

**REMEDIAL ACTION WORK PLAN – PHASE 2  
FORMER UNDERGROUND STORAGE TANK AREA**

**BROWNFIELD CLEANUP PROGRAM  
NYSDEC SITE ID C828130  
118 PETTEN STREET  
ROCHESTER, NEW YORK**

Prepared For: Genesee Marina, Inc.  
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Rochester, New York

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Project No.: 4742R-12

Date: December 2012

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I Timothy K. Hampton, P.E., certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan was prepared in accordance with applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



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Timothy K. Hampton, P.E.  
Vice President  
Day Environmental, Inc.

## **1.0 INTRODUCTION**

The subject property (Site) is addressed as 118 Petten Street, in the City of Rochester, Monroe County, New York. The Site is an approximately 25-acre area and is bounded to the north and south by land owned by the City of Rochester, to the east by the Genesee River, and to the west by a railroad spur. The location of the Site is shown on Figure 1 (Project Locus Map), and the approximate boundaries of the Site are shown on Figure 2 (Site Plan).

The Site consists of a commercial marina formerly known as the Riverview Yacht Basin and Genesee Marina, and currently known as Gibbs Marina. The marina includes multiple buildings and more than 200 boat slips. There are two boat ramps along the river front. The Site also consists of asphalt and gravel roadways and parking areas, woods, and wetlands that are regulated federally and by the New York State Department of Environmental Conservation (NYSDEC).

The Site is zoned by the City of Rochester as Harbortown Village District (H-V). Recreational use, commercial use, and residential use are permitted uses in the H-V zoning district.

This Remedial Action Work Plan (RAWP) has been prepared under the NYSDEC Brownfield Cleanup Program (BCP) to address environmental conditions at the Site that are associated with three closed-in-place 550-gallon underground storage tanks (USTs) located in the vicinity of Building #6 (refer to Figure 2).

### **1.1 Background**

The Site has been operated commercially as a marina including boat slips, a boat repair shop, storage for boats and boat parts, and a retail boat refueling facility from approximately 1947 to present. The Site also contains offices, a shop, and a parking area that was for patrons of the former Spirit of Rochester cruise boat, which ceased operation in 2003. A portion of the Site was used as a railroad yard by the New York Central Railroad prior to the marina operation. Railroad spurs traversed the northern portion of the Site from approximately 1918 to 1978. The off-site railroad spur along the western property boundary is still active.

### **1.2 Geologic Conditions**

The bedrock underlying the overburden deposits consists of Queenston Shale and was encountered at depths between 66 to 102 feet below ground surface.

The overburden at the Site generally consists of miscellaneous fill underlain by native soils. The fill material across the Site ranges from 1.5 feet to 20 feet in thickness. The native soils consist of brown silty peat underlain by gray clay and silt in some areas of the Site and gray sandy clay and silt in other areas of the Site.

The Genesee River, a Class B river, borders the Site to the east and flows northerly. Surface water from the Site flows towards the Genesee River. The depth to groundwater ranges from 0.16 to 7.33 feet across the Site. Groundwater flow at the Site appears to change

seasonally. The Genesee River is hydraulically down gradient from the Site during high groundwater conditions and hydraulically up gradient during low groundwater conditions. Two seasonal groundwater flow figures for May 7, 2008 and August 8, 2008 are included as Figure 3 and Figure 4, respectively.

### **1.3 Environmental Conditions**

The Site is a Monroe County Environmental Management Council (EMC) Waste Disposal Site (Number RO-109). The Site was used for the disposal of construction and demolition (C&D) debris from the 1960's until recently. The dumping observed by Monroe County also included dredge spoils from the Genesee River.

The Site is serviced by a public water system. The Monroe County Department of Public Health (MCDPH) has no records of public or private drinking water wells at, or within a 0.25-mile radius of, the Site. A review of a document titled "Groundwater Resources of Monroe County" (1935) revealed no groundwater supply wells on, or in the proximity of, the Site.

In 2004, environmental site assessments and investigations were conducted on the, which consisted of a Phase I Environmental Site Assessment, a Limited Phase II Site Assessment, and a Phase II Environmental Site Assessment.

Gibbs Marina (leasee and current operator of the Genesee Marina) also conducted a sediment sampling program along the Genesee River and within the marina basin in the fall of 2006 as part of a United States Army Corps of Engineers- permitted dredging program.

The NYSDEC Spills database indicates that there have been a total of 11 recorded spills at the Site with one spill remaining open.

A Remedial Investigation (RI) was performed to characterize the nature and extent of contamination at the Site. The RI was conducted between the fall of 2007 and spring of 2008. The results of the RI are discussed in detail in a document titled "Remedial Investigation Report, Brownfield Cleanup Program, NYSDEC Site ID C828130, 118 Petten Street, Rochester, New York" dated September 2011.

Generally, the RI determined that the primary contaminants of concern are volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) comprised mostly of polynuclear aromatic hydrocarbons (PAHs), and metals. These contaminants have been detected in soil, sediment, and/or groundwater samples collected from the Site. The contamination appears to be moderate but widespread across the Site. The contaminant(s) of concern identified at the Site are:

- The SVOCs naphthalene, benzo(k)fluoranthene, benzo(b)fluoranthene, and benzo(a)pyrene;
- The Metals chromium, copper, silver, mercury, and lead; and
- The VOCs benzene, ethylbenzene, methyl-tert-butyl-ether (MTBE), toluene, and xylene (mixed).

The contaminant(s) of concern exceed the one or more of applicable standards, criteria and guidance (SCG) values for groundwater, soil, or sediment.

The NYSDEC in conjunction with New York State Department of Health (NYSDOH) reviewed the environmental data submitted to date and determined that the Site does not pose a significant threat to the general public and the environment.

Below is a summary of conditions when the RI was performed between 2006 and 2008:

#### Sediments:

Six sediments samples were collected from upstream, downstream, within the marina basin, and along the marina's river frontage and were analyzed for the full Target Compound List (TCL) VOCs and SVOCs, Pesticides, Polychlorinated Biphenyls (PCBs), and Target Analyte List (TAL) Metal parameters as well as Total Organic Carbon. The Human Health Bioaccumulation Criteria was exceeded for several SVOCs and pesticides. One pesticide, gamma-chlordane, exceeded the Benthic Aquatic Life Chronic Toxicity Criteria. Several metal compounds including arsenic, chromium, copper, and silver exceeded the Lowest Effect Level. Silver concentrations ranged from 3.1 to 8.1 parts per million (ppm) which exceeded the Severe Effect Level. Silver concentrations in the river sediment are attributable to an off-site upstream source.

The NYSDEC Division of Fish, Wildlife and Marine Resources reviewed the environmental data and determined that contaminants at the Site and in the sediment do not present a potential for significant fish or wildlife impacts.

#### Surface and Near-Surface Soil:

Thirty surface and near-surface soil samples were collected and submitted for the full TCL VOCs and SVOCs, Pesticides, PCBs, and TAL Metals parameters. Results were compared to soil cleanup objectives (SCOs) referenced in a NYSDEC document titled "*6 NYCRR Part 375, Environmental Remediation Programs*" dated December 14, 2006. Commercial SCOs for some SVOCs including PAHs and/or metals were exceeded. PAH concentrations range from 1.1 to 9.7 ppm. Metals highest exceedances included copper (850 ppm) and lead (439 ppm). The exceedances were moderate but widespread across the site. In the wetland and its associated buffer zone, metals and pesticides (4,4-DDE and 4,4-DDT) were detected above the ecological SCOs. The locations where constituents in surface and near-surface soil samples exceeded Unrestricted Use SCOs, Restricted Residential Use SCOs, and/or Restricted Commercial Use SCOs are shown on Figure 5.

#### Subsurface Soil:

Thirty-five subsurface soil samples were collected and submitted for the full TCL VOCs and SVOCs, Pesticides, PCBs, and TAL Metals parameters. The commercial SCOs were exceeded for SVOCs and/or metals. PAH concentrations ranged from 0.89 to 14 ppm. Metals highest exceedances included copper (440 ppm), lead (2300 ppm), and arsenic (169

ppm). The exceedances were moderate but widespread across the Site. Subsurface soil samples collected in the wetlands and its associated buffer zone did not exceed ecological SCOs. The locations where subsurface soil samples from test pits and test borings exceeded Unrestricted Use SCOs, Restricted Residential Use SCOs, and/or Restricted Commercial Use SCOs are shown on Figure 6.

#### Surface Water:

Three surface water samples were collected and analyzed for the full TCL VOCs and SVOCs, Pesticides, PCBs, and TAL Metals parameters, Cyanide, and Hardness. The results were compared to surface water standards referenced in the NYSDEC document titled *“Division of Water, Technical and Operational Guidance Series 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1)”* dated June 1998, as amended by Addendums dated April 2000 and June 2004. Aluminum and iron exceeded the NYSDEC Surface Water Quality Standards for a Class B water body in all 3 of the surface water samples. The concentrations in the upstream and downstream concentrations were similar; therefore, attributed to naturally occurring background levels.

#### Groundwater:

Twenty-two groundwater monitoring wells were sampled. The groundwater samples were analyzed for the full TCL VOCs and SVOCs, Pesticides, PCBs, and TAL Metals parameters. Petroleum-related compounds (VOCs and SVOCs) and metals were detected and exceeded groundwater standards or guidance values in 5 monitoring wells. Pesticides were detected and exceeded the groundwater standards or guidance values in 4 monitoring wells. Petroleum-related compounds highest exceedances included benzene (600 microgram per liter or ug/L), naphthalene (120 ug/L), xylenes - total (540 ug/L), and ethylbenzene (130 ug/L). Metals highest exceedance included mercury (2.4 ug/L), lead (352 ug/L), and copper (477 ug/L).

A select group of groundwater monitoring wells (13 wells) was resampled. Petroleum-related compounds (VOCs and SVOCs), metals, and pesticides were detected and exceeded the groundwater standards or guidance values. Two groundwater monitoring wells had exceedances of VOC petroleum-related compounds. The highest VOC petroleum exceedances included benzene (1200 ug/L), MTBE (33 ug/L), xylenes - total (730 ug/L), and toluene (890 ug/L). Four groundwater monitoring wells had SVOC petroleum-related compound exceedances. One groundwater monitoring well had a metals exceedance of the standards or guidance value - mercury was detected at 1.3 ug/L. One groundwater monitoring well had a pesticide exceedance of the standards or guidance value - dieldrin was detected at 0.25 ug/L.

The locations of monitoring well where the groundwater samples exceeded one or more groundwater standards or guidance values are shown on Figure 7.

### Former Underground Storage Tank Area

There is reported to be three (3) 550-gallon USTs that were closed-in-place just east of Building 6 (refer to Figure 2). This is an area where petroleum-related VOCs and SVOCs were detected in the groundwater and petroleum-related SVOCs were detected in the subsurface soils.

In 2004, a geophysical survey was completed as part of a Phase II Environmental Site Assessment in order to identify magnetic anomalies, including anomalies that may be suggestive of the presence of the three closed-in-place USTs. Such an anomaly was identified inside along the east wall of Building #6. A test pit (GM-TP20) was completed, and gray/black stained fill material with a petroleum-type odor was encountered. A concrete slab was encountered at a depth of 4 feet bgs, however, the test pits had to be backfilled due to cave in, and no USTs were encountered in this test pit.

The former closed-in-place UST area is the subject of this RAWP.

## **1.4 Remedial Action Objectives**

Remedial action objectives (RAOs) that were developed for the Site are summarized below.

### Soil

RAOs for public health protection include:

- Prevent ingestion and direct contact with contaminated soil; and
- Prevent inhalation of, and exposure to, volatilization of contaminants in soil.

RAOs for environmental protection include:

- Prevent migration of contamination that would result in impacts to surface water or groundwater; and
- Prevent impacts to biota via ingestion or direct contact with contaminated soil that would result in toxic conditions or impacts from bioaccumulation through the terrestrial food chain.

### Groundwater

RAOs for public health protection include:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards; and
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for environmental protection include:

- Restore the groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable;
- Prevent the discharge of contaminants to surface water; and
- Remove the source(s) of groundwater contamination.



Although the RI addressed both Restricted Residential Use and Restricted Commercial Use SCOs, the Site is currently Commercial and a remedial action objective is to bring the Site into compliance with Restricted Commercial Use SCOs, with the future option of developing part of the Site into Restricted Residential Use. Should part of the Site be developed into Restricted Residential Use, that portion of the Site will be brought into compliance with Restricted Residential Use SCOs with input from the NYSDEC.

## **1.5 Remedial Alternatives and Remedy Selection**

In response to the findings of the RI, a Remedial Alternatives Analysis (RAA) Report dated September 2011 was prepared that provided an analysis of remedial alternatives that were evaluated. The RAA report also recommended a remedial alternative for implementation at the Site. The NYSDEC, with input from the NYSDOH, reviewed the RI and RAA reports, and developed a Decision Document dated March 2012 that summarizes Site conditions and identifies the components of the remedy that was selected in accordance with 6 NYCRR Part 375. The selected remedy is a Track 4 cleanup that uses soil cleanup objectives for restricted use.

The selected remedy provided the best combination of components to address the RAOs, and to satisfy the following remediation goals set forth in DER-10:

- Protection of Human Health and the Environment
- Compliance with SCG Values
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility and Volume
- Short-Term Impacts and Effectiveness
- Implementability
- Cost
- Planned Future Use of the Site
- Community Acceptance

The elements of the selected remedy are as follows:

1. Performance of a Remedial Design Investigation to further evaluate the extent of petroleum contamination associated with the three reportedly closed-in-place USTs.
2. Removal and disposal of petroleum-contaminated soil associated with the three reportedly closed-in-place USTs.
3. In-situ bioremediation of petroleum-contaminated soil and groundwater associated with the three reportedly closed-in-place USTs that is not addressed by the removal and disposal identified above.
4. Design and installation of a Cover System.
5. Preparation and implementation of Institutional Controls.
6. Preparation and implementation of a Site Management Plan.

Elements 1, 2, and 3 above are addressed by this RAWP.

## **2.0 SCOPE OF WORK**

As identified above, the scope of work of this RAWP is to further address the area of the three reportedly closed-in-place USTs located along the east side of Building #6. The scope of work will include implementation of a Remedial Design Investigation (RDI) followed by preparation and implementation of a Remedial Design Work Plan (RDWP). The RDWP will address the closed-in-place USTs (if encountered) and associated petroleum contamination to the extent possible and practicable.

A Health and Safety Plan (HASP), which includes a Community Air Monitoring Plan (CAMP) is included as Appendix A. The provisions set forth in the HASP and CAMP will be implemented during field activities outlined in this RAWP.

A Quality Assurance Project Plan (QAPP) is included as Appendix B. The provisions set forth in the QAPP will be implemented during this RAWP.

Prior to conducting any intrusive work in the area of the three reportedly closed-in-place USTs, a utility stakeout will be conducted to identify the location of buried utilities in this area.

### **2.1 Remedial Design Investigation**

The RDI will be completed in the area of the former reportedly closed-in-place USTs. The RDI will include a test pit evaluation to look for the USTs and assess any UST contents and source area material, and also a test boring/monitoring well evaluation to further assess the extent of petroleum impact attributable to the USTs.

