6 NYCRR 375-1.11(d) and subdivision 1.4(b) of this guidance, for sites in the programs identified by paragraphs 1.2(a) 1 through 3.

3. If an inspection identifies damage to a component of the engineering controls in place at the site that may affect the effectiveness or protectiveness of the remedy, it shall be reported to DER if it is determined:

i. to be an emergency situation by noon of the following business day, as set forth in subdivision 1.4(d); or

ii. if it is not an emergency situation, within five business days of the inspection.

4. In addition to the scheduled inspections or periodic reporting requirements, if at any time during the reporting period the remedial party identifies the failures of one or more of the engineering controls or non-compliance with one or more of the institutional controls, the remedial party must:

i. notify DER of the identification of such failure(s) or non-compliance, if determined, in accordance with paragraph 3 above;

ii. identify and implement corrective measures in accordance with paragraphs 6.3(a) 6 and 7; and

iii. provide a periodic certification in accordance with the requirements of section 6.3, for the period established by DER in the approval of the corrective measures.

(e) Electronic submissions. The all required plans, notices, reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

6.2 Site Management Plan

(a) Site management plan. Except as provided in paragraph 3 below, a site-specific SMP developed in accordance with this subdivision is required at all sites upon completion of the final remedial action unless the site remedy requires no restrictions. The SMP should provide a general description of the site, the controls in-place as well as a description of the nature and extent of the remaining contamination at the site. Available SMP template will be on the DEC website identified in the table of contents.

1. The SMP must be approved prior to the approval of the FER.

2. The SMP will include, as required for the site remedy, up to three separate plans summarized as follows:

i. institutional and engineering control (IEC) plan. The IEC plan is described in subsection 6.2.1 and is required in every SMP;

ii. monitoring plan. The monitoring plan is described in subsection 6.2.2. This plan is required when it is necessary to monitor and report the performance and/or effectiveness of the remedy; and

iii. operation and maintenance plan. The operation and maintenance (O&M) plan is described in subsection 6.2.3. This plan is required where the remedial program includes the operation and maintenance of a component of the remedy.

3. Exemption to the SMP requirements. For sites where the remedial program is limited in scope, the SMP may be limited to the level of detail equivalent to an interim SMP, as set forth in subdivision 6.1(b). Sites subject to this exemption are those where the remedial program was limited to:

i. tank closures performed pursuant to section 5.5;

ii. for soil vapor intrusion monitoring, or the operation, maintenance and monitoring of

sub-slab soil vapor mitigation and/or point-of-entry treatment (POET) systems on private wells when such systems or monitoring are the only activity undertaken as an IRM. Should other IRMs or another operable unit of the site require an interim SMP, the vapor intrusion monitoring or the operation, maintenance and monitoring of sub-slab mitigation and/or point-of-entry treatment (POET) systems will be included in that interim SMP; or

iii. sites where any elements of site management will be satisfied within 18 months of the start of site management and institutional controls, if any, will also be terminated in this time frame. Should the need for site management extend beyond 18 months, an SMP in accordance with paragraphs 1 and 2 above will be required by DER.

(b) The SMP will be modified to reflect changes or deletions approved by DER in accordance with paragraph 6.3(a)5.

(c) Electronic submissions. The SMP and all other required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

6.2.1 Institutional Control and Engineering Control Plan

(a) An institutional control and engineering control (IEC) plan is required for all sites for which the remedy does not allow for unrestricted use.

1. The IEC plan details the steps and media-specific requirements necessary to assure the institutional and/or engineering controls remain in place and effective. This plan should include:

i. a description of all institutional controls and, if applicable, engineering controls;

ii. the steps necessary for the periodic certification of the institutional and/or engineering controls;

iii. a provision for implementation of an IC and/or EC, in accordance with subdivision (b) below;

iv. any other provisions necessary to identify or establish methods for implementing the institutional and/or engineering controls required by the site remedy; and

v. a provision to add the environmental easement or deed restriction as an appendix to the SMP upon its execution/issuance.

2. The plan should identify those items to be evaluated in order for the IC/EC certification identified in subdivisions (b) and(c) below to be made.

3. The IC/EC plan should identify areas of the site where contamination remains to be manage by the SMP.

(b) The IC/EC plan should include the applicable plans identified by this subdivision.

1. Excavation plan. An excavation plan is necessary where the remedial program for a site or area of a site does not achieve a soil cleanup which allows for, at a minimum, residential use of the

site. This plan should include provisions for the:

i. removal, management and handling of soil encountered during excavation of the site, which exceeds the residential use soil SCGs:

(1) which is removed from beneath a soil cover or site cap;
(2) where subsurface soil exceeds the site-specific soil cleanup objectives; and/or
(3) where soil from the site will be exported from the site [see subdivision 5.4(f)];

ii. handling and quality of the fill brought to the site, for use below the soil cover/site cap or for use above, or as part of, the cover/cap [see subdivision 5.4(e)];

iii. handling of soil removed from the site [see subdivision 5.4(f)];

iv collection, management, handling and treatment of contaminated groundwater resulting from the de-watering of excavations on the site;

v. installation, management and repair of any subsurface utilities or structures at the site, including provisions to allow utilities to work on or near the site without causing any exposure to the public or workers;

vi. health and safety procedures that comply with 29 CFR 1910.120 and subdivision 1.9 (c) and a CAMP are to be followed for all excavations or other activities at the site which may encounter remaining contamination; and

vii. remedial party and/or site owner to provide notification to DER, in accordance with subdivision 1.4(c).

2. Media-specific plans. Media-specific implementation plans including, but not limited to, plans for:

i. fill which is brought to the site for use above the cap during (re)development or use of the site, to be in accordance with subdivision 5.4(e);

ii. treatment to allow the use of contaminated groundwater; or

iii. the evaluation of need and/or installation/operation/monitoring of sub-slab depressurization systems or other mitigation systems to address soil vapor intrusion in newly constructed structures, or where a change in the use in an existing building occurs.

3. Remedy-specific plans. Plans for the installation, inspection and maintenance of a final cap, cover system or other engineering controls.

4. Health and safety plan (HASP) and Community Air Monitoring Plan (CAMP). A summary of the requirements for the development of a HASP as set forth in subdivision 1.9 (c), the CAMP as set forth in Appendices 1A and 1B and an identification of areas of the site where these plans will be required, should be included in the IC/EC plan. Site management activities where a HASP/CAMP will be necessary include:

i. intrusive activities below the soil cover/site cap or in other areas of the site where contaminant levels in remaining contamination exceed or, if no data is available, may exceed, residential use levels;

ii. the decommissioning/removal of monitoring wells or other engineering controls;

iii. implementation of elements of the monitoring plan [see subsection 6.2.2]; and/or

iv. operation and maintenance pursuant to the O&M plan [see subsection 6.2.3].

5. Other plans. As appropriate for the site management of the site, plans to manage unique site-specific human health or environmental exposure impacts identified by the remedy.

(c) Property transfer provisions. The IC/EC plan must identify the provisions for transfer of site management responsibilities upon property transfer, including the notifications required by subdivision 6.1(d) and 6 NYCRR 375-1.11(d).

1. These provisions will include the requirement that the following site management related documentation, up to the point of transfer, be provided to the new owner:

i. a copy of the approved SMP with any updates;

ii. all previously approved PRRs; and

iii. the IC/EC certification, provided by DER to be completed for the next scheduled periodic review.

2. DER must be notified of the fulfillment of the requirements of paragraph 1, upon notification of the change of use or within five business days of the transfer.

3. The date of the change of use notification to DER, and the date of the document transfer to the new owner are to be reported in the PRR for the review period in which the transfer occurs. It must be noted that this PRR reporting requirement does not satisfy the requirement for a notice of transfer of the certificate of completion for a BCP site, in accordance with 6 NYCRR 375-1.9(f).

6.2.2 Monitoring Plan

(a) General. The monitoring plan describes the measures for monitoring the performance and effectiveness of the remedy at a site. The monitoring plan will vary depending on the type of site, monitoring needs, site location and components of the remedy. The plan should include provisions for the evaluation of site information periodically, to confirm that the remedy continues to be effective for the protection of public health and the environment.

1. The monitoring plan should be designed to assess the performance and effectiveness of the remedy in meeting the objectives identified the remedial program and otherwise complying with applicable SCGs. The monitoring plan should also detail the steps necessary to inspect, monitor and report this performance and effectiveness. The plan should identify the requirements for:

i. assessing compliance with any discharge limits established for the site by a permit or permit equivalent;

ii. assessing whether the remedial treatment components, if any, are achieving their performance criteria;

iii. assessing achievement of remedial action objectives;

iv. evaluating site information periodically, to confirm that the remedy continues to be effective protecting public health and the environment;

v. sampling and analysis of appropriate media; and

vi. preparing the necessary reports of the results of this monitoring.

2. For specific remedies, as described in paragraphs (c) 3 through 6 below, the plan may also need to include provision for:

i. evaluating monitored natural attenuation;

ii. plume management monitoring;

iii. fish and wildlife resource monitoring; and

iv. trend analysis.

3. A monitoring plan may not be required for those remediation sites defined in paragraph 6.2(a)3. However, any wells to be monitored for such sites will require analytical results for the contaminants of concern for two sampling events not more than nine months apart, one event during a high groundwater period and one event during a dry period.

(b) Performance monitoring. Performance monitoring is the regular assessment of physical and chemical parameters to determine whether the remedy is performing as designed. Performance monitoring is typically associated with remedies with active treatment systems.