#### **2.1.1 Test Pit Evaluation and Contingency UST Removal**

A backhoe or excavator and operator will be used to excavate up to three test pits (designated as TP1 through TP3) in the area of the three reportedly closed-in-place USTs near the east side of Building #6 (refer to Figure 8 for tentative locations). The purpose of the test pits is to attempt to find and evaluate these USTs, and also evaluate surrounding subsurface soil/fill conditions. The results of the 2004 geophysical survey on this portion of the Site were used to assist in selecting the location of test pit TP3. Prior to excavating the test pits, a Schonstedt MAC-51B magnetic locator will be used along approximate five foot grid lines inside and outside Building #6 in the area of the former reportedly closed-in-place USTs to assist in adjusting the test pit locations to include any identified magnetic anomalies that may be suggestive of the USTs. As shown, the three tentative test pit locations are parallel to each other and also parallel to the east wall of Building #6. The test pits will be excavated in the order they are numbered. If USTs are encountered, any remaining test pits not in the area of the USTs may not be excavated unless necessary to further evaluate the extent of petroleum contamination, if present.

These test pits will be excavated to depths of at least eight feet. Excavated materials will be placed on plastic sheeting in proximity to each test pit. Excavated soil/fill from the test pits will be screened using a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp. Day Environmental, Inc. (DAY) will observe excavated and in-situ materials for evidence of petroleum contamination (e.g., odors, staining, free product, etc.). PID screening will include screening the air headspace of select soil/fill samples using the protocol outlined in the QAPP included as Appendix B.

Subsurface conditions at each test pit will be documented in the field, including a photographic log. Pertinent information will be recorded on test pit logs, which will include:

- Date, sample identification (if collected), location and project identification;
- Name of individual preparing the log;
- Name of entity excavating the test pits;
- Equipment used;
- Sequential stratigraphic boundaries;
- Size of test pit area (depth, width, and length);
- Field observations; and
- PID screening results.

If an abandoned UST is encountered, an attempt may be made to excavate the test pit to a depth that is below the invert of the UST within the reach limits of the equipment. The USTs were reportedly filled with K-Crete when closed-in-place; however, an attempt will be made to gain access to the interior of any UST that is encountered in order to evaluate any contents. If a UST contains accessible petroleum-type contents (e.g., liquid or sludge), a sample will be collected for waste characterization using the protocol set forth in the QAPP in Appendix B. The sample(s) would be relinquished under chain-of-custody control to Paradigm Environmental Services, Inc. (Paradigm), which is a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory. Paradigm would test the UST contents samples for the following parameters:

- NYSDEC Spill Technology and Remediation Series (STARS)-list VOCs and tentatively identified compounds (TICs) using United States Environmental Protection Agency (USEPA) Method 8260; and
- Flashpoint using USEPA Method 1010.

If feasible based on Site conditions (i.e., no complicating factors such as overlying building foundations, etc.), abandoned USTs encountered will be removed in accordance with applicable federal, New York State and local regulations under permit with the City of Rochester. Closure work would be completed in accordance with Section 5.5 (Underground Storage Tank Closure) of DER-10. In accordance with 6 NYCRR 612.2(d), a Petroleum Bulk Storage (PBS) modification form documenting the permanent UST removal work would be submitted to the NYSDEC.

If field evidence of petroleum contamination (odors, staining, elevated PID readings, free petroleum product, petroleum sheen, etc.) is encountered at a test pit, a sample will be collected for possible analytical laboratory testing, and the sample location will be biased towards the area of the test pit that has the greatest field evidence of potential petroleum contamination. Samples will be collected using one of the methods provided in the QAPP in Appendix B. If field evidence of petroleum contamination is not encountered at a test pit, no sample will be collected for possible analytical laboratory testing. Pertinent field observations will be recorded for each location on a test pit excavation log. Details regarding the field reporting protocols are provided in the attached QAPP.

As identified above and in Table 1 of the QAPP in Appendix B, up to one soil sample from each test pit may be submitted for analytical laboratory testing. The sample(s) would be delivered under chain-of-custody control to Paradigm, which would analyze the sample(s) for the following parameters:

- NYSDEC STARS-list VOCs and TICs using USEPA Method 8260; and
- NYSDEC STARS-list SVOCs and TICs using USEPA Method 8270.

If abandoned USTs are encountered and are to be removed, additional site characterization would be performed, which would likely include the collection and analysis of additional samples from the tank pit sidewalls and bottom that would be tested for the above VOC and SVOC parameters in accordance with Section 5.5 of DER-10. The number and locations of any additional soil samples will be determined in accordance with Section 5.5 of DER-10 and input from the NYSDEC Project Manager.

Laboratory analysis of Quality Assurance/Quality Control (QA/QC) samples will also be completed in accordance with provisions of the QAPP included as Appendix B. The laboratory results will be provided in a NYSDEC Analytical Services Protocol (ASP) Category B deliverables package. Also as identified in the QAPP, a Data Usability Summary Report (DUSR) will be completed on the laboratory report. The test results for detected VOCs and SVOCs, as qualified by the DUSR, will be summarized on a table, which will also include a comparison to NYSDEC Part 375 SCOs for Unrestricted Use, Restricted Commercial Use, and Protection of Groundwater.

Test pit locations will be backfilled and compacted using the previously-excavated materials in accordance with Section 3.3(e)4 of DER-10. The backhoe or excavator will be decontaminated prior to use at each test pit location and at the termination of the work. Decontamination procedures are included in the QAPP in Appendix B.

### **2.1.2 Test Boring/Temporary Monitoring Well Evaluation**

Direct-push Geoprobe drilling equipment will be used to advance ten test borings (designated as TMW1 through TMW10) to depths of approximately twelve feet below the ground surface, or equipment refusal if encountered at shallower depths. The tentative locations are shown on Figure 8. Actual locations will vary from those shown based on the Site conditions encountered as the RDI work progresses. These test borings will intercept the uppermost water bearing unit at the Site.

At each test boring, continuous Geoprobe MacroCore samples will be collected in four foot long or less intervals from the ground surface to the termination depth. The soil samples will be collected in new disposable plastic liners. The Geoprobe sampling technique is further outlined in the QAPP included in Appendix B. The recovered soil/fill samples will be examined by a DAY representative for evidence of suspect contamination (e.g., odors, staining, free product, etc.) and screened with a PID. The PID screening will include screening the air headspace of portions of select soil/fill samples using the protocol outlined in the QAPP included in Appendix B. Peak PID readings measured will be recorded on a log sheet or log book. Other portions of the samples will be placed in containers for possible analytical laboratory testing.

One soil/fill sample from each test boring (i.e., total of ten samples) will be selected for analytical laboratory testing. At test boring locations with field evidence of petroleum contamination, the sample with the highest field evidence of contamination will be selected for analytical laboratory testing. At test boring locations with no field evidence of petroleum contamination, the sample immediately above the water table noted in the corresponding well will be selected for analytical laboratory testing.

Following the completion of drilling at each test boring, a temporary Schedule 40 polyvinyl chloride (PVC) monitoring well will be constructed within each test boring (total of ten temporary wells). Each temporary monitoring well will consist of a pre-cleaned one-inch inner diameter, threaded, flush-jointed, five-foot to ten-foot long No. 10 slot screen that is attached to solid riser casing that will extend from the top of the screened section to above the ground surface. Each well screen will be installed to intercept the top of the uppermost water-bearing unit. At each well, a PVC cap will be installed on the top of the riser, and then a washed and graded sand will be placed in the annulus around the screen and riser.

Pertinent information will be recorded on test boring logs and well construction diagrams, which will include:

- Date, boring/well identification, and project identification;
- Name of individual developing the log;
- Name of drilling contractor;
- Drill make and model, and sampling method;
- Identification of alternative drilling methods used;
- Depths recorded in feet and fractions thereof (tenths of inches) referenced to ground surface.
- The length of the sample interval and the percentage of the sample recovered.
- The depth of the first encountered water table, along with the method of determination, referenced to ground surface.
- Drilling and borehole characteristics;
- Sequential stratigraphic boundaries;
- Well specifications (materials; screened interval; sand pack, etc.);
- Initial PID screening results of soil/fill samples and PID screening results of ambient headspace air above selected samples; and
- Top of PVC riser well elevation surveyed with laser level using the same datum as existing wells.

At each of the ten temporary wells, and also at existing well GM-MW16, static water level and light non-aqueous phase liquid (LNAPL) measurements will be made, the wells will be purged, and groundwater samples will be collected in accordance with the protocol set forth in the QAPP included as Appendix B.

Once a groundwater sample has been collected from the temporary wells, the PVC will be removed from the borings, and the borings will be backfilled with grout in accordance with protocols set forth in the NYSDEC document titled “CP-43: Groundwater Monitoring Well Decommissioning Policy” dated November 3, 2009.

Soil/fill cuttings, disposable materials, well purge water, and decontamination water will be placed in New York State Department of Transportation (NYSDOT)-approved drums that will be characterized and disposed off-site in accordance with applicable regulations once the RDI is complete.

The ten soil samples and eleven groundwater samples described above will be submitted under chain-of-custody control to Paradigm. In accordance with Table 1 of the QAPP in Appendix B, Paradigm will analyze the samples for NYSDEC STARS-list VOCs and TICs using USEPA Method 8260.

Laboratory analysis of QA/QC samples will also be completed in accordance with provisions of the QAPP included as Appendix B. The laboratory results will be provided in a NYSDEC ASP Category B deliverables package. Also as identified in the QAPP, a DUSR will be completed on the laboratory report. The test results for detected VOCs, as qualified by the DUSR, will be summarized on tables. The table for soil samples will include a comparison to NYSDEC Part 375 SCOs for Unrestricted Use, Restricted Commercial Use, and Protection of Groundwater. The table for groundwater samples will include a comparison to NYSDEC TOGS 1.1.1 groundwater standards and guidance values.

### **2.1.3 RDI Report**

An RDI Report will be prepared and submitted to representatives of Genesee Marina, Inc., the NYSDEC and the NYSDOH. The RDI report will include a summary of the work performed, details on the USTs and their contents (if encountered), select photographs of field activities, figures depicting test locations and Site findings, test pit logs, test boring logs, construction diagrams for the temporary wells, ASP Category B deliverable laboratory reports, DUSRs, and data tables comparing analytical results to corresponding Part 375 SCOs (soil samples) and TOGS 1.1.1 groundwater standards and guidance values (groundwater samples), and conclusions regarding the nature and extent of petroleum-contaminated media attributable to the former reportedly closed in-place USTs.

## **2.2 Remedial Design Work Plan**

Based on the findings of the RI and the RDI, a RDWP will be prepared in accordance with Section 5.2 of DER-10, submitted to NYSDEC for approval, and implemented to address the former reportedly closed-in-place USTs area. Under the RDWP, exceedances of soil and groundwater would be addressed. Remediation is anticipated to include a source area soil removal and off-site disposal, excavation dewatering and off-site disposal, post-excavation sampling, installation of a remediation supplement (e.g., bioremediation) in the excavation as a polishing agent followed by backfilling, and potential in-situ remediation (presumed outside the limits of the excavation). Long-term groundwater monitoring would be performed to evaluate the effectiveness of the remedy.

The goal will be to remediate the residual petroleum contamination in soil to achieve NYSDEC Part 375 Restricted Commercial Use SCOs and Protection of Groundwater SCOs, and remediate residual petroleum contamination in groundwater to achieve NYSDEC TOGS 1.1.1 groundwater standards and guidance values.

### **3.0 REFERENCES**

NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1), June 1998, Addended April 2000 and June 2004.

NYSDEC, 6 NYCRR Part 375 Environmental Remediation Programs, effective December 14, 2006.

NYSDEC Division of Environmental Remediation, DER-10 / Technical Guidance for Site Investigation and Remediation, May 3, 2010.

NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.

## 4.0 ACRONYMS

ASP	Analytical Services Protocol
BCP	Brownfield Cleanup Program
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
DAY	Day Environmental, Inc.
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EMC	Monroe County Environmental Management Council
eV	Electron Volt
HASP	Health and Safety Plan
LNAPL	Light Non-Aqueous Phase Liquid
MCDPH	Monroe County Department of Public Health
MTBE	Methyl-Tert-Butyl Ether
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PAH	Polynuclear Aromatic Hydrocarbon
Paradigm	Paradigm Environmental Services, Inc.
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PPM	Parts Per Million
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAA	Remedial Alternatives Analysis
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RDI	Remedial Design Investigation
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
SCG	Standard, Criteria and Guidance
SCO	Soil Cleanup Objective
STARS	Spill Technology And Remediation Series
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TIC	Tentatively Identified Compound
TOGS	Technical and Operational Guidance Series
Ug/L	Microgram Per Liter
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound



## FIGURES



Date  
 10-29-2012

Drawn By  
 CPS

Scale  
 AS NOTED

**day**  
**DAY ENVIRONMENTAL, INC.**  
 Environmental Consultants  
 Rochester, New York 14606  
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Project Title  
 GENESEE MARINA  
 118 PETTEN STREET  
 ROCHESTER, NEW YORK  
 (NYSDEC SITE No. C828130)

REMEDIAL ACTION WORK PLAN

Drawing Title

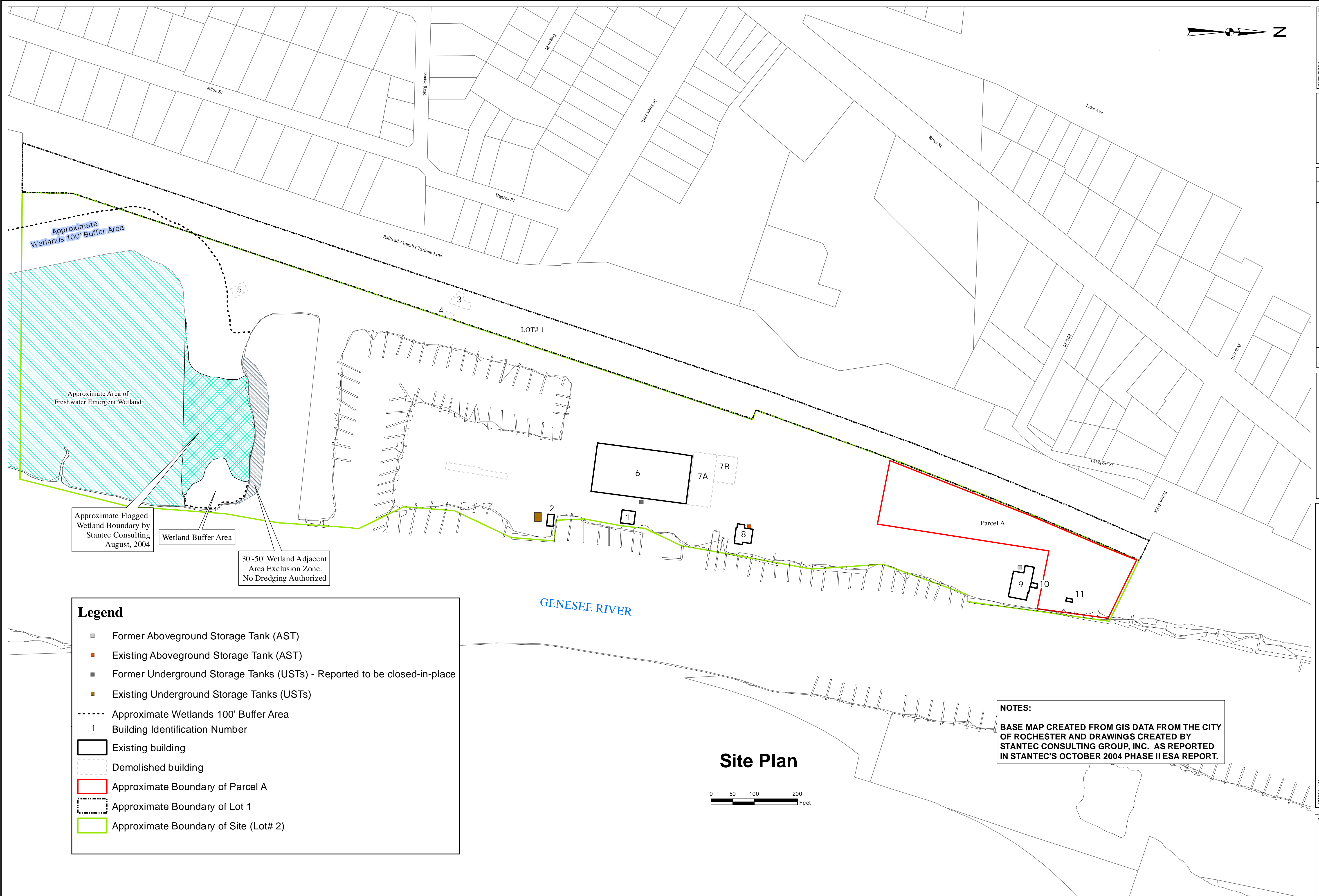
Project Locus Map

Project No.