1. A performance monitoring program should include provision for:

i. measuring the area or volume of the media being treated;

ii. sampling the influent, intermediate and/or effluent streams;

iii. measuring static water elevations in wells, to determine groundwater flow paths and to evaluate the performance of in-ground containment or groundwater control structures (e.g., funnel-and-gate system);

iv. measuring parameters to gauge the effectiveness of the collection, mitigation and/or treatment of contaminants (e.g., maintaining a negative pressure under a building, positive pressure within a building, recovering sparged air or achieving the designed groundwater capture zone);

v. measuring the mass of contaminants removed or treated by the remedy and calculating removal efficiency; and/or

vi. evaluating the results of performance monitoring and implementing maintenance and/or system adjustments if the data identifies that the system is not operating properly.

2. Should DER approve the decommissioning or shut-off of any operating system at a site, the performance monitoring of the system is discontinued and deleted from the monitoring plan and/or SMP once the system is decommissioned or permanently shut off.

(c) Effectiveness monitoring. Effectiveness monitoring is the periodic chemical and physical analysis of media of concern to determine and/or confirm that the remedial action objectives are being achieved when compared to data obtained from the investigation, implementation and previous monitoring of the remedy. The remedial design should have identified those aspects of the remedy for which baseline (pre-remediation) conditions and/or for which reference station data (often related to tracking any trends in groundwater, sediment and/or biota) are needed. Effectiveness monitoring requirements for various media are provided in this subdivision.

1. Effectiveness monitoring requirements for groundwater:

i. a network of wells should be designed and monitored over time to assess up-gradient, on-site and down-gradient conditions in the vicinity of the site. The design of the well network may require vertical profiling to determine proper vertical placement, number and length of the screened intervals;

ii. the network of wells is to provide adequate and effective collection points for samples and include all areas of concern, at various depths if appropriate;

iii. groundwater should be characterized as to its temperature, pH, conductivity, turbidity and, where appropriate, indicator parameters for monitored natural attenuation at the site; and

iv. analysis of groundwater samples must include the contaminants of concern that are relevant to the performance.

2. Effectiveness monitoring requirements for surface water, soil, sediment, soil vapor and biota. Monitoring requirements for each of these media should be established on a case-by-case basis. Generally, where biota sampling/monitoring is to be included, baseline monitoring data both on-site and at a reference station are needed. Remedy implementation should not be delayed to gather additional baseline data.

3. Effectiveness monitoring requirements for monitored natural attenuation (MNA). For a remedy with an MNA component, a groundwater monitoring program should be implemented to monitor groundwater plume characteristics, horizontal and vertical contaminant migration and related controlling processes, in accordance with the USEPA guidance for MNA, OSWER Directive 9200.4-17 *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (November 1997).

4. Plume management monitoring (PMM) requirements. PMM requires a comprehensive and dynamic approach to groundwater monitoring. The following elements should be included in the PMM monitoring plan, taking into consideration the extent of the groundwater plume and the potential for impact to human health or the environment:

i. a network of wells, sufficient in scope to monitor the fate and transport of the plume and to identify impacts to sensitive receptors. Each PMM program should be custom designed and adjusted based on observed plume dynamics and predictive modeling using the following, as applicable:

(1) monitoring wells should be placed along the plume and in its projected path based on vertical and horizontal profiling, three dimensional modeling, proximity to sensitive receptors and professional judgment;

(2) multi-level groundwater data should be collected at various locations and depths to track the plume and bracket it vertically; and

(3) data from all monitoring points should be used to calibrate the predictive model to ensure that it truly describes the contaminant plume and to validate the protection of sensitive receptors;

ii. sampling should be conducted on a quarterly basis at monitoring wells associated with PMM for a minimum of eight quarters, including:

(1) at least one well or well cluster in the source area to monitor contaminant concentrations and determine vertical hydraulic gradients;

(2) at least one well or well cluster located down gradient of the source area along the centerline of the plume screened to bracket the plume vertically;

(3) at least one plume fringe monitoring well located at the limit of the plume. The plume limit is defined as an area where contaminant concentrations are below applicable SCGs. This well should be screened spanning the projected depth of greatest concentration based on the observed vertical gradient;

(4) at least one sentinel well or well cluster located beyond the zone of groundwater exceeding applicable SCGs screened across the projected depth of contamination. The sentinel well should be located no closer than three years' travel time of groundwater to the nearest potential downgradient receptor and no further than five years' travel time from the delineated downgradient extent of the contaminant plume;

(5) additional monitoring wells may either be pre-installed along the centerline of the projected plume or immediately (within two weeks) after contaminants are first detected in the downgradient sentinel. The time difference between the projected and observed first detection of contaminant should be used to refine the predictive model. The down gradient distances to successive wells will be adjusted based on the degree of predictive success; and

(6) as the plume moves toward its discharge point, the sampling frequency of upgradient wells may be reduced based upon suitable trend line analysis and higher confidence in the predictive model. Once the plume reaches its discharge point, the monitoring well network may be further scaled back depending on site-specific assurance requirements;

iii. a provision that should the plume reach apparent stability before its point of discharge, the use of MNA in accordance with paragraph 6.2.2(c)3 can be evaluated, as an alternative remedy; and

iv. soil vapor monitoring, as set forth in the most recent NYSDOH guidance document should be used as appropriate.

5. Fish and wildlife resource monitoring requirements. For sites or areas of concern involving impacts to fish and wildlife resources, monitoring may be required after implementation of the

remedy, to evaluate physical, chemical and biological conditions resulting from the initial implementation of the remedy, in addition to monitoring the long-term effectiveness of the remedy. Where applicable, fish and wildlife resource monitoring should include monitoring of:

i. fish and wildlife resources, including photographic documentation;

ii. physical conditions, which may include:

(1) inspection of wetland or other plants installed during site restoration to ensure acceptable growth and survival and for removal of invasive species. Restorative plants which do not meet specified parameters must be replaced. For wetland restorations, a five-year monitoring and replacement period should be included in the monitoring plan;

(2) inspection of stream-bank stabilization measures to ensure proper function after completion of the remedy. Any erosion or slumping of the bank or loss of erosion-control vegetation should be addressed immediately by repair or replacement; and

(3) monitoring of water levels and vegetation in wetlands or water bodies where hydrological conditions were altered as a result of construction; and

iii. chemical and biological post-remedial conditions, which may include:

(1) collection and analysis of fish or other biological tissue to document reduction of contaminant concentrations in the resource;

(2) monitoring macrobenthic populations or other environmental indicators to determine that an unimpacted habitat condition has been achieved or is being maintained;

(3) conducting toxicity testing of soil, sediments or surface waters to determine that a nontoxic condition has been achieved or is being maintained; and

(4) post-remedial observation of the health or behavior of endangered, threatened or special-concern species or rare ecological communities or other populations of concern previously identified at or near the site, to document that there are no lasting effects due to construction activities.

6. Trend monitoring requirements. Trend monitoring is conducted once there is sufficient quality data to develop an understanding of the effectiveness of the remedy in addressing the exposures presented at the site and to begin to identify any trend(s) with regard to the achievement of remedial objectives. Trend monitoring should:

i. include sampling and analysis to define a trend in groundwater, which may require a minimum of four (4) seasonal sampling events and four (4) synoptic water level measurement events of the same wells where statistical confidence is required;

ii. consider if it may be appropriate to sample every fifth quarter, upon approval from DER, where a site has been sampled quarterly for two years and the results do not show any significant contamination or changing trends. This change may allow the remedial party or site owner to evaluate the results of approximately annual sampling with the benefit of evaluating possible seasonal variations;

iii. plot and evaluate the analytical results to identify any trend in conditions and/or to illustrate that remedial action objectives have been met;

iv. consider sampling to establish a trend in surface water, soil, sediment, soil vapor and/or biota. For some sites, a statistical analysis of the data may be considered to establish or verify a

trend. Where required, any statistical analysis should be data-specific and the method used is to be approved by DER prior to data analysis; and

v. where appropriate, provide statistical reliability for biota tissue sampling(e.g., a minimum of five samples of the same species should be collected at each location).

(d) Monitoring work plan. The monitoring plan section of the SMP should include a work plan of a level of detail sufficient to gather the information required for the performance and effectiveness monitoring appropriate for any media to be sampled as part of site management.

1. A monitoring plan should include the:

i. identification of the sampling points;

ii. analytical method(s) protocol;

iii. qualifications of the laboratory;

iii. frequency of sampling;

iv. sample collection protocols;

v. sampling, reporting and quality assurance/quality control requirements pursuant to Chapter 2;

vi. process for reporting and addressing migration of contaminants to sentinel wells or other compliance monitoring points;

vii. protocols for modifying the plan by expanding or removing monitoring points; and

viii. protocols for determining when or if, the required monitoring of media subject to the plan may be terminated.

2. A HASP for the monitoring identified in paragraph 6.2.1(b)4 is required and is to be prepared in accordance with subdivision 1.9(c).

3. The monitoring plan should also include provision for:

i. the inspection and maintenance of groundwater monitoring wells, extraction wells or other permanent compliance monitoring points (e.g., soil vapor probes); and

ii. decommissioning of groundwater monitoring wells, extraction wells or other permanent compliance monitoring points, by the remedial party or site owner:

(1) when DER determines they are no longer necessary for monitoring the remedy; and

(2) in accordance with the procedures set forth in the applicable guidance, CP-43, *Commissioner Policy on Groundwater Monitoring Well Decommissioning*.

(e) Monitoring plan closeout. When the element(s) of the remedial program which require implementation of the monitoring plan is/are no longer required, the SMP can be revised to eliminate the monitoring plan, with DER approval.

6.2.3 Operation and Maintenance Plan

(a) General. The operation and maintenance (O&M) plan of the SMP is applicable when it is necessary to operate and maintain any mechanical or physical components of the remedial program. Such components of the remedial program include: air, groundwater, soil and/or water treatment systems; groundwater or leachate collection and/or extraction systems; gas venting/treatment systems and soil vapor intrusion mitigation measures or other components of the remedial system, including engineered caps and soil covers.

1. An O&M plan:

i. should be developed in accordance with the work plan required by sections 5.2 or 5.3 during the implementation of the remedy; and

ii. may include an O&M manual if proposed by the remedial party/site owner, or required by DER, in accordance with paragraph 3 below, for use by the operator of the treatment, containment, collection or recovery system required by the site remedy. This is generally used where there are complex remedial components.

2. The O&M plan should:

i. be a sufficiently complete description of the steps necessary to allow individuals unfamiliar with the site to operate and maintain the mechanical and physical components of the remedy for the site, including an O&M manual as needed;

ii. include information on considerations for optimization of the systems, in accordance with paragraph 6.4(b)2;

iii. require the collection of data to allow:

(1) the calculation and reporting of contaminant mass recovered, treated, or destroyed by the operating system(s); and/or
(2) to document and report that the system(s) is/are achieving the design performance standards;

iv. include provision for periodic updating during use, to reflect:

(1) changes in site conditions;
(2) the manner in which the remedy is operated and maintained; and/or
(3) optimization or other changes to the system(s); and

v. incorporate the relevant portions of other documents, such as:

(1) manufacturer operation and maintenance manuals, including instructions for operating and maintaining the equipment, equipment catalog-cuts and/or any component- or process-

specific special procedures

(2) specifications from the contract documents, shop drawing or "as built" drawings, pursuant to paragraph 5.8 (b) 8.; and

(3) any applicable requirements of federal, state and local regulations (e.g., building or fire codes, utility requirements).

3. DER may require an O&M manual be developed for a site in the following cases:

i. when the remedy is of sufficient scale and complexity, where it is determined necessary by either DER, the remedial party or site owner to have a document with the level of detail identified in paragraph 2 above;

ii. if a significant number of the documents identified in subparagraph (a)2.v above are necessary for the operation and/or maintenance of equipment located at the site; or

iii. where DER determines a contingency plan is necessary which describes procedures to be conducted in the event of an emergency (e.g., a fire, spill, tank, drum overflow or rupture, severe weather or vandalism) to protect and/or maintain the operation of the remedy.

4. A HASP for the O&M plan is required as identified in paragraph 6.2.1(b)4 and is to be prepared in accordance with subdivision 1.9(c).

(b) O&M plan closeout. When DER determines that element(s) of the remedial program which require the implementation of the O&M plan are no longer required, the SMP can be revised to eliminate the O&M plan.

6.3 Periodic Review

(a) Periodic review. Site management activities will be reported, and the necessary IC/EC certification will be provided on a periodic basis, in a periodic review report (PRR) prepared in accordance with subdivision (b) below.

1. The initial periodic review will be conducted no more than 18 months after issuance of the certificate of completion or closure letter.

2. Subsequent periodic reviews will be annually, unless a different certification period is approved by DER and set forth in the approval letter for the latest periodic review.

3. Only one IC/EC certification is to be filed per site. If the site comprises multiple properties or parcels and/or multiple owners, the remedial parties/owners shall arrange for one PRR and one certification.

4. Evaluation of records and reporting. The PRR is to provide the information necessary to document the basis for the IC/EC certification. To the extent applicable, the site monitoring data, as well as results of the inspections, should be evaluated as part of the periodic review to confirm that:

i. engineering controls, including necessary treatment or mitigation systems and associated institutional controls are in place, are performing properly and remain effective;

ii. the monitoring plan is being implemented;

iii. operation and maintenance activities are being conducted properly; and

iv. based on this review, the remedy continues to be protective of public health and the environment and is compliant with the decision document.

5. Recommendations for the continued need for an EC or IC. The periodic review should evaluate the data gathered to determine whether all ECs and/or ICs identified for the site remain necessary for the continued effectiveness and protectiveness of the remedy. Such changes can only be requested and approved in the context of a periodic review, as follows:

i. any recommendations for discontinuing any element of the SMP, an EC or the continued need for an IC and the basis for the recommendation are documented in the PRR;

ii. if the recommendation is accepted by DER, the next IC/EC certification will be modified to reflect the accepted change; and

iii. if accepted by DER, the SMP is to be updated by the addition of an errata sheet(s) to reflect the change, the reason for the change and the date of DER's acceptance.

6. Inability to provide a periodic certification. In the event that a periodic certification cannot be provided due to a failure of one or more of the institutional and/or engineering controls, or other condition to be certified,, the remedial party will provide DER with the following:

i. timely notification explaining the cause for such failure;

ii. a work plan to implement corrective measures necessary to enable the certification to be made; and

iii. a schedule for implementing the DER-approved corrective measures work plan and for submission of the revised PRR with the required certification.

7. Corrective measures. Corrective measures shall be implemented in accordance with the DER-approved work plan, and upon completion:

i. the periodic certification meeting the requirements of subdivision 6.3(d) shall be submitted by the remedial party; or

ii. where the certification still cannot be made, DER may:

(1) direct that additional corrective measures be proposed in accordance with paragraph 6 above, and implemented in accordance with this paragraph; or

(2) revoke the certificate of completion, release or closure letter issued by DEC, due to this non-conformance/failure of the IC/ECs.

(b) Periodic review report. A PRR is to be prepared for the certification period which summarizes compliance with the SMP, i.e., the IC/EC, monitoring and O&M plans, based on the inspections in conducted in accordance with paragraph 6.1(c)1 and the periodic review detailed in subdivision (a)

above.

1. The PRR is to be submitted at least 45 days prior to the date of the end of the certification period, as determined by DER, and is to include the required IC/EC certification.

2. The PRR must summarize and document an evaluation of all site-related data to support the required elements of the certification identified by subdivision (d) below, and include:

i. the performance and effectiveness of the remedy, including of all treatment units, etc., including identification of any needed repairs or modifications;

ii. any new conclusions or observations regarding the site contamination based on inspections or data generated by the implementation of the site monitoring plan for the media being monitored; and

iii. recommendations regarding any necessary changes to the remedy and/or monitoring or O&M plans.

3. Where applicable, the PRR must summarize the data and/or information collected in compliance with the following:

i. any discharge monitoring data for the certification period with relevant comments and conclusions:

(1) for a SPDES or air permit, reports are to be submitted to DER as stated in the permit requirements, or
(2) if a permit was not required, equivalent discharge monitoring reports are to be submitted to DER;

ii. comments, conclusions and recommendations based on an engineering evaluation of the information included in the report must be prepared by a professional engineer in accordance with section 1.5, where engineering controls, that are components of the remedy, may require such analysis; and

iii. comments, conclusions and recommendations based on an evaluation of the information in the report where institutional controls exist, prepared by a qualified person pursuant to subdivision 1.5.

4. Where the O&M plan identifies the need for monthly, quarterly or biannual reports of performance monitoring, the PRR should include and summarize the following:

i. a description of the on-line performance of the treatment system(s), if present, which includes the:

(1) number of days the system was run for the reporting period, or percentage of run time for the reporting period if the system is to operate continuously;
(2) volume processed per time period and the cumulative total processed for the reporting period; and
(3) average, high and low flows per day;

ii. the mass of contaminants removed, or removed by each system (e.g., SVE systems, air-sparging systems, or groundwater treatment systems);

iii. a description of routine maintenance and inspection forms;

iv. a description of breakdowns and/or repairs, with an explanation for any significant downtime;

v. a summary of the performance monitoring conducted;

vi. any optimization performed, in accordance with paragraph 6.4(b)2 above;

vii. comments, conclusions and recommendations based on an evaluation and resolution of performance problems; and

viii. all field data (e.g., vacuum and pressure readings, PID readings).

5. A PRR must include a figure showing:

i. sampling and well locations, with tabulated significant analytical values at sampling locations, where effectiveness monitoring is performed;

ii. groundwater plume contours and flow directions; and/or

iii. the area of influence/radius of capture of a treatment system.

6. A PRR must document a change of use, as set forth in paragraph 6.2.1(c)2 and/or a property transfer, as set forth in subdivision 6.2.1(c)

7. A PRR should include any recommendations for modification to the ECs or ICs as set forth in paragraph (a)5 above.

8. The PRR must include cumulative data summary tables and/or graphical representations of contaminants of concern, as follows:

i. include a general listing of all compounds analyzed for, along with the applicable standards; and

ii. provide by sampling point, only those compounds detected, with the minimum reporting and detection limits noted.

9. The results of all analyses, copies of all laboratory data sheets and the required laboratory data deliverables, pursuant to sections 2.2 and 2.3 and Appendix 2B, must be submitted electronically upon the request of DER. This backup data is not to be included in the PRR or as an appendix to the PRR.

10. All inspection reports generated during the period are to be provided electronically.

11. Electronic submissions. The PRR and any required reports and/or documentation must be provided in an electronic format in accordance with section 1.15, using template(s) which may be available on DEC's website identified in the table of contents.

(c) Person providing the IC/EC certification. The PRR documents the basis for the person identified by this subdivision to provide the necessary IC/EC certification for the site.