4742R-12

FIGURE 1





DESIGNED BY:	DJG	10-2012	DATE
DRAWN BY:	CPS	10-2012	DATE
CHECKED BY:	RJM	10-2012	DATE
APPROVED BY:	TKH	10-2012	DATE
SCALE:	AS NOTED	10-26-2012	DATE

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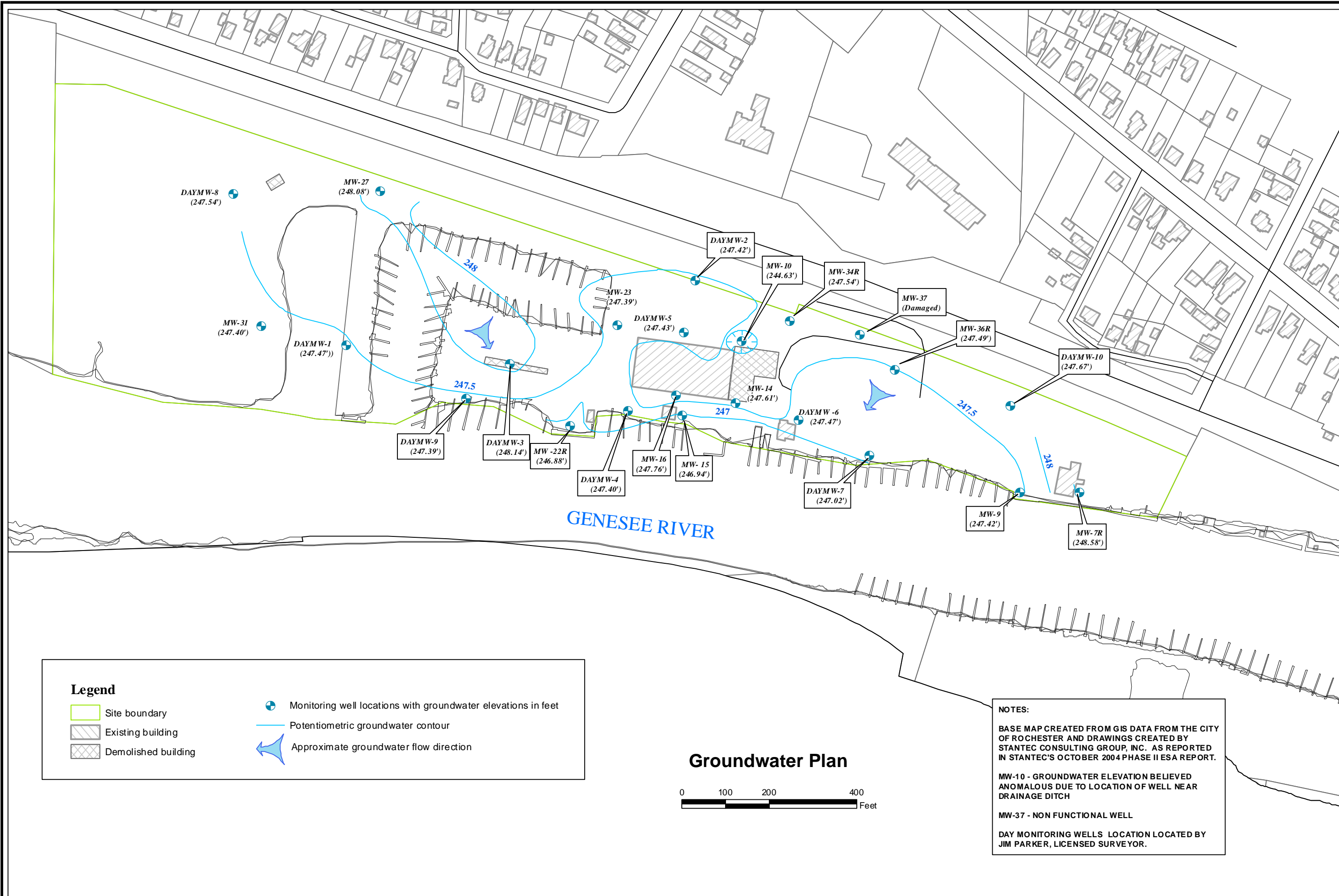
**day**  
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NEW YORK, NEW YORK 10170

PROJECT <b>GENESSEE MARINA</b> <b>118 PETTEN STREET</b> <b>ROCHESTER, NEW YORK</b>	REMEDIAL ACTION WORK PLAN (NYSDEC SITE NO. C828130)  DRAWING TITLE
SITE PLAN	

PROJECT NO.: **4742R-12**

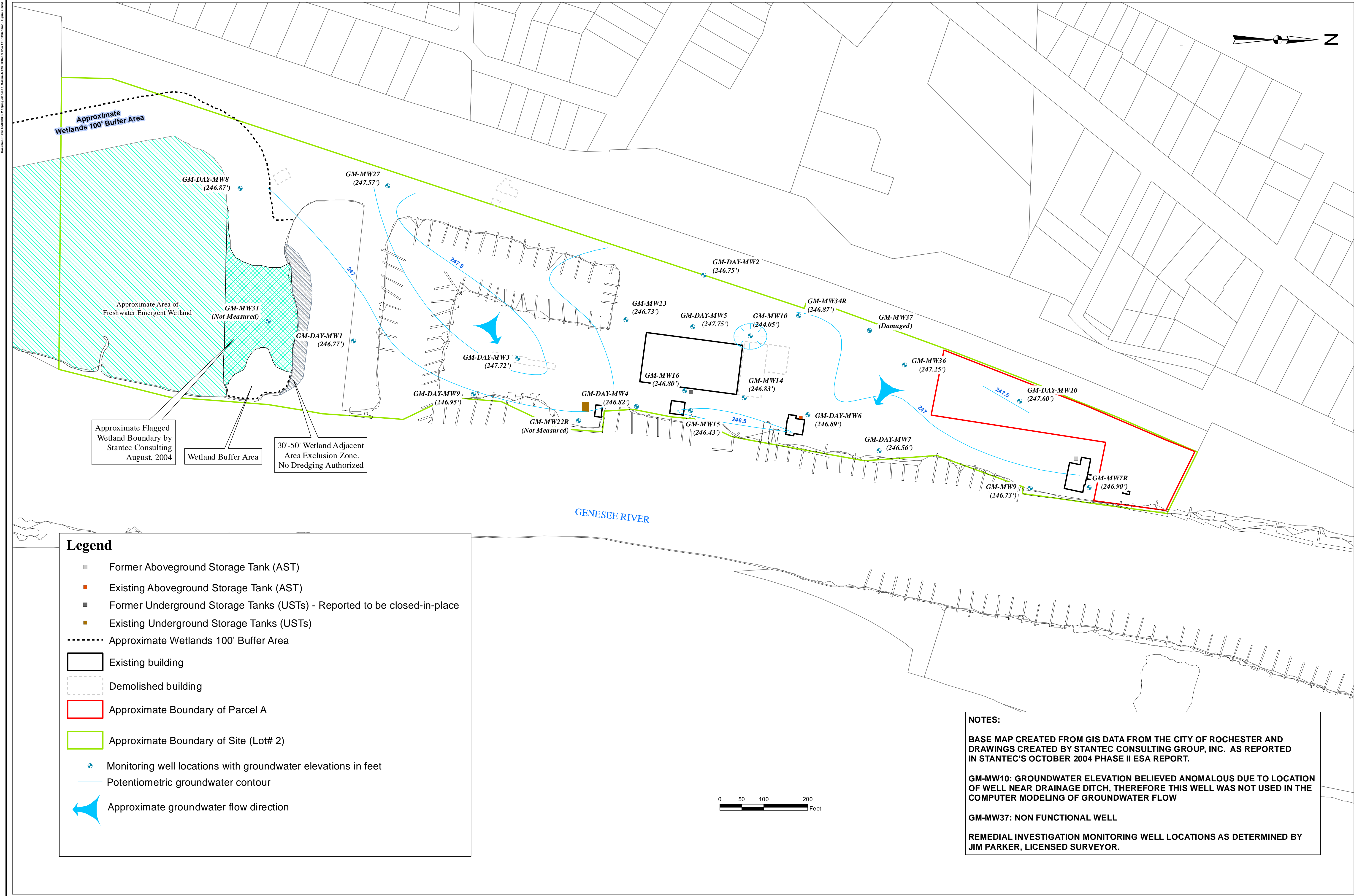
**FIGURE 2**



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DJG	10-2012	CPS	10-2012	RJM	10-2012	DDO	10-2012	AS NOTED	10-26-2012

DAY ENVIRONMENTAL, INC.	DRAWING ALLOCATION	DATE	BY
DAY ENVIRONMENTAL, INC.	DRAWING ALLOCATION		

REVISIONS	DATE	BY

**PROJECT TITLE:**  
GENESEE MARINA  
118 PETTEN STREET  
ROCHESTER, NEW YORK

**DRAWING TITLE:**  
REMEDIAL ACTION WORK PLAN (NYSDEC SITE NO. C828130)  
POTENTIOMETRIC GROUNDWATER CONTOUR MAP  
FOR AUGUST 8, 2008

**PROJECT NO.:**  
4742R-12

**FIGURE 4**

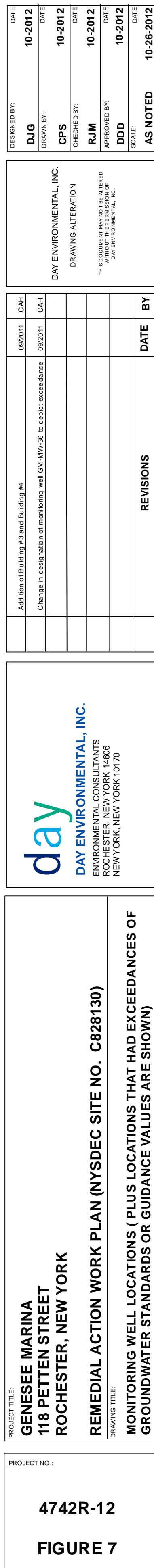


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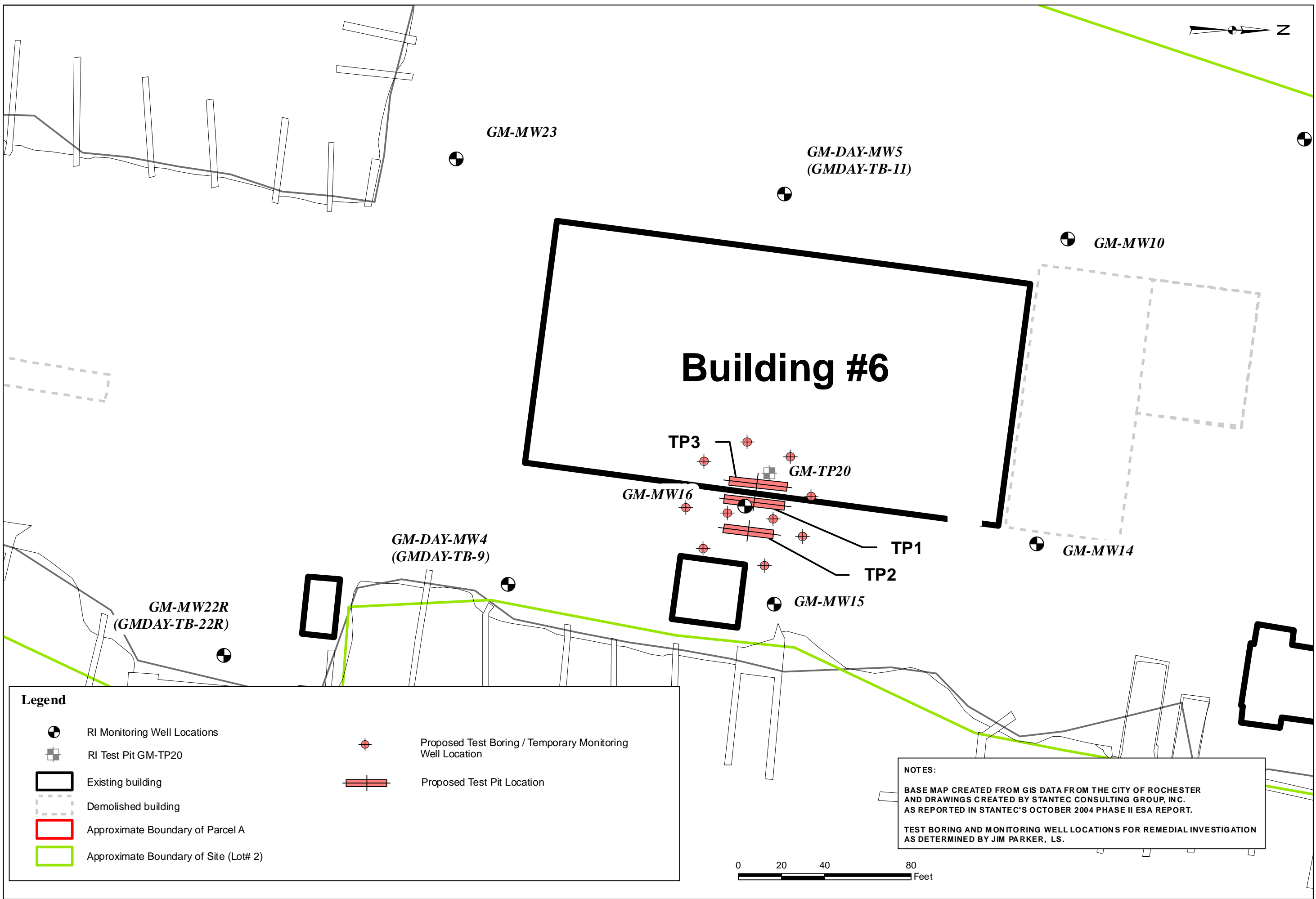


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DESIGNED BY	JAD	DATE	10-2012
DRAWN BY	CPS	DATE	10-2012
CHECKED BY	RJM	DATE	10-2012
APPROVED BY	JAD	DATE	10-2012
SCALE	AS NOTED	DATE	10-26-2012

REVISIONS		DATE	BY

**DAY ENVIRONMENTAL, INC.**  
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PROJECT TITLE	GENESEE MARINA 118 PETTEN STREET ROCHESTER, NEW YORK
DRAWING TITLE	REMEDIAL ACTION WORK PLAN (NYSDEC SITE NO. C828130)
PROJECT NO.	4742R-12
FIGURE	FIGURE 8

## **APPENDIX A**

### **Health and Safety Plan, Including Community Air Monitoring Plan**

**HEALTH AND SAFETY PLAN**  
**BROWNFIELD CLEANUP PROGRAM**  
**118 PETTEN STREET**  
**ROCHESTER, NEW YORK**  
**NYSDEC SITE No. C828130**

<b>Prepared For:</b>	Genesee Marina, Inc. 118 Petten Street Rochester, New York
<b>Prepared by:</b>	Day Environmental, Inc. 1563 Lyell Avenue Rochester, New York 14606
<b>Project No.:</b>	4742R-12
<b>Date:</b>	October 2012

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## **FIGURES**

- Figure 1**      Route for Emergency Service
- Figure 2**      CAMP Air Monitoring Locations

## 1.0 INTRODUCTION

This Health and Safety Plan (HASP) outlines the policies and procedures under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) that are necessary to protect workers and the public from potential environmental hazards posed during activities that have the potential to disturb contaminated media (e.g. soil, gravel, water, fill, etc.). The subject property (Site) is a marina located in an urban setting and consists of approximately 25 acres, with an estimated 2,500 feet of frontage along the western shore of the Genesee River south of the Port of Rochester. The marina includes multiple buildings and more than 200 boat slips. There are two boat ramps located along the riverfront. The Site also contains asphalt and gravel roadways and parking areas, woods, and wetlands that are regulated federally and by the NYSDEC. The property is addressed as 118 Petten Street, City of Rochester, County of Monroe, New York (NYSDEC Site ID C828130). Figure 1 depicts the general location of the Site. As outlined in this HASP, the above activities with the potential to disturb contaminated media shall be conducted in a manner to minimize the probability of exposure, injury, accident, or incident occurrence.

Although the HASP focuses on the specific work activities planned for this Site, it must remain flexible due to the nature of this work. Conditions may change and unforeseen situations can arise that require deviations from the original HASP.

### 1.1 Site History/Overview

In May 2005, the Site property was subdivided into two lots to allow development of the Genesee Riverway Trail by the City of Rochester (City) on Lot #1. For purposes of this report, the Site is defined as Lot #2 in its entirety. The Site is currently bounded to the west by Lot #1, which is now owned by the City. An active railroad spur owned by New York Central Lines LLC is located on the west side of Lot #1. The Site is bounded to the west by an active railroad spur, to the north by land owned by the City, to the east by the Genesee River, and to the south by land (vacant) owned by the City. Residential properties are located across the Genesee River and on the opposite side of the railroad spur to the west.

The Site has been operated commercially as a marina including boat slips, a boat repair shop, storage for boats and boat parts, and a retail boat refueling facility from approximately 1947 to the present. The Site has multiple areas that were historically filled with construction and demolition (C&D) debris and dredge spoils. The Site also contains offices, a shop, and a parking area for the former *Spirit of Rochester* cruise boat, which ceased operations in 2003. Historic petroleum releases have occurred at the Site in the refueling area and the parking lot area. Drums that contain chemicals associated with marina operations, portable gasoline tanks, aboveground storage tanks (ASTs), and underground storage tanks (USTs) have been or are located at the Site. The Site is a registered bulk petroleum storage facility with three registered fuel tanks located at the refueling area. The Site currently has three septic systems, and sanitary/storm sewers are not present at the Site.

The New York Central Railroad prior to the marina operation used a portion of the Site as a railroad yard. Railroad spurs traversed the northern portion of the Site from approximately 1918 to 1978. The off-site railroad spur along the western property boundary is still active. In the area formerly used as a railroad yard, the fill material contains railroad cinder and slag.

The Site is a Monroe County Environmental Management Council (EMC) Waste Disposal Site (Number RO-109). The Site was used for the disposal of C&D debris from the 1960's until recently. The dumping observed by Monroe County also included dredge spoils.

The Site is serviced by the public water system. The Monroe County Department of Public Health (MCDPH) has no records of public or private drinking water wells or process water wells within a 0.25-mile radius of the Site. A review of a document titled "Ground Water Resources of Monroe County," (1935) revealed no groundwater supply wells on, or in the immediate area of, the Site.

Previous environmental work identified that various media (soil, groundwater, fill) on portions of the Site were contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and/or polychlorinated biphenyls (PCBs). Constituents on-site that exceed NYSDEC Part 375 Unrestricted Use soil cleanup objectives (SCOs) and/or NYSDEC Technical and Operational Guidance Series (TOGS 1.1.1) groundwater standards/guidance values include VOCs, SVOCs, pesticides and metals.

## **1.2 Planned Activities Covered by HASP**

Planned activities covered by this HASP include:

- Intrusive activities including investigation of closed in-place USTs and possible removal of the UST(s) and contaminated soil, if present;
- Activities during redevelopment and on-going property maintenance under protocols set forth in a Site Management Plan (SMP);
- In-situ bioremediation in the open USTs excavation, if warranted;
- Site cover engineering control system for most of the Site;
- Groundwater monitoring to evaluate the effectiveness of the remedy; and
- Miscellaneous tasks that may arise.

This HASP can be modified to cover other site activities as deemed appropriate. The owner of the property, its contractors, and other site workers will be responsible for the development and/or implementation of health and safety provisions associated with normal construction activities or site activities.

## **2.0 KEY PERSONNEL AND MANAGEMENT**

The Project Manager (PM) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the HASP on behalf of Day Environmental, Inc. (DAY) representatives.

### **2.1 Project Manager**

The PM has the overall responsibility for the project and will coordinate with the SSO to ensure that the goals of the Site activities are attained in a manner consistent with the HASP requirements.

## **2.2 Site Safety Officer**

The SSO has responsibility for administering the HASP relative to site activities, and will be in the field full-time while site activities are in progress. The SSO's operational responsibilities will be monitoring, including personal and environmental monitoring, ensuring personal protective equipment maintenance, and assignment of protection levels. The SSO will be the main contact in any on-site emergency situation. The SSO will direct field activities involved with safety and be responsible for stopping work when unacceptable health or safety risks exist. The SSO is responsible for ensuring that on-site personnel understand and comply with safety requirements.

## **2.3 Employee Safety Responsibility**

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use the equipment provided in a safe and responsible manner as directed by the SSO.

## **2.4 Key Safety Personnel**

The following DAY individuals are anticipated to share responsibility for health and safety of DAY employees at the site.

Project Manager	Jeffrey A. Danzinger
Site Safety Officer	Charles A. Hampton

DAY's safety personnel will share environmental monitoring information, etc. with other on-site entities (e.g., contractors, regulators). However, these other on-site entities are responsible for their own health and safety and should provide their own safety personnel (e.g., SSO) as deemed necessary depending upon the activities they are performing at the Site (refer to Section 3.0).

## **3.0 SAFETY RESPONSIBILITY**

Contractors, consultants, state or local agencies, or other parties, and their employees, involved with intrusive activities at this Site, will be responsible for their own safety while on-site. Their employees will be required to understand the information contained in this HASP, and must follow the recommendations that are made in this document. As an alternative, contractors, consultants, state or local agencies, or other parties, and their employees, involved with this project can utilize their own health and safety plan for this project as long as it is found acceptable to the New York State Department of Health (NYSDOH), MCDPH and/or NYSDEC.

## **4.0 JOB HAZARD ANALYSIS**

There are many hazards associated with intrusive work on a site, and this HASP discusses some of the anticipated hazards for this Site. The hazards listed below deal specifically with those hazards associated with the disturbance of potentially contaminated media (e.g., soil, groundwater, fill, etc.).



## 4.1 Chemical Hazards

Chemical substances can enter the unprotected body and can cause damage to the point of contact or can act systemically, causing a toxic effect at a part of the body distant from the point of initial contact.

A list of VOCs, SVOCs, pesticides, and metals that have been historically detected at the Site are provided below. This list also presents the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs), National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (RELs), and NIOSH immediately dangerous to life or health (IDLH) levels.

CONSTITUENT	OSHA PEL	NIOSH REL	NIOSH IDLH
Acetone	1000 ppm	250 ppm	2500 ppm
Benzene	1 ppm	0.1 ppm	500 ppm
Chloroform	50 ppm	2 ppm	500 ppm
Ethylbenzene	100 ppm	100 ppm	800 ppm
Isopropylbenzene	50 ppm	50 ppm	900 ppm
Methyl-Tert-Butyl-Ether	40 ppm*	NA	NA
Methylene Chloride	25 ppm	NA	2300 ppm
Nitrobenzene	1 ppm	1 ppm	200 ppm
Toluene	200 ppm	100 ppm	500 ppm
Xylene	100 ppm	100 ppm	900 ppm
Benzo (a) anthracene	NA	NA	NA
Benzo (a) pyrene	0.2 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>
Benzo (b) fluoranthene	0.2 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>
Benzo (k) fluoranthene	0.2 mg/m <sup>3</sup>	NA	80 mg/m <sup>3</sup>
Chrysene	0.2 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>
Dibenzo(a,b)anthracene	NA	NA	NA
Indeno (1,2,3-cd) pyrene	NA	NA	NA
Naphthalene	10 ppm	10 ppm	250 ppm
Phenanthrene	0.2 mg/m <sup>3</sup>	NA	NA
Phenol	5 ppm	5 ppm	250 ppm
Arsenic	0.1 mg/m <sup>3</sup>	0.002 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Barium	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>
Cadmium	0.005 mg/m <sup>3</sup>	NA	9 mg/m <sup>3</sup>
Chromium	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	250 mg/m <sup>3</sup>
Cobalt Dust	0.1 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	20 mg/m <sup>3</sup>
Copper Dust	1 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>
Lead	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>
Mercury	0.1 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Nickel	1 mg/m <sup>3</sup>	0.015 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Silver	0.01 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Zinc	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	500 mg/m <sup>3</sup>
Dieldrin	0.25 mg/m <sup>3</sup>	0.25 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>
Aroclor 1254	0.5 mg/m <sup>3</sup> **	0.00 mg/m <sup>3</sup>	NA
CONSTITUENT	CONSTITUENT	NIOSH REL	NIOSH IDLH
4,4'-DDT	1 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	NA

NA – Not Available

\* Proposed ACGIH

\*\* Skin Notation

The potential routes of exposure for these analytes and chemicals include inhalation, ingestion, skin absorption and skin/eye contact. The potential for exposure through any one of these routes will depend on the activity conducted. The most likely routes of exposure for intrusive activities include inhalation and skin contact.

## **4.2 Physical Hazards**

There are physical hazards that might compound the chemical hazards. Hazard identification, training, adherence to the planned Site measures, and careful housekeeping can prevent many problems or accidents arising from physical hazards. Potential physical hazards associated with this Site and suggested preventative measures include:

- Slip/Trip/Fall Hazards - Some areas may have wet surfaces that will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with the fall hazard. Good housekeeping practices are essential to minimize the trip hazards.
- Small Quantity Flammable Liquids - Small quantities of flammable liquids may be stored in "safety" cans and labeled according to contents.
- Electrical Hazards - Electrical devices and equipment shall be de-energized prior to working near them. All extension cords will be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical circuits will be protected with ground fault circuit interrupters. Only qualified electricians are authorized to work on electrical circuits. Heavy equipment (e.g., backhoe, drill rig) shall not be operated within 10 feet of high voltage lines, unless proper protection from the high voltage lines is provided by the appropriate utility company.
- Noise - Work around large equipment often creates excessive noise. The effects of noise can include:
  - Workers being startled, annoyed, or distracted.
  - Physical damage to the ear resulting in pain, or temporary and/or permanent hearing loss.
  - Communication interference that may increase potential hazards due to the inability to warn of danger and proper safety precautions to be taken.

Proper hearing protection will be worn as deemed necessary. In general, feasible administrative or engineering controls shall be utilized when on-site personnel are subjected to noise exceeding an 8-hour time weighted average (TWA) sound level of 90 dBA (decibels on the A-weighted scale). In addition, whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 dBA, employers shall administer a continuing, effective hearing conservation program as described in the OSHA Regulation 29 CFR Part 1910.95.

- Heavy Equipment - Each morning before start-up, heavy equipment will be inspected to ensure safety equipment and devices are operational and ready for immediate use.
- Subsurface and Overhead Hazards - Before any excavation activity, efforts will be made to determine whether underground utilities and potential overhead hazards will be encountered. Notify Underground Facilities Protection Organization (UFPO) 2 business days prior to excavating or drilling at 811 or (800) 962-7962 for utility stakeout.

### **4.3 Environmental Hazards**

Environmental factors such as weather, wild animals, insects, and irritant plants can pose a hazard when performing outdoor tasks. The SSO shall make every reasonable effort to alleviate these hazards should they arise.

#### **4.3.1 Heat Stress**

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. In particular:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Site workers will be encouraged to increase consumption of water or electrolyte-containing beverages such as Gatorade<sup>®</sup> when the potential for heat stress exists. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSO.

#### **4.3.2 Exposure to Cold**

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation.

### **5.0 SITE CONTROLS**

To prevent migration of contamination caused through tracking by personnel or equipment, work areas, and personal protective equipment staging/decontamination areas will be specified prior to beginning operations.

#### **5.1 Site Zones**

In the area where contaminated materials present the potential for worker exposure (work zone), personnel entering the area must wear the mandated level of protection for the area. A "transition zone" shall be established where personnel can begin and complete personal and equipment decontamination procedures. This can reduce potential off-site migration of contaminated media. Contaminated equipment or clothing will not be allowed outside the transition zone (e.g., on clean portions of the Site) unless properly containerized for disposal. Operational support facilities will be located outside the transition zone (i.e., in a "support zone"), and normal work clothing and support equipment are appropriate in this area. If possible, the support zone should be located upwind of the work zone and transition zone.

## 5.2 General

The following items will be requirements to protect the health and safety of workers during implementation of activities that disturb contaminated material.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination shall not occur in the work zone and/or transition zone during disturbance of contaminated material.
- Personnel admitted in the work zone shall be properly trained in health and safety techniques and equipment usage.
- No personnel shall be admitted in the work zone without the proper safety equipment.
- Proper decontamination procedures shall be followed before leaving the Site.

## 6.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE) which are or may be required at this job site. Personnel entering the work zone and transition zone shall be trained in the use of the anticipated PPE to be utilized.

### 6.1 Anticipated Protection Levels

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Site mobilization	D	
Site prep/construction of engineering controls	D	
Extrusive work (e.g., surveying, etc.)	D	
Intrusive work (e.g., excavation work, groundwater monitoring, etc.)	C/Modified D/D	Based on air monitoring, and SSO discretion
Support zone	D	
Site breakdown and demobilization	D	

It is anticipated that work conducted, when there is the potential for encountering residual contaminants, will be performed in Level D or modified Level D PPE. If conditions are encountered that require higher levels of PPE (e.g., Level C, B, or A), the work will immediately be stopped. The appropriate government agencies (e.g., NYSDEC, NYSDOH, etc.) will be notified and the proper health and safety measures will be implemented (e.g., develop and implement engineering controls, upgrade in PPE, etc.).

## **6.2 Protection Level Descriptions**

This section lists the minimum requirements for each protection level. Modifications to these requirements can be made upon approval of the SSO. If Level A, Level B, and/or Level C PPE is required, Site personnel that enter the work zone and/or transition zone must be properly trained and certified in the use of those levels of PPE.

### **6.2.1 Level D**

Level D consists of the following:

- Safety glasses
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Protective gloves during sampling or handling of potentially contaminated media
- Work clothing as prescribed by weather

### **6.2.2 Modified Level D**

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Work gloves
- Outer protective wear, such as Tyvek coverall [Tyveks (Sarans) and polyvinyl chloride (PVC) acid gear will be required when workers have a potential to be exposed to impacted liquids or impacted particulates].