1. The person responsible for preparing and certifying a PRR can be a qualified environmental professional (QEP), as defined in paragraph 1.3(b)49, unless:

i. an engineering evaluation of monitoring or operational data is necessary to certify the effectiveness of an engineering control; hence a P.E. certification is required. For instance, the certification that a soil cover or site cap remains effective by inspection could be provided by a QEP, while an engineering evaluation of settlement measurements for a composite cap to determine whether a liner may be breached would require a professional engineer's certification; or

ii. the reevaluation of design parameters or a redesign of an engineering control is necessary based on review of the data, before the certification can be made; therefore a P.E. certification is required.. For instance, certification of a system's effective operation based on monitoring data, such as manometer readings supporting a vacuum created by a sub-slab depressurization system, could be certified by a QEP, while an analysis of data or redesign of a system in response to a finding that it was not effective would require an engineering evaluation and certification by a professional engineer.

2. When the engineering controls and/or monitoring components of a remedy are no longer required and the certification relates solely to land or groundwater use restrictions, the certification may be made by a QEP or, alternatively, the site property owner may certify in instances where the certification relates solely to land or groundwater use restrictions.

(d) The institutional control and engineering control (IC/EC) certification for a site is provided in the PRR. The certification is made after an evaluation of the ability of the plans developed in accordance with section 6.2 to maintain the continued effectiveness of the institutional and/or engineering controls for the site.

1. The IC/EC certification is to be in the forms provided in paragraphs 1.5(b)5 or 6, submitted and certified as set forth in 6 NYCRR 375-1.8(h)(3)(i). The person certifying will depend upon the scope of the IC/ECs subject to the certification. Additional guidance regarding the appropriate certifying person is provided in Table 1.5.

2. The IC/EC certification must identify any IC/ECs required by the remedy and certify that:

i. any inspection of the site to confirm the effectiveness of the institutional controls and/or applicable engineering controls required by the remedial program was performed under the direction of the person making the certification;

ii. the IC/ECs employed are unchanged from the previous certification and:

(1) are in place and effective;
(2) are performing as designed; and

(3) nothing has occurred that would impair the ability of the controls to protect the public health and environment.

iii. nothing has occurred that would constitute a violation or failure to comply with any SMP for such controls;

iv. access continues to be available to the site to evaluate such controls;

v. the PRR and all attachments (or the inspections/evaluations necessary to make this certification) were prepared under the direction of, and reviewed by, the person making the certification;

vi. to the best of their knowledge and belief, the work and conclusions described in the certification are in accordance with the requirements of the site remedial program; and

vii. the information presented is accurate and complete.

3. For a site where a financial assurance mechanism is required, the PRR should include an evaluation of the mechanism to assure that it remains valid and sufficient for its intended purpose, to support the certification provide in paragraph 1.5(b)5.

4. For BCP sites that DER has determined do not constitute a significant threat but where contaminants in groundwater contravene drinking water standards at the site border, in accordance with 6 NYCRR 375-3.8(h)2, the PRR will also evaluate groundwater conditions. The IC/EC certification for such sites will also:

i. certify that no new information has come to the remedial party/site owner`s attention, since the last certification, to indicate that the assumptions made in the qualitative exposure assessment of offsite contamination are no longer valid. This includes data from groundwater monitoring wells located at the site boundary if any; and

ii. every five years, in addition to certifying the information in subparagraph i above, also certify that the assumptions made in the qualitative exposure assessment remain valid.

5. When IC’s and EC’s are no longer necessary, DEC may terminate the need to provide the certification in paragraph 4 above:

i. upon a request in writing to DEC with documentation to support such request; and

ii. after notice to the site contact list and a public comment period of 30 days.

6.4 Remedial Process Closure Requirements

(a) A remedial process is considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. When this occurs, the remedial party or site owner may by the submission of a PRR, in accordance with paragraph 6.3(a)5, propose that a treatment system be shut down and/or monitoring of a groundwater and/or soil vapor plume can be terminated.

1. System closure is initiated when the remedial action objectives for the site, including compliance with SCGs, have been satisfactorily achieved. If compounds without applicable SCGs are identified, they would be evaluated on a case-by-case basis.

2. Dependent on site-specific considerations, site closure may be initiated before the SCGs have been met, with prior DER approval, when it can be demonstrated, as appropriate for the site contaminants that:

i. the remedy has achieved the bulk reduction of groundwater contamination, as set forth in subdivision 4.1(d); and

ii. it would not be feasible to continue operation of the remedy, provided:

(1) the remedy has been properly implemented;
(2) it has been optimized to its fullest extent; and
(3) it could not be otherwise modified to improve or achieve the required performance; and

iii. in no case should site closure be considered if the site remains a threat to public health and the environment or it will create a public health exposure or environmental impact, unless the human exposure or environmental impact can be mitigated by another means.

3. Remedial process closure requirements are included in this section for the following:

i. remedial groundwater treatment systems in subdivision (b) below;

ii. monitored natural attenuation in subdivision (c) below;

iii. plume management monitoring in subdivision (d) below; and

iv. drinking water treatment systems in subdivision (e) below.

4. Mitigation or monitoring actions associated with soil vapor intrusion (e.g., sub-slab depressurization systems) may also be undertaken in accordance with the or the most recent NYSDOH guidance document, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006) or the most current version with appropriate updates.

5. Closure of one element of the remedial program does not relieve the remedial party or site owner of its obligations to continue site management for other engineering and/or institutional controls, or other SMP obligations.

(b) Shutdown of groundwater treatment systems. A groundwater treatment system can be shut down when it is determined that the RAOs have been met, or that continued operation of a remedial treatment system is no longer effective and the system has achieved a bulk reduction in contamination. Groundwater treatment systems addressed in this subdivision include both systems designed to treat contaminated groundwater and systems to treat soil contamination which is the source of groundwater contamination (see clause (b)2.ii.(2) below).

1. Operation of the system has reached asymptotic removal rates. The need for continued system operation may be evaluated after reaching level asymptotic removal rates. Continued operation and pulsing of the system for a period of time prior to any proposal must confirm that asymptotic groundwater conditions have resulted from the treatment.

2. Shutdown of a system with no specified shutdown criteria. If the remedy has not incorporated specific shutdown criteria for the remedial system, the following methodology is recommended to evaluate whether permanent system shut down conditions have been reached, as follows when:

i. operational data indicates that a remedial system has reached asymptotic removal rates, as discussed in paragraph 1 above, the system should be pulsed (i.e., cycled on and off) for a specified period. Additional data is to be collected to evaluate how the period of inactivity has impacted contaminant concentrations [for example, how does the data compare to pre-shut down conditions, and how did the system react when restarted?]:

(1) an increase in concentrations when the remedial treatment system is re-started indicates that the system may continue to be effective in removing contaminants using a pulsing schedule;

(2) if the post-shutdown removal concentrations are the same as the pre-shutdown concentrations, then the system can be considered to no longer be removing a significant level of contaminants, and it may be appropriate for DER to consider shutdown of the system;

(3) a decrease in contaminant levels in adjacent groundwater monitoring wells during shutdown may also correlate to decreasing levels in the surrounding saturated contaminated soils. This may also be considered by DER in justifying remedial system shutdown; and

(4) decreases in soil vapor concentrations;

ii. the mass of contaminant(s) extracted over time and the groundwater monitoring data are graphically recorded to illustrate the effectiveness of system operation and the influence of pulsing on the system:

(1) a minimum of eight groundwater approved data sets are typically necessary to statistically demonstrate within 95% confidence limits that asymptotic conditions have been reached. Alternative non-parametric statistical tests may be proposed. DER will determine the acceptability of such tests on a case-by-case basis; and

(2) generally, a system treating soil impacting groundwater will not be shut down until:

(A) the contaminant levels in soil samples are near or below the soil cleanup objectives for the protection of groundwater;

(B) groundwater standards have been met at the property line(s); and

(C) contamination levels beyond the site property boundary(s) will no longer be at levels which threaten public health and the environment;

iii. when system performance has reached asymptotic conditions, in accordance with subparagraphs i and ii above, soil samples are to be collected from borings or test pits placed at the source area and/or the property boundaries, as approved by DER, and compared to applicable soil clean-up levels; and

iv. when the treatment system has been operating for its anticipated duration, the remedial action objectives are not met and optimization does not improve system success, an evaluation of alternatives, in accordance with subdivision 4.3(a) should be performed to evaluate possible remedial alternatives to meet RAOs, which may conclude in a justification of no further action.

3. Request for shutdown of a remedial system. The remedial party or site owner may request approval from DER prior to the shut down all or a portion of a remedial treatment system. A request to shut down a system:

i. may be considered when:

(1) the applicable RAOs have been achieved;
(2) it is determined that contaminated groundwater can be discharged without further treatment;
(3) there is no significant downgradient impact, and further groundwater treatment is not necessary; or
(4) there is a report detailing the basis for permanent system shutdown that includes all soil, vapor and groundwater data and pulsing information generated by the above evaluation; and

ii. when undertaking studies to support such report in accordance with subparagraph i above:

(1) DER is to be notified when sampling of the media subject to treatment will occur, with DER provided the opportunity to obtain (a) duplicate sample(s) for independent analysis; and
(2) approval for a permanent system shutdown will only be provided when DER has determined that shutdown conditions have been demonstrated.

4. Considerations for shutdown of a system. It is not appropriate to consider shutting down a system used to control contaminant groundwater plume migration (containment versus remediation), human exposures (e.g., soil vapor intrusion) or environmental impacts based on performance data alone. An understanding of site-specific contaminant fate and transport relative to sensitive receptors is essential for this type of determination.

(c) Monitored Natural Attenuation. The determination that MNA will achieve the remedial goals for the site in a manner that is fully protective of all identified receptors, and that monitoring can be terminated, is to be made in accordance with this subdivision.