### **6.2.3 Level C**

Level C consists of the following:

- Air-purifying respirator with appropriate cartridges
- Outer protective wear, such as Tyvek coverall [Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to impacted liquids or particulates].
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Nitrile, neoprene, or PVC overboots, if appropriate
- Nitrile, neoprene, or PVC gloves, if appropriate
- Face shield (when projectiles or splashes pose a hazard)

#### **6.2.4 Level B**

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator. Level B PPE is not anticipated to be required for this Site. If the need for level B PPE becomes evident, site activities will be ceased until site conditions are further evaluated, and any necessary modifications to the HASP have been approved by the PM and SSO. Subsequently, the appropriate safety measures (including Level B PPE) must be implemented prior to commencing site activities.

#### **6.2.5 Level A**

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure. Level A PPE is not anticipated to be required for this Site. If the need for level A PPE becomes evident, site activities will be ceased until site conditions are further evaluated, and any necessary modifications to the HASP have been approved by the PM and SSO. Subsequently, the appropriate safety measures (including Level A PPE) must be implemented prior to commencing site activities.

### **6.3 Respiratory Protection**

Any respirator used during activities associated with Site contaminants will meet the requirements of the OSHA 29 CFR 1910.134. Both the respirator and cartridges specified shall be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910). Air purifying respirators shall not be worn if contaminant levels exceed designated use concentrations. The workers will wear respirators with approval for: organic vapors <1,000 parts per million (ppm); and dusts, fumes and mists with a TWA < 0.05 milligram per meter cubed (mg/m<sup>3</sup>).

No personnel who have facial hair, which interferes with respirator sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use due to Site contaminants.

Only workers who have been certified by a physician as being physically capable of respirator usage shall be issued a respirator for work associated with Site contaminants. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas that require respirator protection in relation to Site contaminants.

## **7.0 DECONTAMINATION PROCEDURES**

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

## **7.1 Personnel Decontamination**

Personnel involved with activities that involve disturbing contaminated media will follow the decontamination procedures described herein to ensure that material which workers may have contacted in the work zone and/or transition zone does not result in personal exposure and is not spread to clean areas of the Site. This sequence describes the general decontamination procedure. The specific stages can vary depending on the Site, the task, and the protection level, etc.

1. Leave work zone and go to transition zone
2. Remove soil/debris from boots and gloves
3. Remove boots
4. Remove gloves
5. Remove Tyvek suit and discard, if applicable
6. Remove and wash respirator, if applicable
7. Go to support zone

## **7.2 Equipment Decontamination**

Contaminated equipment shall be decontaminated in the transition zone before leaving the Site. Decontamination procedures can vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steam cleaning the exterior of the equipment. Personnel performing this task will wear the proper PPE.

## **7.3 Disposal**

Disposable clothing will be treated as contaminated waste and be disposed of properly. Liquids (e.g., decontamination water, etc.) generated by activities involving residual Site contaminants will be disposed of in accordance with applicable local, state and federal regulations.

## **8.0 AIR MONITORING**

During activities that involve potential exposure to Site contaminants, air monitoring will be conducted in order to determine airborne particulate and contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered and that chemical contaminants are not migrating off-site. Additional air monitoring may be conducted at the discretion of the SSO. Readings will be recorded and available for review.

The following chart describes the direct reading instrumentation that will be utilized and appropriate action levels.

Monitoring Device	Action level	Response/Level of PPE
Photoionization Detector (PID) Volatile Organic Compound Meter	< 1 ppm in breathing zone, sustained 5 minutes	<u>Level D</u>
	1-25 ppm in breathing zone, sustained 5 minutes	<u>Level C</u>
	26-250 ppm in breathing zone, sustained 5 minutes	<u>Level B</u> , Stop work, evaluate the use of engineering controls
	>250 ppm in breathing zone	<u>Level A</u> , Stop work, evaluate the use of engineering controls
Real Time Aerosol Monitor (RTAM) Particulate Meter	<150 micrograms per meter cubed ( $\mu\text{g}/\text{m}^3$ ) over an integrated period not to exceed 15 minutes.	Continue working
	>150 $\mu\text{g}/\text{m}^3$	Cease work, implement dust suppression, change in way work performed, etc. If levels can not be brought below 150 $\mu\text{g}/\text{m}^3$ , then upgrade PPE to <u>Level C</u> .

## 8.1 Particulate Monitoring

During intrusive activities where contaminated materials may be disturbed on a large scale (e.g., during excavation through contaminated soil or fill), air monitoring will include real-time monitoring for particulates using an RTAM particulate meter at the perimeter of the work zone in accordance with Appendix 1B (Fugitive Dust and Particulate Monitoring) of the NYSDEC document entitled “DER-10, Technical Guidance for Site Investigation and Remediation” dated May 3, 2010. DER-10 uses an action level of 150  $\mu\text{g}/\text{m}^3$  (0.15  $\text{mg}/\text{m}^3$ ) over an integrated period not to exceed 15 minutes. If the action level is exceeded, or if visible dust is encountered, then work shall be discontinued until corrective actions are implemented. Corrective actions may include dust suppression, change in the way work is performed, and/or upgrade of personal protective equipment.

## 8.2 Volatile Organic Compound Monitoring

During activities where contaminated materials may be disturbed, a PID will be used to monitor total VOCs in the ambient air. The PID will prove useful as a direct reading instrument to aid in determining if current respiratory protection is adequate or needs to be upgraded. The SSO will take measurements before operations begin in an area to determine the amount of VOCs naturally occurring in the air. This is referred to as a background level. Levels of VOCs will periodically be measured in the air at active work sites, and at the transition zone when levels are detected above background in the work zone.



### 8.3 Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) includes real-time monitoring for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area when activities with the potential to release VOCs or residual Site contaminants on dust are in progress at the Site. This CAMP is based on the NYSDOH Generic CAMP included as Appendix 1A of DER-10. 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 the 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. Reliance on the CAMP should not preclude simple, common sense measures to keep VOCs, dust, and odors at a minimum around the work areas. Tentative CAMP air monitoring locations are shown on Figure 2.

**Continuous monitoring** will be conducted during ground intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, installation of monitoring wells, etc.

**Periodic monitoring** for VOCs will be conducted during non-intrusive activities such as the collection of groundwater samples from 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.

#### 8.3.1 VOC Monitoring, Response Levels, and Actions

VOCs must be monitored at the downwind perimeter of the immediate work area (i.e., the work 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. 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.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities must be temporarily halted and monitoring must be continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- 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 or 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.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

The 15-minute readings must be recorded and made available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

### **8.3.2 Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the work 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.

- If the downwind PM-10 particulate level (i.e., particulate matter less than 10 micrometers in diameter) is  $100 \mu\text{g}/\text{m}^3$  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  $150 \mu\text{g}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \mu\text{g}/\text{m}^3$  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  $150 \mu\text{g}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

Readings must be recorded and made available for NYSDEC, NYSDOH, and MCDPH personnel to review.

## **9.0 EMERGENCY RESPONSE**

To provide first-line assistance to field personnel in the case of illness or injury, the following items will be made immediately available on the Site:

- First-aid kit;
- Portable emergency eye wash; and
- Supply of clean water.

## 9.1 Emergency Telephone Numbers

The following telephone numbers are listed in case there is an emergency at the Site:

Fire/Police Department:	911
Poison Control Center:	(800) 222-1222
<u>NYSDEC</u>	
Charlotte B. Theobald	(585) 226-5351
Spills	(585) 226-2466
<u>NYSDOH</u>	
Melissa Doroski	(585) 402-7860
<u>MCDPH</u>	
Jeffrey Kosmala, P.E.	(585) 753-5470
<u>GENESEE MARINA, INC.</u>	
Steve Gibbs	(585) 663-8990
<u>DAY ENVIRONMENTAL, INC.</u>	
Jeff Danzinger	(585) 454-0210 x114
Ray Kampf	(585) 454-0210 x108
Nearest Hospital	Rochester General Hospital 1425 Portland Avenue Rochester, New York Hospital Telephone: (585) 922-4000 Emergency Dept. Telephone: (585) 922-5462
Directions to the Hospital:	West on Petten Street (0.1 miles). Turn south on Lake Avenue (3.8 miles). Turn east on Route 104E/Redge Road East (2.0 miles). Turn south on Carter Street (0.1 miles). (refer to Figure 1)

## 9.2 Evacuation

A log of each individual entering and leaving the Site should be kept for emergency accounting practices. Although unlikely, it is possible that a site emergency could require evacuating all personnel from the site. If required, the SSO will give the appropriate signal for site evacuation (i.e., hand signals, alarms, etc.).

All personnel shall exit the site and shall congregate in an area designated by the SSO. The SSO shall ensure that all personnel are accounted for. If someone is missing, the SSO will alert emergency personnel. The appropriate government agencies will be notified as soon as possible regarding the evacuation, and any necessary measures that may be required to mitigate the reason for the evacuation.

### **9.3 Medical Emergency**

In the event of a medical emergency involving illness or injury to one of the on-site personnel, the work area should be shutdown and immediately secured. The appropriate government agencies should be notified immediately. The area in which the injury or illness occurred shall not be entered until the cause of the illness or injury is known. The nature of injury or illness shall be assessed. If the victim appears to be critically injured, administer first aid and/or cardio-pulmonary resuscitation (CPR) as needed. Instantaneous real-time air monitoring shall be done in accordance with air monitoring outlined in Section 8.0 of this HASP.

### **9.4 Contamination Emergency**

It is unlikely that a contamination emergency will occur; however, if such an emergency does occur, the work area shall be shutdown and immediately secured. If an emergency rescue is needed, notify Police, Fire Department and Emergency Medical Service (EMS) Units immediately. Advise them of the situation and request an expedient response. The appropriate government agencies shall be notified immediately. The area in which the contamination occurred shall not be entered until the arrival of trained personnel who are properly equipped with the appropriate PPE and monitoring instrumentation as outlined in Section 8.0 of this HASP.

### **9.5 Fire Emergency**

In the event of a fire on-site, the work area shall be shutdown and immediately secured. The area in which the fire occurred shall not be entered until the cause can be determined. All non-essential site personnel shall be evacuated from the site to a safe, secure area. Notify the Fire Department immediately. Advise the Fire Department of the situation and the identification of any hazardous materials involved. The appropriate government agencies shall be notified as soon as possible.

The four classes of fire along with their constituents are as follows:

- Class A: Wood, cloth, paper, rubber, many plastics, and ordinary combustible materials.
- Class B: Flammable liquids, gases and greases.
- Class C: Energized electrical equipment.
- Class D: Combustible metals such as magnesium, titanium, sodium, potassium.

Small fires on-site may be actively extinguished; however, extreme care shall be taken while in this operation. All approaches to the fire shall be done from the upwind side if possible. Distance from on-site personnel to the fire shall be close enough to ensure proper application of the extinguishing material, but far enough away to ensure that the personnel are safe. The proper extinguisher shall be utilized for the Class(s) of fire present on the site. If possible, the fuel source shall be cut off or separated from the fire. Care must be taken when performing operations involving the shut-off valves and manifolds, if present.

Examples of proper extinguishing agent as follows:

- Class A: Water  
Water with 1% AFFF Foam (Wet Water)  
Water with 6% AFFF or Fluorprotein Foam  
ABC Dry Chemical
- Class B: ABC Dry Chemical  
Purple K  
Carbon Dioxide  
Water with 6% AFFF Foam
- Class C: ABC Dry Chemical  
Carbon Dioxide
- Class D: Metal-X Dry Powder

No attempt shall be made against large fires. These shall be handled by the Fire Department.

## **9.6 Spill or Air Release**

In the event of spills or air releases of hazardous materials on-site, the work area shall be shutdown and immediately secured. The area in which the spills or releases occurred shall not be entered until the cause can be determined and site safety can be evaluated. All non-essential site personnel shall be evacuated from the Site to a safe and secure area. The appropriate government agencies shall be notified as soon as possible. The spilled or released materials shall be immediately identified and appropriate containment measures shall be implemented, if possible. Real-time air monitoring shall be implemented as outlined in Section 8.0 of this HASP. If the materials are unknown, Level B protection is mandatory. Samples of the materials shall be acquired to facilitate identification.

## **9.7 Containerized Waste and/or Underground Storage Tanks**

In the event that unanticipated containerized waste (e.g., drums) and/or underground storage tanks (USTs) are located during intrusive activities, the work area shall be shutdown and immediately secured. The area where unanticipated containerized wastes and/or tanks are discovered shall not be entered until site safety can be evaluated. Non-essential Site personnel shall be evacuated from the Site to a safe and secure area. The appropriate government agencies shall be notified as soon as possible. The SSO shall monitor the area as outlined in Section 8.0 of this HASP.

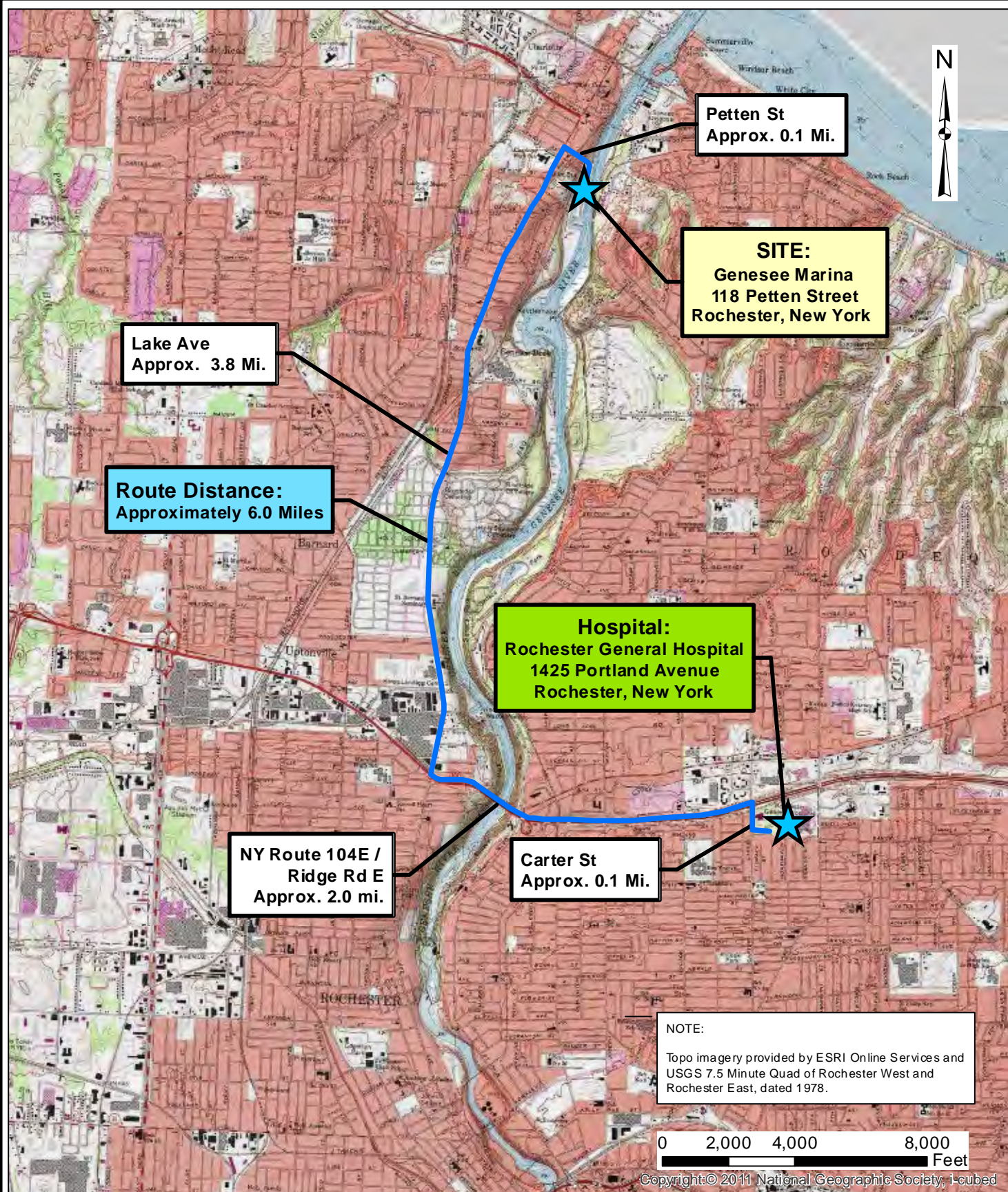
Prior to any handling, unanticipated containers will be visually assessed by the SSO to gain as much information as possible about their contents. As a precautionary measure, personnel shall assume that unlabelled containers and/or tanks contain hazardous materials until their contents are characterized. To the extent possible based upon the nature of the containers encountered, actions may be taken to stabilize the area and prevent migration (e.g., placement of berms, etc.). Subsequent to initial visual assessment and any required stabilization, properly trained personnel will sample, test, remove, and dispose of any containers and/or tanks, and their contents. After visual assessment and air monitoring, if the material remains unknown, Level B protection is mandatory.

## 10.0 ABBREVIATIONS

AST	Aboveground Storage Tank
BCP	Brownfield Cleanup Program
C&D	Construction and Demolition
CAMP	Community Air Monitoring Program
CPR	Cardio-Pulmonary Resuscitation
DAY	Day Environmental, Inc.
dBA	Decibels on the A-Weighted Scale
EMC	Environmental Management Council
EMS	Emergency Medical Service
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Health
MCDPH	Monroe County Department of Public Health
mg/m <sup>3</sup>	Milligram per Meter Cubed
NIOSH	National Institute of Occupational Safety and Health
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PM-10	Particulate matter less than 10 micrometers in diameter
PPE	Personal Protection Equipment
ppm	Parts Per Million
PVC	Polyvinyl Chloride
REL	Recommended Exposure Limit
RTAM	Real-Time Aerosol Monitor
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
TOGS	Technical and Administrative Guidance Series
TWA	Time-Weighted Average
µg/m <sup>3</sup>	Microgram Per Meter Cubed
UFPO	Underground Facilities Protection Organization
UST	Underground Storage Tank
VOC	Volatile Organic Compound

## FIGURES





<p>Date</p> <p>10-26-2012</p> <p>Drawn By</p> <p>CPS</p> <p>Scale</p> <p>AS NOTED</p>	<p><b>day</b>  <b>DAY ENVIRONMENTAL, INC.</b>                  Environmental Consultants                  Rochester, New York 14606                  New York, New York 10170</p>	<p>Project Title</p> <p>GENESEE MARINA                  118 PETTEN STREET                  ROCHESTER, NEW YORK                  (NYSDEC SITE NO. C828130)</p> <p>HEALTH AND SAFETY PLAN</p> <p>Drawing Title</p> <p>Route to Emergency Services</p>	<p>Project No.</p> <p>4742R-12</p> <p>FIGURE 1</p>
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<b>PROJECT NO.: 4742R-12  FIGURE 2</b>			
<b>PROJECT TITLE:</b> GENESEE MARINA 118 PETTEN STREET ROCHESTER, NEW YORK  <b>HEALTH AND SAFETY PLAN (NYSDEC SITE NO. C828130)</b>  <small>DRAWING TITLE:</small> <b>CAMP AIR MONITORING LOCATIONS</b>		 <p style="margin-top: -40px;"><b>DAY ENVIRONMENTAL, INC.</b> ENVIRONMENTAL CONSULTANTS 250 WEST HARTSHORN AVENUE NEW YORK, NEW YORK 10170</p>	
		REVISIONS	DATE BY
	Addition of Building #3 and Building #4		09/2011 CAH
	Change in designation of monitoring well GM-MW-3B to depict exceedance		09/2011 CAH
DESIGNED BY: <b>DJG</b> DATE <b>10-2012</b>		DRAWN BY: <b>CPS</b> DATE <b>10-2012</b>	
CHECKED BY: <b>RJM</b> DATE <b>10-2012</b>		APPROVED BY: <b>DDD</b> SCALE: <b>AS NOTED</b>	
PROJECT NAME: <b>DAY ENVIRONMENTAL, INC. DRAWING ALTERATION</b>		THIS DOCUMENT MAY NOT BE ALTERED OR REPRODUCED WITHOUT THE WRITTEN CONSENT OF DAY ENVIRONMENTAL, INC.	

## **APPENDIX B**

### **Quality Assurance Project Plan**

## QUALITY ASSURANCE PROJECT PLAN

This project-specific Quality Assurance Project Plan (QAPP) was prepared in accordance with Section 2.2 of the New York State Department of Environmental Conservation (NYSDEC) DER-10 document for NYSDEC Site ID C828130 (Site). The QAPP provides quality assurance/quality control (QA/QC) protocols and guidance that are to be followed when implementing the Remedial Action Work Plan (RAWP) associated with addressing the three reportedly closed-in-place underground storage tanks (USTs) located in proximity to the east wall of Building #6 on the Site. The QAPP is intended to ensure that data of a known and acceptable precision and accuracy are generated. The QAPP also provides a summary of the remedial project, identifies personnel responsibilities, and provides procedures to be used during sampling of environmental media, other field activities, and the analytical laboratory testing of samples. The components of the QAPP are provided herein.

### **1.0 Project Scope and Project Goals**

The QAPP applies to the aspects of the project associated with the collection of field data, the collection and analytical laboratory testing of field samples and QA/QC samples, and the evaluation of the quality of the data that is generated. Field activities covered by this QAPP include: test pitting to evaluate the potential presence, size, contents, and integrity of the reported USTs; completion of a remedial design investigation (RDI); and potential removal of the USTs and petroleum-contaminated soil.

### **2.0 Project/Task Organization**

Project organization and tentative personnel to implement the work are outlined in this section of the QAPP.

#### Principal in Charge

The Principal in Charge is responsible for review of project documents and ensuring the project is completed in accordance with relative work plans. Mr. David D. Day, P.E., a Day Environmental, Inc. (DAY) representative, will serve as the Principle-in-Charge on this project

#### Project Manager

The Project Manager has the overall responsibility for implementing the project and ensuring that the project meets the objectives and quality standards as presented in this QAPP. Mr. Jeffrey A. Danzinger, a DAY representative, will serve as the Project Manager on this project, and will serve as the primary point of contact and control for the project.

#### Quality Assurance Officer

The Quality Assurance Officer is responsible for QA/QC on this project. The Quality Assurance Officer's responsibilities on this project are not as a project manager or task manager involved with project productivity or profitability as job performance criteria. Mr.

Bart Kline, P.E., a DAY representative, will serve as the Quality Assurance Officer on this project. The Quality Assurance Officer may conduct audits of the operations at the site to ensure that work is being performed in accordance with the QAPP. A copy of Mr. Kline's resume is included as Attachment 1.

#### Technical Staff, Subconsultants and Subcontractors

DAY's technical staff for this project consists of experienced professionals (e.g., professional engineers, engineers-in-training, scientists, technicians, etc.) that possess the qualifications necessary to effectively and efficiently complete the project tasks. The technical staff will be used to gather and analyze data, prepare various project documentation, etc. Subconsultants and subcontractors used on this project will consist of firms and companies with experience in the services to be provided.

#### Analytical Laboratory

It is anticipated that Paradigm Environmental Services, with facilities at 179 Lake Avenue, Rochester, New York will be retained to complete the required analytical laboratory testing of samples as part of this project. Paradigm, is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory (ELAP ID10958).

Mr. Bruce Hoogesteger is the Technical Director for Paradigm. The technical director is responsible procedures used in the lab and the conduct of all lab personnel, and works in conjunction with the Laboratory Manager and Quality Assurance (QA) unit regarding QA and chain-of-custody requirements.

Ms. Rebecca Roztocil is the QA Officer and is responsible for the laboratory QA unit regarding QA elements of specific sample analyses tasks.

### **3.0 Sampling Procedures**

This section of the QAPP provides the protocols for in collection of samples.

#### Soil/Fill Sample Headspace Screening

Portions of selected soil/fill samples from test pits or test borings will be placed in sealable Ziploc<sup>®</sup>-type plastic baggies, and will be field screened the same day they are collected. Each sample will be agitated and homogenized for at least 30 seconds and allowed to equilibrate for at least three minutes. The ambient headspace air inside the baggie above each sample will be screened for total volatile organic compound (VOC) vapors with the photoionization detector (PID) equipped with a 10.6 eV lamp. The sampling port for the PID will be placed in the ambient air headspace inside the bag by opening a corner of the "locked" portion of the bag. The PID will monitor air inside the baggie for a period of at least 15 seconds and the peak readings measured will be recorded on a log sheet or log book.

### Contents Samples from Underground Storage Tanks

For each tank, a new dedicated disposable bailer and twine will be used to collect liquid samples. To the extent possible, samples will be collected from the entire column of liquid in the tank in order to look for different phases of liquid. If different phases exist, they will be characterized in the field, and different phases of liquid sample may be submitted for analytical laboratory testing if deemed warranted.

Depending upon the viscosity and thickness of solid (or sludge) contents, and also whether there is overlying liquid, sludge contents in tanks will be collected using one of the following methods: 1) bailer method described for liquids; or 2) stainless steel spoon, ladle or cup attached to a metal, wood or plastic rod or tank stick.

### Collection of Soil/Fill Samples from Test Pits

For stable test pits less than four feet deep, in-situ soil/fill grab samples may be collected by hand or with a disposable plastic or stainless steel trowel. For stable or unstable test pits, or test pits greater than four feet deep, an excavator or backhoe bucket of soil/fill will be excavated from the desired location within the test pit, and a soil/fill grab samples will be collected from above the teeth of the excavator or backhoe bucket.

### Collection of Soil/Fill Samples from Geoprobe Test Borings

Soil/fill samples will be collected using the Geoprobe MacroCore MC5 soil sampling system. This Geoprobe soil sampling technique will be implemented in accordance with the Standard Operating Procedure (SOP) included in Attachment 2.

### Collection of Groundwater Samples from Temporary Monitoring Wells

Static water level measurements will be obtained from each well using a Heron Model H.OIL oil/water interface probe (or equivalent). DAY will also look for light non-aqueous phase liquid (LNAPL) by using visual observations and the oil/water interface probe at each well location.

Groundwater in each well will then be purged by removing three well casings of water, or to dryness. The purging at each well will be completed using new dedicated disposable bailers and twine and/or new dedicated disposable polyethylene tubing attached to an aboveground electric or gas pump. Each well will be allowed to recharge to within 90% of its original static water level, and then a grab sample will be collected using a dedicated disposable bailer and twine. Specific conductivity, dissolved oxygen, pH, oxidation-reduction potential, temperature, and turbidity will also be measured on a portion of each groundwater sample using a Horiba U-22 water quality meter (or equivalent equipment).

The procedures and equipment used during the purging and groundwater sampling, and the field measurement data obtained, will be documented in the field and recorded on Monitoring Well Sampling Logs.

#### **4.0 Decontamination Procedures**

In order to reduce the potential for cross-contamination of samples collected during this project, the following procedures will be implemented to ensure that the data collected (primarily the laboratory data and field screening measurements) are acceptable.

It is anticipated that most of the materials used to assist in obtaining samples will be disposable one-use materials (e.g., sampling containers, bailers, rope, pump tubing, latex gloves, etc.). When equipment must be re-used (e.g., Geoprobe Macrocore sampler, oil/water interface meter, etc.), it will be decontaminated by at least one of the following methods:

- Steam clean the equipment; or
- Rough wash in tap water; wash in mixture of tap water andalconox-type soap; double rinse with deionized or distilled water; and air dry and/or dry with clean paper towel.

When deemed necessary, a temporary decontamination pad will be constructed of for decontamination of equipment. Any decontamination pad will be removed following completion of associated activities.

Decontamination liquids and disposable equipment and personal protective equipment will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums.

#### **5.0 Characterization and Disposal of RAWP-Derived Wastes**

RAWP-derived wastes will be characterized and disposed upon completion of the RAWP field activities in accordance with local, state and federal regulations.

- A sample of decontamination water will be tested for total purgeable organics using United States Environmental Protection Agency (USEPA) Method 624 and for semi-volatile compounds using USEPA Method 625. Depending upon the results, the water will be:
  1. Discharged to the sanitary sewer system under a sewer use permit;
  2. Pre-treated and then discharged to the sanitary sewer under a sewer use permit after obtaining acceptable effluent results,
  3. Disposed off-site; or
  4. Discharged on-site at an acceptable location if below NYSDEC Division of Water Technical and Administrative Guidance Series (TOGS 1.1.1) groundwater standards and guidance values, and approved by the NYSDEC.

Prior to any discharge of water to the sanitary sewer, the NYSDEC will be notified and provided with a copy of the sewer use permit.

- The results of soil/fill samples will be used to characterize solid RAWP-derived wastes for disposal. Additional analytical testing may be conducted to further characterize material, if required by a disposal facility.

## **6.0 Operation and Calibration of On-Site Monitoring Equipment**

The field personnel will be familiar with the equipment being used as presented in the subsections below.

### **6.1 VOC Monitoring Equipment**

Real-time monitoring for VOCs will be conducted to evaluate the nature and extent of petroleum at test locations and to determine the appropriate personal protective equipment as noted in the Health and Safety Plan (HASP) for the project. The primary field instrument for monitoring VOCs will be a PID. It is anticipated that a Minirae 2000 PID (or equivalent) equipped with a 10.6 eV lamp will be used during this project. During fieldwork, the PID will be calibrated on a daily basis in accordance with the manufacturer's specifications. Isobutylene gas will be used to calibrate the PID prior to use and as necessary during fieldwork. Measurements will be collected before operations begin in an area to determine the amount of VOCs naturally occurring in the air (i.e., background concentrations).

### **6.2 Particulate Monitoring Equipment**

Particulate monitoring will be conducted during intrusive activities as noted in the Community Air Monitoring Plan (CAMP) portion of the HASP. It is anticipated that the particulate air monitoring will be conducted using a real-time aerosol monitor (RTAM) particulate meter. During fieldwork, the particulate meter will be regularly calibrated in accordance with the manufacturer's specifications. Measurements will be collected along the upwind perimeter of the intrusive investigation activities to determine the amount of particulates naturally occurring in the air (i.e., background concentrations) as per the requirements of the CAMP.

### **6.3 Miscellaneous Field Monitoring Equipment**

Several other pieces of miscellaneous field monitoring equipment will be used as part of the project. It is anticipated that the other field monitoring equipment utilized during portions of the project include:

- A global positioning system (GPS);
- Survey equipment;
- An oil/water interface probe; and
- A Horiba U-22 water quality meter, or similar.

These meters will be calibrated, operated, and maintained in accordance with the manufacturer's recommendations.

## **7.0 Sample Handling and Custody Requirements**

During sampling activities, personnel will wear disposable latex or nitrile gloves. Between collection of samples, personnel performing the sampling will discard used latex gloves and put on new gloves to preclude cross-contamination between samples. As few personnel as possible will handle samples or be in charge of their custody prior to shipment to the analytical laboratory.

New laboratory-grade sample containers will be used to collect soil/fill and groundwater samples. Sufficient volume will be collected to ensure that the laboratory has adequate sample to perform the specified analyses.

Samples will be preserved as specified by the analytical laboratory for the type of parameters and matrices being tested. Sample holding times and preservation protocols will be adhered to during this project in accordance with Analytical Services Protocol (ASP) requirements.