1. Continued monitoring/remedial action is required if, based upon the analysis of monitoring data collected in accordance with paragraph 6.2.2(c)4:

i. contaminant levels in the sentinel well exceed the applicable SCGs;

ii. the plume length is shown to be increasing;

iii. contaminant levels for individual contaminants are not decreasing in monitoring well(s) in any area of concern identified for the site; or

iv. sensitive receptors not previously identified are threatened.

2. Proposals to sample the monitoring wells at a decreased frequency for the purpose of monitoring the effectiveness of the remedy may be included in the PRR, in accordance with paragraph 6.3(a)5, and will be considered by DER where:

i. contaminant levels in the sentinel well do not exceed the applicable RAOs at any time during the monitoring program;

ii. contaminant levels detected in the plume or monitoring wells at the edge of the plume are reflective of the contaminant levels predicted by the groundwater flow/contaminant transport model;

iii. contaminant levels above the applicable RAOs remain, but a decreasing trend in the levels is demonstrated in the area of concern monitoring well(s). The decreasing trend should be demonstrated by a DER-approved statistical evaluation which should be applied to each of the individual contaminants detected in each monitoring well; and

iv. groundwater sample data is not averaged for the purpose of statistical validation.

3. Proposals for no further monitoring of the groundwater, may be included in the PRR in accordance with paragraph 6.3(a)5, if:

i. contaminant levels in the sentinel well(s) do not exceed the applicable RAOs at any time during the monitoring program. The sentinel well is a well or wells down gradient from the plume, which act(s) as an early detection for the leading edge of the plume from the site being monitored. This presumes that contaminants transported by groundwater have had sufficient time to reach the well, allowing for sorptive retardation and other hydrogeological processes that may have slowed their migration. A proposal regarding the duration of the monitoring program at the sentinel well made by the remedial party/site owner must be based upon site-specific data;

ii. the contaminant plume length has been demonstrated to be stable or shrinking by groundwater monitoring. This requires concentration versus distance trend analysis with either suitable statistical validation or site-specific information for all identified contaminants of concerns; or

iii. the contaminant concentrations along the centerline of the plume have been demonstrated to be decreasing over time by groundwater monitoring. This requires:

(1) concentration versus time trend analysis, with suitable statistical validation, for all identified contaminants of concern and a demonstration that groundwater standards are met before reaching the point of compliance identified for the site; and

(2) a reliable location of the center line of the plume, as such several multi-level profiles on a transect may be required.

4. A determination in accordance with paragraph 6.3(a)5, that the monitoring detailed in paragraph 6.2.2(c)2 in support of an MNA remedy may be discontinued, does not end any continuing obligation for:

i. monitoring of the groundwater plume or other environmental media pursuant to the SMP;

ii. mitigation and monitoring actions to address exposures related to soil vapor intrusion or POET systems installed in the area of the plume; and/or

iii. other actions that may be required by the SMP to address human exposures or environmental impacts.

(d) Plume Management Monitoring. PMM is typically reserved for contaminant plumes for which no feasible remedial option has yet been identified, where hydraulic control of a groundwater plume is not a feasible option and where the leading edge of a plume is not attenuating in a timely manner and continues to expand.

1. A PMM remedy tracks a plume to the ultimate point of discharge (e.g., a water body) based upon fate and transport modeling and an extensive monitoring well network to determine whether:

i. given enough time and distance, the plume may attenuate by dilution and dispersion and reach apparent stability; and

ii. should stability be confirmed, in accordance with subparagraph 6.4(d)2.i, the PMM approach may be terminated and an MNA evaluation initiated.

2. A proposal, in accordance with paragraph 6.3(a)5, to discontinue PMM is only appropriate under the following circumstances:

i. no further monitoring may be required:

(1) if it has been satisfactorily demonstrated that the contaminant plume is discharging into a body of water with sufficient assimilative capacity to ensure that there is no contravention of surface water standards, threat to fish and wildlife resources, or threat to human health and the environment;

(2) if it has been satisfactorily demonstrated that the plume has reached a stable length beyond which it is incapable of impacting the receptors identified in the decision document. This condition should be demonstrated with a statistically valid and properly calibrated contaminant fate and transport model; or

(3) an MNA exit strategy in accordance with paragraph 6.2.2(c)3 can be evaluated once stability is confirmed; and

ii. the decision that a plume management strategy is no longer acceptable and another remedy is required may occur under the following circumstances:

(1) the predictive model cannot be verified or calibrated with the field data from the monitoring well network;

(2) field data indicates that there is a threat to a receptor identified in the decision document;

(3) a receptor not previously identified is threatened;

(4) the contaminant has degraded to daughter products which threaten a receptor;
(5) an implementable remedy not previously available is identified; or
(6) if monitoring indicates another remedy should be considered, an evaluation of alternatives consistent with subdivision 4.3(a) should be conducted which should evaluate possible remedial alternative(s) to obtain the site RAOs and may conclude with a justification of no further action.

3. A determination, in accordance with paragraph 6.3(a)5, that the monitoring detailed in subdivision 6.2.2(c)3 in support of an PMM remedy may be discontinued does not end:

i. monitoring of the groundwater plume or other environmental media pursuant to the SMP;

ii. mitigation and monitoring actions to address exposures related to soil vapor intrusion SVI or POET systems installed in the area of the plume; and/or

iii. other actions that may be required by the SMP to address human exposures or environmental impacts.

(e) Drinking Water Treatment Systems. The determination that continued operation of a drinking water treatment system is no longer necessary to provide potable water, and the system can be shut down, is based upon the evaluation of system performance set forth in this subdivision and applicable DER guidance. (e.g., DER 24 - *Assistance for Contaminated Water Supplies*).

1. Operation of water treatment systems installed in response to actual or potential contamination of a drinking water supply may be terminated or removed when one or more of the following has/have been achieved:

i. an alternative potable water supply is provided;

ii. the remedial party/site owner has:

(1) identified the source of the contamination;
(2) accurately and completely delineated, with respect to the impacted water supply, the location and direction of the contaminant plume as being away from the treatment systems; and
(3) addressed the source of the contamination with an appropriate remedial action; or

iii. contaminant concentrations in the water supply influent:

(1) remain at or below drinking water standards for four consecutive quarters;
(2) followed by concentrations at or below 50% of the state drinking water standards for four additional consecutive quarters; and
(3) no taste and/or odors are attributable to the site contamination.

2. Sampling frequency and/or duration, in subparagraph (e)1.iii above can be reduced or extended, subject to local regulations, with the approval of DER.

3. The remedial party must provide the request for shut down or removal in writing to DER. The request should include all appropriate documentation supporting a decision for shut down or removal based on one or more of the criteria identified in paragraph (e)1 above.

6.5 Site Closeout

(a) Site closeout occurs when all investigation and/or remediation required for the remedial program has been completed and the institutional and engineering controls are no longer required.

1. The remedial party or the site owner may petition DER, or DER can independently initiate site closeout.

2. Site closeout may be initiated when the conditions of section 6.4 have been met for all remedial processes, including:

i. groundwater treatment systems in accordance with subdivision 6.4(b);

ii. MNA in accordance with subdivision 6.4(c);

iii. PMM in accordance with subdivision 6.4(d);

iv. drinking water treatment in accordance with subdivision 6.4(e);

v. soil vapor intrusion mitigation measures in accordance with the most recent NYSDOH guidance; and

vi. other monitoring or maintenance not listed above has been completed as necessary, on a case-by-case basis.

(b) Final periodic review report. When the conditions noted in subdivision (a) above have been met, site closeout is documented by preparation of the final PRR, in accordance with 6.3(a)5.

1. The final PRR must include sufficient data tables and graphs to illustrate that the requirements of section 6.4 have been satisfied.

2. Site closeout may proceed when it has been determined by DER, in accordance with subdivision 6.3(a)5, that all institutional and/or engineering controls identified for the site are no longer necessary.

3. Upon DER approval of the final PRR, the remedial process can be discontinued, the environmental easement extinguished or deed restrictions removed and the site closed out.

4. Electronic submissions. The final PRR and all other required reports and/or documentation identified by this section must be provided in an electronic format in accordance with section 1.15.

DER-10 Appendices

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 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 techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/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 PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

Appendix 1C
DEC Permits Subject to Exemption

In accordance with section 1.10, exemptions from the following permit programs may be granted to the person responsible for conducting the remedial programs undertaken pursuant to section 1.2:

Air - Title 5 permits
Air - State permits
Air - Registrations
Ballast Discharge
Chemical Control
Coastal Erosion Hazard Areas
Construction of Hazardous Waste Management Facilities
Construction of Solid Waste Management Facilities
Dams
Excavation and Fill in Navigatable Waters (Article 15)
Flood Hazard Area Development
Freshwater Wetland
Hazardous Waste
Long Island Wells
Mined Land Reclamation
Navigation Law - Docks
Navigation Law - Floating Objects
Navigation Law - Marinas
Non-Industrial Waste Transport
Operation of Solid Waste Management Facilities
Operation of Hazardous Waste Management Facilities
State Pollution Discharge Elimination Systems (SPDES)
Stream Disturbance
Tidal Wetlands
Water Quality Certification
Water Supply
Wild, Scenic and Recreational Rivers

Appendix 2A
The Role of Field-Testing Technologies in Site Investigation and Remediation

Purpose

This Appendix identifies the role of field-testing technologies in the investigation and remediation of contaminated sites and the conditions under which the data generated by the field testing method may be used to make project decisions. While DER encourages the use field-testing technologies, data upon which decisions impacting human health are based must be confirmed by a laboratory certified by the New York State Department of Health (NYSDOH) to analyze environmental samples.