### Chain-Of-Custody

Samples that are collected for subsequent testing as part of this project will be handled using chain-of-custody control. Chain-of-custody documentation will accompany samples from their inception to their analysis, and copies of chain-of-custody documentation will be included with the laboratory's report. The chain-of-custody will include the date and time the sample was collected, the sample identity and sampling location, the requested analysis, and any request for accelerated turnaround time.

### Sample Labels

Sample labels for field samples and quality control (QC) samples with adhesive backing will be placed on sample containers in order to identify the sample. Sample information will be clearly written on the sample labels using waterproof ink. Sufficient sample information will be provided on the label to allow for cross-reference with the field sampling records or sample logbook.

The following information will be provided on each sample label:

- Name of company;
- Initials of sampler;
- Date and time of collection;
- Sample identification;
- Intended analyses; and
- Preservation required.

### Custody Seals

Custody seals are preprinted adhesive-backed seals that are designed to break if disturbed. Seals will be signed and dated before being placed on the shipping cooler. Seals will be placed on one or more location on each shipping cooler as necessary to ensure security. Shipping tape will be placed over the seals on the coolers to ensure that the seals are not accidentally broken during shipment. Sample receipt personnel at the laboratory will check and document whether the seals on the shipping coolers are intact when received.



## Sample Identification

The following format will be used on the labels affixed to sample containers to identify samples:

Each sample will be numbered starting at 001, and continue in succession (i.e., 001, 002, 003, etc.). The sample test location will also be provided after the sample number using the following test location designations:

TP~~xx-xx-xx	Test Pit location with day/month/year
TMW~~xx-xx-xx	Test boring/temporary monitoring well location with day/month/year
GM-MW16-xx-xx-xx	Existing monitoring well location with day/month/year
TBxx-xx-xx-	Trip Blank with day/month/year
FBxx-xx-xx-	Field Blank (equipment rinsate) with day/month/year

## Transportation of Samples

Samples will be handled, packaged and shipped in accordance with applicable regulations, and in a manner that does not diminish their quality or integrity. Samples will be delivered to the laboratory no later than 48 hours from the day of collection.

## **7.0 Analytical Quality Assurance/Quality Control**

Analytical laboratory testing will be completed by Paradigm (NYSDOH ELAP ID #110958). The analytical laboratory test results for soil/fill samples and groundwater samples will be reported in NYSDEC ASP Category B deliverable reports. Analytical laboratory test results for soil samples will be reported on a dry-weight basis. Paradigm will analyze the samples using the lowest practical quantitation limits (PQLs) possible.

Paradigm's preventative maintenance procedures and calibration procedures for laboratory equipment are provided in its Quality Assurance Plan (QAP) included in Attachment 3.

Paradigm will provide internal QA/QC checks that are required by NYSDEC ASP, USEPA Contract Laboratory Protocol (CLP) protocol and/or USEPA SW846, such as analyses performed, spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Laboratory reports will be reviewed by the laboratory as outlined in its Quality Manual, and also by the Quality Assurance Officer.

Laboratory results will be compared to data quality indicators in accordance with Paradigm's QAP and NYSDEC ASP. Data quality indicators include: precision, accuracy, representation, completeness, and comparability.

The analytical methods to be used for each type of sample and sample matrix are identified on Table 1 included in Attachment 4. These exclude additional analytical methods that may be required by regulated disposal facilities for the purposes of waste disposal. As shown, sample methods include the following:

- NYSDEC Spill Technology and Remediation Series (STARS)-list VOCs including Tentatively Identified Compounds (TICs) using USEPA Method 8260 for soil/fill, groundwater, and QA/QC samples.
- NYSDEC STARS-list semi-volatile organic compounds (SVOCs) including TICs using USEPA Method 8270 for soil/fill and QA/QC samples.
- Total purgeable organics using USEPA Method 624 for decontamination and purge water samples.
- SVOCs using USEPA Method 625 for decontamination and purge water samples.

In order to provide control over the collection, analysis, review, and interpretation of analytical laboratory data, the following QA/QC samples will be included as part of this project (refer to Table 1 in Attachment 4):

- One trip blank per 20 liquid samples, or per shipment if less than 20 samples, when the shipment contains liquid field samples (i.e., groundwater samples) that are to be analyzed by Paradigm for VOCs (excludes waste characterization samples). The trip blank will be analyzed for NYSDEC STARS-list VOCs and TICs using USEPA Method 8260.
- One matrix spike/matrix spike duplicate (MS/MSD) for each sample matrix, for each sampling event of 20 samples, or per shipment if less than 20 samples, within a seven-day period (excludes waste characterization samples). Specific parameters that MS/MSD samples will be tested for by Paradigm is dependent upon the test parameters of the field samples that are being analyzed.
- One field blank (i.e., rinsate sample) will be collected from reusable sampling equipment for each sampling event of 20 samples, or per shipment if less than 20 samples (excludes waste characterization samples). The field blank(s) will be tested for the test parameters of the samples that are being analyzed by Paradigm. It is anticipated that a field blank will be collected from the excavator/backhoe bucket used during the test pit work, and from the MacroCore cutting shoe used during the test boring work.

#### Data Usability Summary Report

Data Usability Summary Reports (DUSRs) will be completed on the soil/fill and groundwater sample analytical laboratory data that is generated as part of the scope of work in the RAWP. The DUSR will be conducted in accordance with the provisions set forth in Appendix 2B of the DER-10 Technical Guidance for Site Investigation and Remediation dated May 3, 2010. The findings of the DUSR will be incorporated in the RDI report. DUSRs will be completed by a qualified entity or individual that is approved by the NYSDEC.

## Reporting

Analytical and QC data will be included in the RDI report. The RDI report will summarize the RDI work and provide evaluation of the data that is generated, including the validity of the results in the context of QA/QC procedures.

### **8.0 Record Keeping and Data Management**

DAY will document project activities in a bound field book on a daily basis. Information that will be recorded in the field book will include:

- Dates and time work is performed;
- Details on work being performed;
- Details on field equipment being used;
- Visual and olfactory observations during field activities;
- Field meter measurements collected during monitoring activities;
- Sampling locations and depths;
- Measurements of sample locations, and test locations, excavations, etc.;
- Personnel and equipment on-site;
- Weather conditions; and
- Other pertinent information as warranted.

Additionally, DAY will record information from test locations on designated logs (e.g., test pit logs, test boring logs, well construction diagrams, etc.). Groundwater sampling data will also be presented on designated logs. Blank copies of these logs are included in Attachment 5.

The analytical data will be reported as electronic data deliverables (EDDs) and as hard copies. EDDs will include NYSDEC EQUIS files. A differential GPS, swing ties from existing surveyed site structures, and/or a laser level will be used to collect spatial data. The spatial data will be plotted using integrated geographic information system (GIS) and/or computer-aided design (CAD) mapping. Electronic and hard copy files will be maintained by DAY.

## **ATTACHMENT 1**

### **Resume**

## BARTON F. KLINE, P.E.

### EXPERIENCE

Day Environmental, Inc.: April 1992 to present  
Years with Other Firms: 4 years

### AREAS OF SPECIALIZATION

- Remedial Services
- Environmental Facilities Design and Design/Build Services

### EDUCATION

University of Rochester, B.S. Chemical Engineering, 1987  
University of California at Berkeley, Graduate Coursework, Chemical Engineering

### REGISTRATIONS/AFFILIATIONS

- Registered Professional Engineer in State of New York
- 40 Hour OSHA Hazardous Waste Site Worker Training
- Member, Water Environment Federation
- Member, National Fire Protection Association

### RESPONSIBILITIES AND PROJECT EXPERIENCE

Mr. Kline has 22 years of professional experience. At Day Environmental, he is primarily responsible for engineering, design, and project coordination for the installation of environmental facilities and support systems. Areas of expertise include soil and groundwater remedial treatment, water and wastewater treatment, chemical and petroleum bulk handling facilities, industrial ventilation and air pollution control, and solid waste management. Representative projects are described below.

#### *Soils and Groundwater Remedial Projects*

**Brownfields Remedial Cleanup at Former General Circuits Site, Rochester, New York.** Current Project Manager responsible for ongoing remedial project in cooperation with NYSDEC and NYSDOH involving design and installation of multiple engineering controls, including carbon air filtration (only known site in this region for which this was approved) to address soil vapor intrusion within a large, complex industrial site encompassing over a dozen current industrial tenants. Also responsible for design and installation of a groundwater extraction and treatment system for this same site incorporating a novel and untested groundwater treatment technology for contaminant removal developed by professors at Cornell University.

**Soil Vapor Intrusion Mitigation at Old Millhouse Restaurant, Gorham, New York.** Project Engineer for design and installation of vapor barrier and subslab ventilation system in basement and crawlspace of a turn-of-the-century building currently utilized as an active restaurant. Vapor barrier was a custom design (fiber-reinforced thinset concrete with shallow vapor collection system) to accommodate limited access and headspace requirements, and work was completed with no disruption to restaurant business.

**General Motors Corp. Harrison Radiator Division Facility Remedial Investigation, Lockport, New York.** Project Engineer for state-mandated contaminant site investigation at a contaminated automotive industrial manufacturing site, including well installation, data acquisition and interpretation, and preparation of reports assessing degree and sources of contamination, and remedial recommendations. Also assisted in construction review of wastewater treatment system and outfall renovation.

## BARTON F. KLINE, P.E.

**Superfund Site Assessments/Remedial Investigations at Love Canal, Niagara Falls, New York.** Project Engineer responsible for on-site coordination of hazardous waste sampling and treatability testing activities and assisting in various site waste characterization evaluations.

**Other Remedial Systems Designs.** Senior Engineer responsible for design of multiple other NYSDEC and NYSDOH-compliant soil-vapor extraction, bioventing, active and passive ventilation systems, and groundwater treatment systems at various industrial, commercial and residential sites throughout New York.

### *Facilities Design*

**Metro-North Railroad Transportation Facilities, New York, New York.** Project Manager / Senior Engineer for design and/or installation of multiple facility systems since 1992, including:

- wastewater transfer and aeration facilities (Brewster, NY) – discharge agreement was negotiated with Town to eliminate significant trucking costs, and over one mile of new sewer, pump station, screening and aeration facilities were installed.
- stormwater pump and treatment system to recover spilled oil from locomotive fueling pad runoff (Harmon, NY) – system eliminates disposal costs, and oil is recovered for burning in facility heaters, reducing heating costs. Also performed inflow and infiltration study and testing upon 35-acre yard drainage system at this site.
- membrane filtration industrial wastewater treatment system (White Plains, NY)
- fixed-film biological industrial wastewater treatment system (Harmon, NY)
- physical-chemical wastewater treatment system for chelated metals removal (New Haven, CT)
- 200,000-gallon diesel fuel storage tank and remote filling station (Harmon, NY)
- lube and waste oil handling, transport and storage facilities (Harmon, NY)

**Saint-Gobain Technical Fabrics Thermal Oxidation System, Albion, New York.** Project Manager / Senior Engineer for \$900,000 design-build project involving installation of a 50,000 CFM ventilation system and regenerative thermal oxidizer to remove VOC emissions from manufacturing operations.

**Corning-Tropel Optics Manufacturing Facility, Fairport, New York.** Project Manager and Senior Engineer responsible for: (i) design and implementation of multiple ventilation, process exhaust, and particulate and organic vapor removal systems associated with production operations; (ii) design and implementation of closed-loop heated and chilled process water supply systems and HVAC control systems (multi-zone temp. control maintains temp. within tenths of a degree for temperature-sensitive precision optics manufacturing operations); and (iii) design and implementation of an evaporative waste treatment system to reduce waste disposal costs.

**Rochester Gas & Electric Corp., Rochester, New York.** Senior engineer responsible for: (i) engineering and design of containment and stormwater overflow structures at seven local electrical substations; (ii) water treatment and conveyance systems to support hydroelectric facility work (five pump stations involved @ 350 GPM each); and (iii) computer modeling and development of certified Spill Prevention Control and Countermeasures Plan covering 162 electric substations and hydroelectric facilities throughout western New York.

**Teledyne CAE Aeronautical Defense Plating Facility, Toledo, Ohio.** Project Manager and Senior Engineer for military facility projects totaling approximately \$700,000 involving: (i) waste source evaluation, segregation, and waste minimization activities; (ii) renovation, upgrade and automation of wastewater treatment system and equipment to handle current waste stream; and (iii) installation of additional air pollution control equipment for source control of metal finishing process air emissions.

## **ATTACHMENT 2**

### **Geoprobe MacroCore Soil Sampling SOP**

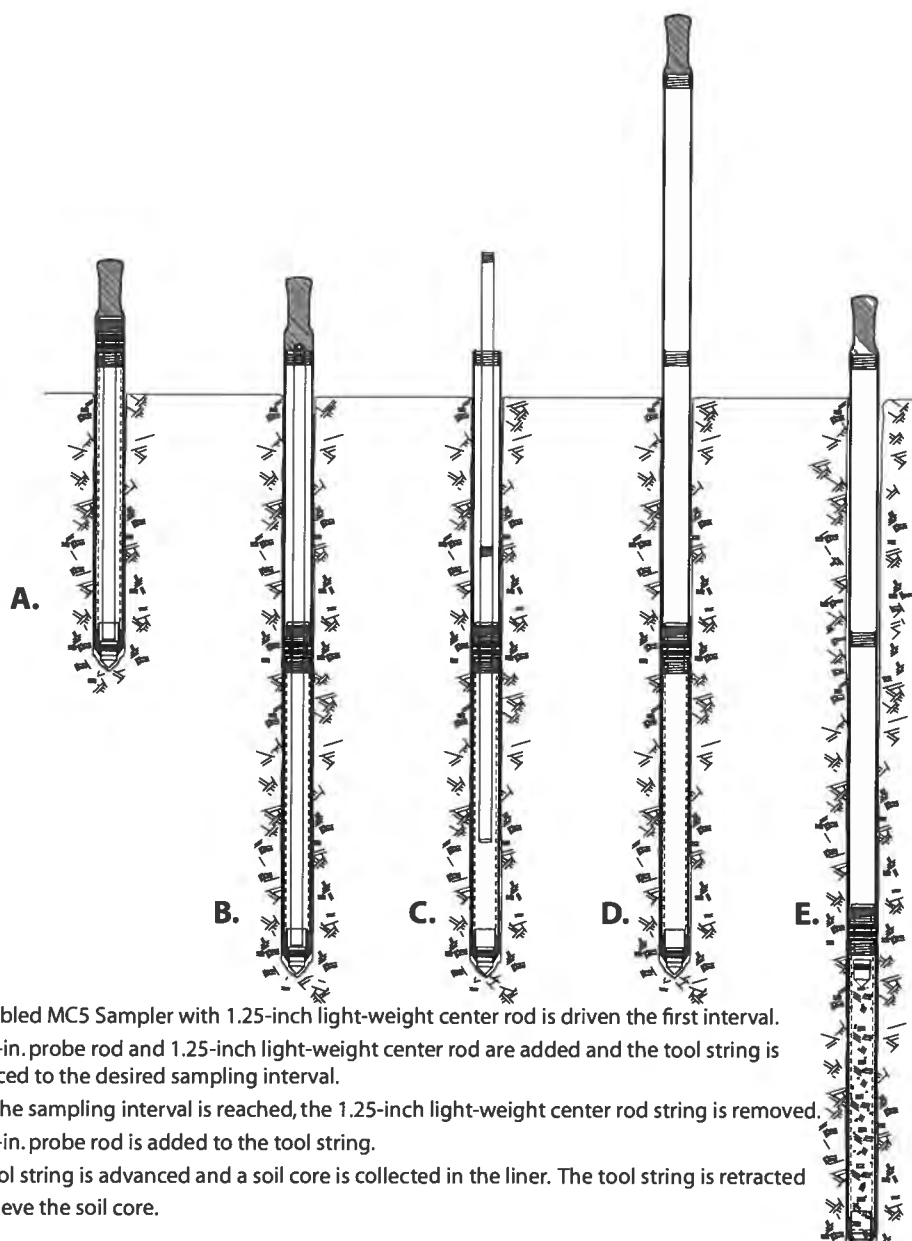
# **GEOPROBE® MACRO-CORE® MC5**

## **1.25-INCH LIGHT-WEIGHT CENTER ROD SOIL SAMPLING SYSTEM**

### **STANDARD OPERATING PROCEDURE**

**Technical Bulletin No. MK3139**

**PREPARED: January, 2011**



### **OPERATION OF THE MACRO-CORE® MC5 SOIL SAMPLING SYSTEM**





**Geoprobe® and Geoprobe Systems®, Macro-Core®, and Direct Image®  
are Registered Trademarks of Kejr, Inc., Salina, Kansas**

**Macro-Core® and Large Bore Soil Samplers  
manufactured under US Patent 5,606,139.**

**Macro-Core® Closed-Piston Drive Point  
manufactured under US Patent 5,542,481**

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## 1.0 OBJECTIVE

The objective of this procedure is to collect a representative soil sample at depth and recover it for visual inspection and/or chemical analysis.