Background

Section 502.2 of the Public Health Law requires the use of accredited laboratories for the analysis of all environmental samples in New York. Laboratories meet requirements in a specific analytical method can become accredited for that method through NYSDOH's Environmental Laboratory Accreditation Program (ELAP). Although field-testing technologies have not been approved through the ELAP, NYSDOH acknowledges the need and benefit of the use of such field-testing technologies in conjunction with ELAP-certified methods.

For purposes of this Appendix, a field-testing technology means any field-deployable tool or technique that provides real-time or near real-time environmental data. Examples include immunoassay or other colorimetric test kits, portable gas chromatography with any of a variety of detectors, x-ray fluorescence analyzers, and direct-sensing, down-hole devices such as the membrane interface probe. Quick turn-around analysis using a modified analytical method at a fixed or mobile laboratory is also considered to be a field-testing technology, unless the laboratory is ELAP-accredited to analyze samples by that method.

Why is the use of field-testing technologies beneficial?

Use of field-testing technologies by skilled technicians, in conjunction with rapid data interpretation and analysis by the project management team, can improve confidence in project decisions while significantly reducing the costs and time needed to investigate and remediate sites. Real-time measurements using field-testing technologies are generally less-expensive and quicker (on a per sample basis) than comparable laboratory analyses, making it feasible to increase the sampling density and improve sample representativeness. More timely and cost-effective decision-making can also result in a site being fully-characterized in one deployment while the sampling team is still mobilized instead of conducting the investigation in several phases over a longer period of time.

Use of field-testing technologies, in conjunction with field-based decision-making, also expedites the preliminary identification of "clean areas" and facilitates the collection of appropriate confirmation and documentation samples from optimal locations for analysis by an ELAP-certified laboratory. Accuracy is increased by ensuring that the right samples are collected in the right locations. Precision is maintained through the analysis of quality control (QC) samples specific to the field-testing technology or method.

Despite these benefits, it is important to recognize the analytical uncertainty and limitations of these methods and that they generally produce data of lower analytical quality than fixed-based laboratories. Some of these field-based methods are not analyte-specific or are only able to provide semi-quantitative data due to relatively high detection limits. The primary benefits of using field-testing technologies are to hasten the site investigative process and improve sample representativeness. Any remaining analytical uncertainty must be managed using ELAP-accredited laboratory analyses.

How should field-testing technologies be used as part of expedited site investigation or the Triad Approach?

The use of field-testing technologies is one part of an expedited site characterization process. This process has also been called the Triad Approach. It combines systematic project planning, dynamic work strategies, and the use of field-testing technologies. Systematic project planning ensures that the goals for the characterization are known prior to the start of the project. A dynamic work strategy allows experienced members of the field team to modify site activities based on results of prior sampling on a near real-time basis. The use of field-testing technologies allows for the generation, review, and interpretation of real-time (or near real-time) data in the field and the continuation of sampling until the investigation objectives are met.

Using the Triad Approach, decisions on where to sample next are based on an evolving conceptual site model that is constantly being updated with data generated in the field. By increasing the number of samples and attaining a higher spatial density, errors attributed to sample representativeness are reduced. Because of the analytical uncertainty inherent in these technologies, the recommended approach is to use field-testing technologies and ELAP-accredited laboratory analyses in a collaborative effort that accounts for both their strengths and weaknesses to improve overall data quality and confidence in decision-making.

What are the requirements for the use of field-testing technologies?

All QC measures specified by the testing method and by the regulatory agencies must be followed to demonstrate that the method is working properly. A standard operating procedure (SOP) must be included in the sampling plan that details the step-by-step procedures to follow and includes all quality assurance parameters (e.g., calibration standards, blanks, duplicates, and matrix spikes). Documentation on the field instruments and methodologies used should also be included that describes its maintenance history and record of calibrations as well as an assessment of the precision, accuracy, and false interferences associated with the test.

Equally as important as following the written procedures is assembling a field team with enough experience, and to select the appropriate test method for conditions specific to the site. Field-testing technologies should only be used by technicians or field analysts that have been documented as being trained and experienced in the use of the specific field-testing equipment. Personnel responsible for making field decisions should also have documented experience developing and refining conceptual site models and collecting representative samples in order to expedite the field investigation phase and improve the project team's understanding of the site. The project work plans therefore should also include the qualifications and training of the field technicians who will be collecting the samples and performing the tests as well as those of the project team leader responsible for making field decisions.

In order to assess the comparability of field-generated results to those of a fixed-based laboratory

(using the same or a different method), spilt samples should be collected and submitted to an ELAP-accredited laboratory for correlation analysis. The number of split samples required in order to demonstrate adequate correlation between field and laboratory results may vary depending on the accuracy of the field-testing technology used, the results of correlation studies at other sites, and media heterogeneity. As a rule, a minimum of ten percent (10%) of all field samples must be split and sent to an ELAP-accredited laboratory for correlation analysis. If less than ten samples are collected, then at least three split sample must be collected for correlation analysis. The correlation is generally considered acceptable if the field-testing results are within thirty relative percent difference (RPD) of the laboratory results. DEC ASP Category A deliverables are acceptable for these correlation samples. There should be no bias in correlation sample selection.

Based on Section 502 of the Public Health Law, data upon which decisions impacting human health are based must be confirmed by an ELAP-accredited laboratory, accordingly confirmation and documentation samples will require analysis by an ELAP-accredited laboratory. The laboratory should be requested to provide DEC ASP Category B deliverables for confirmation sample results. An associated Data Usability Summary Report (DUSR) must be prepared by a qualified and approved data validator and submitted along with the results.

Conclusion

The appropriate use of field-testing technology can lead to more cost-effective site investigation and will lead to sites being investigated and remediated more quickly. The key issues are the selection of the appropriate field method, deployment of the method by well-trained and experienced field personnel, and adherence to standard operating procedures and QC requirements appropriate to the field test method.

Appendix 2B
Guidance for Data Deliverables and the Development of
Data Usability Summary Reports

1.0 Data Deliverables

(a) DEC Analytical Services Protocol Category A Data Deliverables:

1. A Category A Data Deliverable as described in the most current DEC Analytical Services Protocol (ASP) includes:

i. a Sample Delivery Group Narrative;

ii. contract Lab Sample Information sheets;

iii. DEC Data Package Summary Forms;

iv. chain-of-custody forms; and,

v. test analyses results (including tentatively identified compounds for analysis of volatile and semi-volatile organic compounds)

2. For a DEC Category A Data Deliverable, a data applicability report may be requested, in which case it will be prepared, to the extent possible, in accordance with the DUSR guidance detailed below.

(b) DEC Analytical Services Protocol Category B Data Deliverables

1. A Category B Data Deliverable is includes the information provided for the Category A Data Deliverable, identified in subdivision (a) above, plus related QA/QC information and documentation consisting of:

i. calibration standards;

ii. surrogate recoveries;

iii. blank results;

iv. spike recoveries;

v. duplicate results;

vi. confirmation (lab check/QC) samples;

vii. internal standard area and retention time summary;

viii. chromatograms;

ix. raw data files; and

x. other specific information as described in the most current DEC ASP.

2. A DEC Category B Data Deliverable is required for the development of a Data Usability Summary Report (DUSR).

2.0 Data Usability Summary Reports (DUSRs)

(a) Background. The Data Usability Summary Report (DUSR) provides a thorough evaluation of analytical data with the primary objective to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use.

1. The development of the DUSR must be carried out by an experienced environmental scientist, such as the project Quality Assurance Officer, who is fully capable of conducting a full data validation. The DUSR is developed from:

i. a DEC ASP Category B Data Deliverable; or

ii. the *USEPA Contract Laboratory Program National Functional Data Validation Standard Operating Procedures for Data Evaluation and Validation*.

2. The DUSR and the data deliverables package will be reviewed by DER staff. If full third party data validation is found to be necessary (e.g. pending litigation) this can be carried out at a later date on the same data package used for the development of the DUSR.

(b) Personnel Requirements. The person preparing the DUSR must be pre-approved by DER. The person must submit their qualifications to DER documenting experience in analysis and data validation. Data validator qualifications are available on DEC's website identified in the table of contents.

(c) Preparation of a DUSR. The DUSR is developed by reviewing and evaluating the analytical data package. In order for the DUSR to be acceptable, during the course of this review the following questions applicable to the analysis being reviewed must be answered in the affirmative.

1. Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA CLP data deliverables?

2. Have all holding times been met?

3. Do all the QC data; blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?

4. Have all of the data been generated using established and agreed upon analytical protocols?

5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?

6. Have the correct data qualifiers been used and are they consistent with the most current DEC ASP?

7. Have any quality control (QC) exceedances been specifically noted in the DUSR and have the corresponding QC summary sheets from the data package been attached to the DUSR?

(d) Documenting the validation process in the DUSR. Once the data package has been reviewed and the above questions asked and answered the DUSR proceeds to describe the samples and the analytical parameters, including data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed.

Appendix 3A
Records Search Requirements

(a) The first phase of a site characterization (SC) should be a records search based on diligent inquiry. A phase 1 report, prepared prior to a site entering one of the DER remedial programs identified in section 1.2, may be provided in lieu of a records search report, provided it was prepared in accordance with applicable ASTM guidance for preparation of Phase 1 reports. A records search report should include the following:

1. Historical information concerning the site history should be part of the site assessment. Historical information is not required if the investigation is directed at either a specific discharge event (rather than a particular area of concern) or any underground tank or underground tank system unless directed by DEC. The site history should include an evaluation of the following to the extent available from diligent inquiry:

i. site history information from sources including, but not limited to, the following:

(1) Sanborn Fire Insurance Maps;
(2) MacRae's Industrial Directory;
(3) title and deed;
(4) site plans and facility as-built drawings;
(5) federal, State, county and local government offices; and
(6) DEC Geographic Information System;
(7) adjacent property uses

ii. the industrial/commercial site history from the time the site was naturally vegetated or utilized as farmland, including without limitation:

(1) names of all owners and operators;
(2) dates of ownership of each owner;
(3) dates of operation of each operator; and
(4) brief descriptions of the past industrial/commercial usage of the site by each owner and operator;

iii. all raw materials, finished products, formulations and hazardous substances, hazardous wastes, and petroleum products which are or were present on the site, including intermediates and by-products;

iv. present and past production processes, including dates, and their respective water use should be identified and evaluated, including ultimate and potential discharge and disposal points and how and where materials are or were received onsite (for example, rail, truck);

v. all former and current containers, container or bulk storage areas, above and below ground tanks, above and below ground waste and product delivery lines, surface impoundments, landfills, septic systems and other structures, vessels, conveyances or units that contain or previously contained hazardous substances, hazardous waste, and petroleum products, including:

(1) type;
(2) age;
(3) dimension of each container;
(4) location;
(5) chemical content;
(6) integrity (for example, tank test reports);
(7) volume;
(8) construction materials; and
(9) inventory control records to include records of leak detection system inspections, where there is no discharge history;

vi. an interpretation of the aerial photographic history of the site, based on available current and historical color, black and white and infrared aerial photographs (scale 1:17.,000 or less) of the site and surrounding area at a frequency which provides the evaluator with a historical perspective of site activities. The photographic history should date back to 1932 or to the earliest photograph available.

vii. any data or information concerning known discharges that have occurred on the site;

viii. remediation activities previously conducted or currently underway at the site including dates of previous discharges, remedial actions, and all existing sampling data concerning contaminants at the site. If a government agency was involved, the name of the lead government agency, case identification number, and current case status;

ix. all remedies previously approved by DEC in a remedial action work plan or decision document to determine if the remedy remains protective of human health and the environment;

x. all existing environmental sampling data concerning contaminants at the site;

xi. any known changes in site conditions or new information developed since completion of previous sampling or remediation;

xii. all Federal, State and local environmental permits including permits for all previous and current owners or operators, applied for or received, or both, for the site including the:

(1) name and address of permitting agency;
(2) reason for the permit;
(3) permit identification number;
(4) application date;
(5) date of approval, denial, or status of application;
(6) name and current address of all permittees;
(7) reason for denial, revocation or suspension if applicable; and
(8) permit expiration date;

xiii. all administrative, civil and criminal enforcement actions for alleged violations of environmental laws concerning the site, including:

(1) the name and address of agency that initiated the enforcement action;
(2) the date of the enforcement action;
(3) the section of statute, rule or permit allegedly violated;
(4) the type of enforcement action;
(5) a description of alleged violations;
(6) the resolution or status of violation and enforcement action; and
(7) a description of any potential environmental impact which may have resulted from the alleged violation; and

xiv. all areas where non-indigenous fill materials were used to replace soil or raise the topographic elevation of the site, including the dates of emplacement, where reasonably available, paying particular attention to potential areas of concern as identified in section 1.7.

2. The person conducting the records search should conduct a site visit to verify the findings in paragraph (a)1 above. Where site conditions are not already well known, appropriate monitoring instruments such as Organic Vapor Analyers (Photo Ionization Detectors, explosimeters), oxygen detectors and radiation detectors should be used to assure personal safety and assist with SC.

3. Interviews are to be utilized, where appropriate, taking into consideration the following factors relative to who to interview, how and when they should be conducted:

i. interviews with facility personnel (past and present), adjoining property owners, and persons familiar with past activities at the site can be useful in determining if and where hazardous waste/substances, or petroleum products were disposed of at the site and what exposure pathways are likely to be at risk. Information obtained during the interview process can supplement other means used in the investigation. However, if the information is crucial to the determination that hazardous waste/substances or petroleum products were disposed of at the site, the documentation outlined in 3.iv (below) is required;

ii. interviews may be conducted in person, by telephone, email or post;

iii. interviews may be conducted prior to, during or after the site reconnaissance, as convenient to the project manager;

iv. interviews must be documented with the date and signature of the person granting the interview. At the end of the interview the person should read and be asked then and there to sign and date the transcript. In cases where a telephone interview was conducted, the project manager should determine during that conversation if the person is willing to sign his/her statements. If so, the project manager will send a transcript to that person for signature thus verifying the conversation. In the case where the person interviewed is unwilling to sign a transcript, or the consultant, after making a reasonable effort (mailing a transcript with a follow-up letter requesting the return), is unable to obtain the person's signature on the transcript, then this statement should not be used or referenced in the report. The person's name, however should be listed in the references section of the report as being contacted during the investigation;

v. areas of inquiry should include the following:
(1) any pending or past litigation or administrative proceedings regarding hazardous waste/substances or petroleum products on the site;

(2) any notices from any government agency regarding any possible violation of environmental or safety laws;
(3) previous environmental assessments or audits;
(4) environmental permits or registrations;
(5) safety plans, prevention plans, control plans; and
(6) reports describing local hydrogeologic conditions;

vi. people to interview should include:

(1) pertinent DEC and NYSDOH staff;
(2) past owners, occupants and operators, key managers, former employees;
(3) site neighbors; and
(4) local officials, such as elected officials, attorneys, building inspectors; zoning board, planning board, as well as any fire police, health, engineering and environmental DECs; and

vii. evaluation of interview responses should include the following factors:

(1) degree of specificity;
(2) degree of interviewee's knowledge;
(3) degree of interviewee's good faith;
(4) completeness;
(5) documentation; and
(6) corroboration.

(b) The records search report is prepared in accordance with section 3.12.

Appendix 3B
New York State Department of Health
Qualitative Human Health Exposure Assessment

The overall purpose of the Qualitative Human Health Exposure Assessment (or the exposure assessment) is to evaluate and document how people might be exposed to site-related contaminants, and to identify and characterize the potentially exposed population(s) now and under the reasonably anticipated future use of the site. To evaluate if an exposure pathway exists, the exposure assessment must assess the quality, representativeness and adequacy of the available data. For instance, field data quality, laboratory data quality, and sampling designs need to be appropriate to meet data quality objectives (e.g., detection limits and minimum reporting limits must be appropriate for the evaluation of human exposures).

In addition, the qualitative exposure assessment must consider the nature of populations currently exposed or that have the potential to be exposed to site related contaminants both on- and off-site, and must describe the reasonably anticipated future land use of the site and affected off-site areas. To conduct this evaluation, in addition to collection of on-site data, some off-site field investigation to identify and sample any potential areas of contamination in support of the exposure assessment may be necessary.

At a minimum, the exposure assessment must evaluate the five elements associated with exposure pathways, and describe how each of these elements pertains to the site being evaluated. The exposure pathway elements that must be addressed, include:

(1) a description of the contaminant source(s) including the location of the contaminant release to the environment (any waste disposal area or point of discharge) or if the original source is unknown, the contaminated environmental medium (soil, indoor or outdoor air, biota, water) at the point of exposure;

(2) an explanation of the contaminant release and transport mechanisms to the exposed population;

(3) identification of all potential exposure point(s) where actual or potential human contact with a contaminated medium may occur;

(4) description(s) of the route(s) of exposure (i.e., ingestion, inhalation, dermal absorption); and

(5) a characterization of the receptor populations who may be exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway are documented; a potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway is not known. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and can reasonably be anticipated to never exist in the future.

Qualitative exposure assessments that are provided in work plans and reports should include the following summary table to provide an overview of the current and potential exposures for the specific site. Examples of how the assessments should be summarized are included in the table below.

Environmental Media & Exposure Route	Human Exposure Assessment (examples)
Direct contact with surface soils (and incidental ingestion)	• People are not coming into contact because contaminated surface soils are covered with…[pavement, vegetation, gravel, etc.]. • People are not coming into contact because public access …[to the site, to areas with contaminated surface soils]… is restricted by fencing. • People can come into contact if they trespass on the site.
Direct contact with subsurface soils (and incidental ingestion)	• People can come into contact if they complete ground-intrusive work at the site.
Ingestion of groundwater	• Contaminated groundwater is not being used for drinking water, as the area is served by the public water supply. • There are no known domestic water supply wells in the area. • Where needed, treatment systems have been put on private wells to eliminate exposures to concentrations above drinking water standards set for public water supplies. • The public water supply uses groundwater in the area as its source; however, the water is treated and tested by …[village/town/city/water company]… on a routine basis to verify that it meets drinking water standards prior to distribution to area consumers. • People can come into contact if private wells are installed on the property.
Direct contact with groundwater	• People can come into contact if they complete ground-intrusive work at the site.
Inhalation of air (exposures related to soil vapor intrusion)	• A ventilation system has been installed on the on-site building to prevent the indoor air quality from being affected by the contamination. • Ventilation systems have been installed on off-site buildings to prevent the indoor air quality from being affected by the contamination. • A monitoring program is being implemented at off-site buildings to verify that additional actions are not needed to address exposures related to soil vapor intrusion. • A soil vapor intrusion evaluation will be completed …[should the on-site building become reoccupied, if new construction is planned at the site in the future].
Other: [Examples: Direct contact and incidental ingestion of surface water, Direct contact with sediments, Consumption of fish]	• Anyone wading in the portion of the …[water body]… adjacent to the site can come into contact with …[contaminated sediments, surface water].

Appendix 3C Fish and Wildlife Resources Impact Analysis Decision Key	If YES Go to:	If NO Go to:
1. Is the site or area of concern a discharge or spill event?	13	2
2. Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas.	13	3
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?	4	9
4. Does the site contain habitat of an endangered, threatened or special concern species?	Section 3.10.1	5
5. Has the contamination gone off-site?	6	14
6. Is there any discharge or erosion of contamination to surface water or the potential for discharge or erosion of contamination?	7	14
7. Are the site contaminants PCBs, pesticides or other persistent, bioaccumulable substances?	Section 3.10.1	8
8. Does contamination exist at concentrations that could exceed ecological impact SCGs or be toxic to aquatic life if discharged to surface water?	Section 3.10.1	14
9. Does the site or any adjacent or downgradient property contain any of the following resources? i. Any endangered, threatened or special concern species or rare plants or their habitat ii. Any DEC designated significant habitats or rare NYS Ecological Communities iii. Tidal or freshwater wetlands iv. Stream, creek or river v. Pond, lake, lagoon vi. Drainage ditch or channel vii. Other surface water feature viii. Other marine or freshwater habitat ix. Forest x. Grassland or grassy field xi. Parkland or woodland xii. Shrubby area xiii. Urban wildlife habitat xiv. Other terrestrial habitat	11	10
10. Is the lack of resources due to the contamination?	3.10.1	14
11. Is the contamination a localized source which has not migrated and will not migrate from the source to impact any on-site or off-site resources?	14	12
12. Does the site have widespread surface soil contamination that is not confined under and around buildings or paved areas?	Section 3.10.1	12
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resource? (See #9 for list of potential resources. Contact DEC for information regarding endangered species.)	Section 3.10.1	14
14. No Fish and Wildlife Resources Impact Analysis needed.		

Appendix 4
FWRIA Part 3
Ecological Effects of Remedial Alternatives

(a) When developing and evaluating remedial alternatives, the following considerations should be incorporated into remedy selection, as appropriate.

1. Has the information collected in the FWRIA Part 1 and 2 been incorporated into the development of alternatives?

2. Have actual or potential adverse impacts to fish and wildlife resources been identified?

3. Have contaminants of ecological concern been identified?

4. Have remedial action objectives been established for the contaminants of ecological concern and the protection of the impacted resources?

5. Have ecologically based cleanup levels been identified and the alternatives evaluated in terms of the ability to meet ecologically based cleanup levels?

6. Have the alternatives been evaluated in terms of the expected reduction in the toxicity or bioaccumulation of contaminants?

7. If human health based or other SCGs are proposed as cleanup levels, will the adverse impacts to fish and wildlife resources be eliminated or adequately mitigated?

8. Have alternatives been evaluated in terms of contaminant-related impacts that would remain after implementation?

9. Does the recommended alternative eliminate or adequately mitigate the adverse impacts to fish and wildlife resources? If not, why not?

10. Have applicable resource related SCGs been identified?

11. Have the alternatives been evaluated in terms of the non-contaminant related effects such as temporary and/or permanent loss of, or damage to the resource during implementation?

12. Has the remedial alternative that best maintains or restores fish and wildlife resources been identified? Has an alternative been included that maximizes the acreage of habitat remediated?

13. Has the need for a post-remedial monitoring program (including biological monitoring) been identified? Is a conceptual monitoring program included which can evaluate the long term effectiveness of the remediation?

(b) The above will be incorporated into the remedy selection report for the site prepared in accordance with section 4.4.

Appendix 5
Allowable Constituent Levels for Imported Fill or Soil
Subdivision 5.4(e)

Source: This table is derived from soil cleanup objective (SCO) tables in 6 NYCRR 375. Table 375-6.8(a) is the source for unrestricted use and Table 375-6.8(b) is the source for restricted use.

Note: For constituents not included in this table, refer to the contaminant for supplemental soil cleanup objectives (SSCOs) in the Commissioner Policy on *Soil Cleanup Guidance*. If an SSCO is not provided for a constituent, contact the DER PM to determine a site-specific level.

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Metals					
Arsenic	13	16	16	16	13
Barium	350	350	400	400	433
Beryllium	7.2	14	47	47	10
Cadmium	2.5	2.5	4.3	7.5	4
Chromium, Hexavalent[1]	1 [3]	19	19	19	1 [3]
Chromium, Trivalent[1]	30	36	180	1500	41
Copper	50	270	270	270	50
Cyanide	27	27	27	27	NS
Lead	63	400	400	450	63
Manganese	1600	2000	2000	2000	1600
Mercury (total)	0.18	0.73	0.73	0.73	0.18
Nickel	30	130	130	130	30
Selenium	3.9	4	4	4	3.9
Silver	2	8.3	8.3	8.3	2
Zinc	109	2200	2480	2480	109
PCBs/Pesticides					
2,4,5-TP Acid (Silvex)	3.8	3.8	3.8	3.8	NS
4,4'-DDE	0.0033 [3]	1.8	8.9	17	0.0033 [3]
4,4'-DDT	0.0033 [3]	1.7	7.9	47	0.0033 [3]
4,4'-DDD	0.0033 [3]	2.6	13	14	0.0033 [3]
Aldrin	0.005	0.019	0.097	0.19	0.14
Alpha-BHC	0.02	0.02	0.02	0.02	0.04 [4]
Beta-BHC	0.036	0.072	0.09	0.09	0.6
Chlordane (alpha)	0.094	0.91	2.9	2.9	1.3
Delta-BHC	0.04	0.25	0.25	0.25	0.04 [4]
Dibenzofuran	7	14	59	210	NS
Dieldrin	0.005	0.039	0.1	0.1	0.006
Endosulfan I	2.4[2]	4.8	24	102	NS
Endosulfan II	2.4[2]	4.8	24	102	NS
Endosulfan sulfate	2.4[2]	4.8	24	200	NS
Endrin	0.014	0.06	0.06	0.06	0.014
Heptachlor	0.042	0.38	0.38	0.38	0.14
Lindane	0.1	0.1	0.1	0.1	6
Polychlorinated biphenyls	0.1	1	1	1	1

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Semi-volatile Organic Compounds					
Acenaphthene	20	98	98	98	20
Acenaphthylene	100	100	100	107	NS
Anthracene	100	100	100	500	NS
Benzo(a)anthracene	1	1	1	1	NS
Benzo(a)pyrene	1	1	1	1	2.6
Benzo(b)fluoranthene	1	1	1	1.7	NS
Benzo(g,h,i)perylene	100	100	100	500	NS
Benzo(k)fluoranthene	0.8	1	1.7	1.7	NS
Chrysene	1	1	1	1	NS
Dibenz(a,h)anthracene	0.33 [3]	0.33 [3]	0.33 [3]	0.56	NS
Fluoranthene	100	100	100	500	NS
Fluorene	30	100	100	386	30
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6	NS
m-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
Naphthalene	12	12	12	12	NS
o-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
p-Cresol(s)	0.33	0.33	0.33	0.33	NS
Pentachlorophenol	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]
Phenanthrene	100	100	100	500	NS
Phenol	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	30
Pyrene	100	100	100	500	NS
Volatile Organic Compounds					
1,1,1-Trichloroethane	0.68	0.68	0.68	0.68	NS
1,1-Dichloroethane	0.27	0.27	0.27	0.27	NS
1,1-Dichloroethene	0.33	0.33	0.33	0.33	NS
1,2-Dichlorobenzene	1.1	1.1	1.1	1.1	NS
1,2-Dichloroethane	0.02	0.02	0.02	0.02	10
1,2-Dichloroethene(cis)	0.25	0.25	0.25	0.25	NS
1,2-Dichloroethene(trans)	0.19	0.19	0.19	0.19	NS
1,3-Dichlorobenzene	2.4	2.4	2.4	2.4	NS
1,4-Dichlorobenzene	1.8	1.8	1.8	1.8	20
1,4-Dioxane	0.1 [3]	0.1 [3]	0.1 [3]	0.1 [3]	0.1
Acetone	0.05	0.05	0.05	0.05	2.2
Benzene	0.06	0.06	0.06	0.06	70
Butylbenzene	12	12	12	12	NS
Carbon tetrachloride	0.76	0.76	0.76	0.76	NS
Chlorobenzene	1.1	1.1	1.1	1.1	40
Chloroform	0.37	0.37	0.37	0.37	12
Ethylbenzene	1	1	1	1	NS
Hexachlorobenzene	0.33 [3]	0.33 [3]	1.2	3.2	NS
Methyl ethyl ketone	0.12	0.12	0.12	0.12	100
Methyl tert-butyl ether	0.93	0.93	0.93	0.93	NS
Methylene chloride	0.05	0.05	0.05	0.05	12

Volatile Organic Compounds (continued)					
Propylbenzene-n	3.9	3.9	3.9	3.9	NS
Sec-Butylbenzene	11	11	11	11	NS
Tert-Butylbenzene	5.9	5.9	5.9	5.9	NS
Tetrachloroethene	1.3	1.3	1.3	1.3	2
Toluene	0.7	0.7	0.7	0.7	36
Trichloroethene	0.47	0.47	0.47	0.47	2
Trimethylbenzene-1,2,4	3.6	3.6	3.6	3.6	NS
Trimethylbenzene-1,3,5	8.4	8.4	8.4	8.4	NS
Vinyl chloride	0.02	0.02	0.02	0.02	NS
Xylene (mixed)	0.26	1.6	1.6	1.6	0.26

All concentrations are in parts per million (ppm)
NS = Not Specified

Footnotes:
[1] The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.
[2] The SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.
[3] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.
[4] This SCO is derived from data on mixed isomers of BHC.