## 2.0 BACKGROUND

### 2.1 Definitions

**Geoprobe®:** A brand name of high quality, hydraulically-powered machines that utilize both static force and percussion to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe Systems®, Salina, Kansas. Geoprobe® tools are used to perform soil core and soil gas sampling, groundwater sampling and testing, soil conductivity and contaminant logging, grouting, and materials injection.

*\*Geoprobe® and Geoprobe Systems® are registered trademarks of Kejr, Inc., Salina, Kansas.*

**Macro-Core® MC5 Soil Sampler\*\*:** A solid barrel, direct push device for collecting continuous core samples of unconsolidated materials at depth. Although other lengths are available, the standard Macro-Core® MC5 Sample Tubes come in lengths of 48 inches and 60 inches with an outside diameter of 2.25 inches. Samples are collected inside a removable liner. The Macro-Core® MC5 Sampler may be used in an open-tube or closed-point configuration.

*\*\*Macro-Core® is a registered trademarks of Kejr, Inc., Salina, Kansas.*

**Liner:** A removable/replaceable, thin-walled tube inserted inside the Macro-Core® MC5 sample tube for the purpose of containing and storing soil samples. While other lengths are available, the most common Macro-Core® MC5 Liners are 48 inches and 60 inches in length. The liner length should correspond to the length of the sample tube used. Liner materials include stainless steel, Teflon®, and PVC.

**1.25-inch Light-Weight Center Rods:** Used as the inner Rod String for Macro-Core® MC5 sampling. 1.25-inch Light-Weight Center rods come in lengths of 48 inches and 60 inches. They provide a weight reduction of up to 64% over standard 1.25-inch probe rods.

### 2.2 Discussion

In this procedure, an assembled Macro-Core® MC5 Soil Sampler is driven one sampling interval into the subsurface and retrieved using a Geoprobe® direct push machine. The collected soil core is removed from the sampler along with the used liner. After decon, the Macro-Core® sampler is reassembled using a new liner. The clean sampler is then advanced back down the same hole to collect the next soil core. The Macro-Core® Sampler may be used as an open-tube or closed-point sampler.

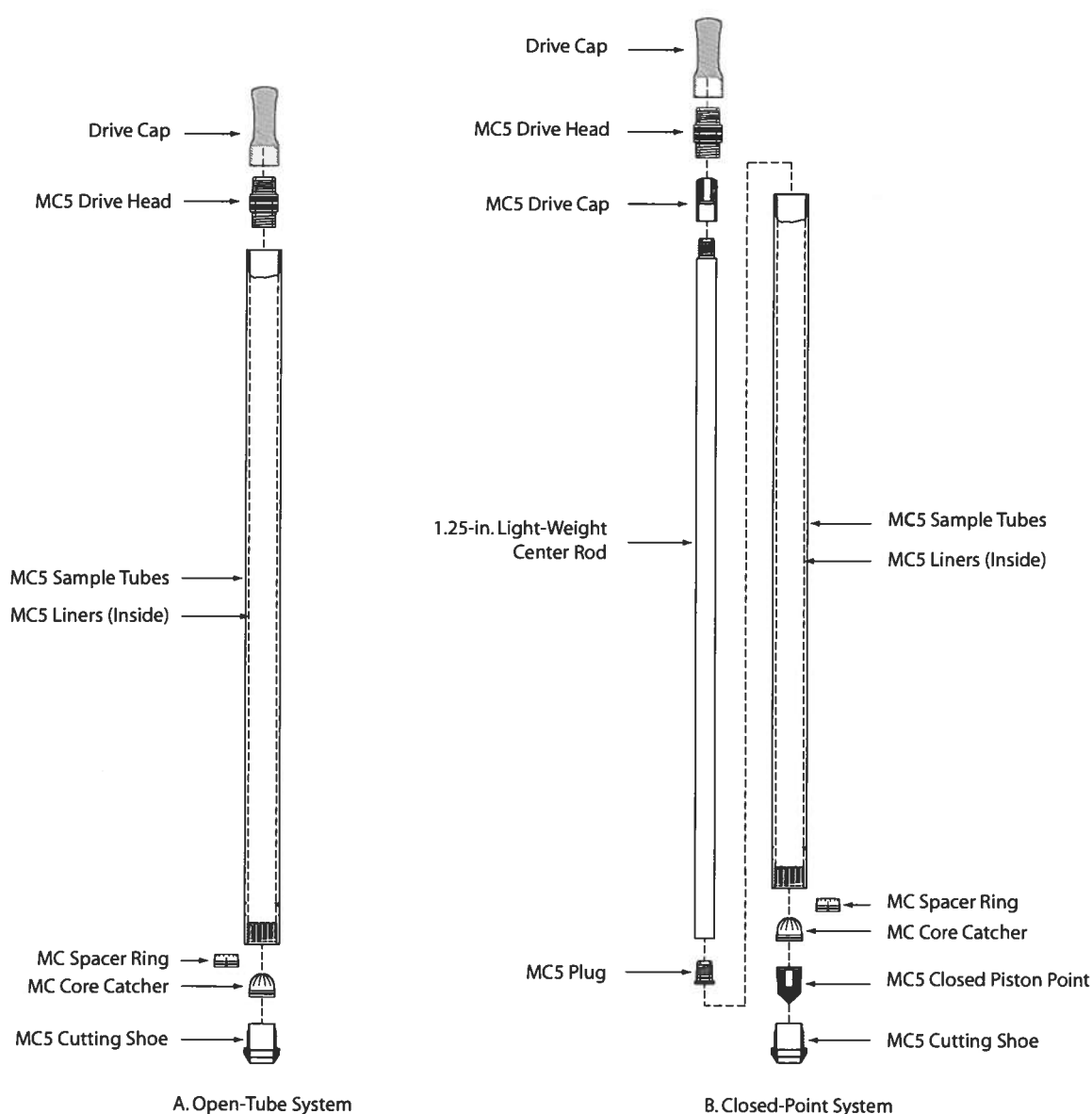
The Macro-Core® MC5 Soil Sampler is commonly used as an open-tube sampler (Fig. 2.1A). In this configuration, coring starts at the ground surface with a sampler that is open at the leading end. The sampler is driven into the subsurface and then pulled from the ground to retrieve the first soil core. In stable soils, an open-tube sampler is advanced back down the same hold to collect the next core.

In unstable soils which tend to collapse into the core hold, the Macro-Core® MC5 Sampler can be equipped with a 1.25-inch Center Rod Closed-Point assembly (Fig 2.1B). The point fits firmly into the cutting shoe and is held in place by the 1.25-inch light-weight center rods. The Macro-Core® MC5 Center Rod System prevents collapsed soil from entering the sampler as it is advanced to the bottom of an existing hole, thus ensuring collection of a representative sample. Once the 1.25-inch light weight center rod system is removed, the point

will be pushed up the liner during the next sampling interval. The point assembly is later retrieved from the sampler with the liner and soil core.

The Macro-Core® MC5 Soil Sampler is a true discrete sampler. It can be driven through undisturbed soil to a desired depth using the 1.25-inch Light Weight Center Rod System. Once the 1.25-inch light-weight center rods are removed, a representative sample is recovered from the desired depth.

Loose soils may fall from the bottom of the sampler as it is retrieved from depth. The MC Core Catcher (Fig. 3.1) alleviates this problem. Excellent results are obtained when the core catcher is used with saturated sands and other non-cohesive soils. A core catcher should not be used with tight soils as it may actually inhibit sample recovery. In that case, a MC Spacer Ring or extended shank cutting shoe can be used. Constructed of PVC, the core catcher is suitable for use with all Geoprobe® liners.



**Figure 2.1**  
**Macro-Core® MC5 Soil Sampler Configurations**

### 3.0 TOOLS AND EQUIPMENT

The following tools and equipment can be used to recover representative soil cores with the MC5 Soil Sampling System. Sample tubes, 1.25-inch light-weight center rods, probe rods, and liners all need to be of equal length in order to obtain a sample. Refer to Figure 3.1 for identification of the specified parts. Additional tooling options are available in Appendix A.

<b><u>MC5 Sampler Parts</u></b>	<b><u>Part Number</u></b>
MC5 Drive Head, 2.25 in. bored .....	28646
MC5 Drive Head, 2.125 in. bored .....	23640
MC5 Sample Tubes, 60 in.....	22992
MC5 Sample Tubes, 48 in.....	22923
MC5 Sample Tubes, 1 m.....	24239
MC5 Sample Tubes, 36 in.....	24238
MC5 Sample Tubes, 24 in.....	24237
MC5 Cutting Shoe, standard, 2.25 in. OD.....	22922
MC5 Cutting Shoe, undersized, 1.35 in. ID.....	23957
MC5 Cutting Shoe, standard, 2.25 in. OD (extended shank) .....	23978
MC5 Cutting Shoe, undersized, 1.35 in. ID (extended shank).....	28237
MC5 Cutting Shoe, undersized, 1.25 in. ID (extended shank).....	26078
MC5 Cutting Shoe, Heavy Duty, 1.35 in. ID, .....	29552
MC5 Closed Piston Point, standard.....	28113
MC5 Closed Piston Point, undersized .....	26865

<b><u>Center Rods (1.25 in.) and Center Rod Accessories</u></b>	<b><u>Part Number</u></b>
1.25-in. Center Rod, 60 in. Lightweight.....	27600
1.25-in. Center Rod, 48 in. Lightweight.....	21900
Probe Rod, 1.25 in. x 1 m.....	AT1239
Probe Rod, 1.25 in. x 36 in.....	AT1236
Probe Rod, 1.25 in. x 24 in.....	AT1224
MC5 Drive Cap, 1.25 in. Center Rod, Threadless.....	23639
MC5 Plug Threaded, 1.25 in.....	23641
1.25 in. Pull Cap.....	AT1204

<b><u>Probe Rods and Probe Rod Accessories</u></b>	<b><u>Part Numbers for Specific Probe Rod OD</u></b>	
	<b><u>2.25-in. OD</u></b>	<b><u>2.125-in. OD</u></b>
Probe Rod, 60 in.....	25301 .....	AT2160
Probe Rod, 48 in.....	25300 .....	AT2148
Probe Rod, 1 m.....	25352 .....	AT2139
Probe Rod, 2.125 in. x 36 in. ....	.....	AT2136
Probe Rod, 2.125 in. x 24 in. ....	.....	13072
Drive Cap, GH60 Series, Threadless.....	31530 .....	8397
Drive Cap, GH40 Series, Threadless .....	31405 .....	
Drive Cap, GH40 Series, Threaded.....	.....	AT2101
Pull Cap.....	25298 .....	AT2104

<b><u>MC5 Liners, Accessories, and Miscellaneous Tools</u></b>	<b><u>Part Number</u></b>
MC Liners, 60 in. (66 liners).....	10074
MC Liners, 48 in. (66 liners).....	AT927K
MC Liners, 1 m. (66 liners).....	AT928K
MC Liners, 36 in. (66 liners).....	AT921K
MC Liners, 24 in. (66 liners).....	AT926K
MC Core Catcher .....	AT8531
MC Spacer Ring .....	AT8532
MC Spacer Ring (Bulk Box of 500).....	AT8533K
Vinyl End Caps (Package of 66).....	AT726K
Liner Cutter .....	AT8010
Universal Liner Holder.....	22734
Rod Wiper Weldment .....	23633
Rod Wiper Doughnuts, 2.125-in and 2.25-in.....	26876
Two Pipe Wrenches	



MC5 Drive Cap, 1.25-in.  
Center Rod, Threadless  
(23639)



Light-Weight  
Center Rods, 1.25-in.  
60-in. (27600)  
48-in. (21900)

Probe Rods, 1.25-in.  
1 m. (AT1239)  
36-in. (AT1236)  
24-in. (AT1224)



MC5 Plug Threaded,  
1.25-in. (23641)

Drive Cap, GH40  
Threadless, 2.25-in.  
(31405)



Drive Cap, GH40  
Threaded, 2.125-in.  
(AT2101)



MC5 Drive Head  
2.25-in. (28646)  
2.125-in. (23640)



MC Core Catcher  
(AT8531)



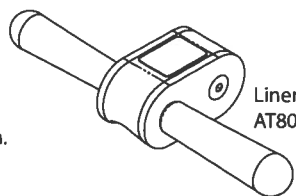
MC5 Closed Piston Point,  
Standard  
(28113)



MC5 Cutting Shoe,  
Standard, 1.5-in. ID  
(22922)



MC5 Cutting Shoe,  
Heavy Duty, 1.35-in. ID  
(29552)



Liner Cutter  
AT8010



Drive Cap, GH60  
Threadless, 2.25-in.  
(31530)



MC Spacer Ring  
(AT8532)



MC5 Closed Piston Point,  
Undersized  
(26865)



MC5 Cutting Shoe,  
Standard, Extended Shank,  
1.5-in. ID  
(23978)



MC5 Cutting Shoe,  
undersized, Extended Shank,  
1.35-in. ID  
(28237)



MC5 Cutting Shoe,  
Undersized, Extended  
Shank, 1.25-in. ID  
(26078)

Universal Liner Holder  
(22734)

MC Liners  
60-in. (10074)  
48-in. (AT927K)  
1 m. (AT928K)  
36-in. (AT921K)  
24-in. (AT926K)



MC5 Sample Tube  
60-in. (22992)  
48-in. (22923)  
1 m. (24239)  
36-in. (24238)  
24-in. (24237)



**Figure 3.1**  
**Macro-Core® MC5 Soil Sampler Parts**

### 3.1 Tool Options

Five major components of the MC5 Soil Sampling System are sample tubes, probe rods, 1.25-inch light-weight center rods, sample liners, and cutting shoes. These items are manufactured in a variety of sizes to fit the specific needs of the operator. This section identifies the specific tool options available for use with the MC5 Soil Sampling System.

#### ***Sample Tubes***

MC5 Sample tubes come in lengths of 60 inches (1524 mm), 48 inches (1219 mm), 1 meter, 36 inches (914 mm), and 24 inches (610 mm).

#### ***Probe Rods***

Standard Geoprobe® 2.125-inch and 2.25-inch OD probe rods are required to operate the MC5 Soil Sampling System. The specific length of rods may be selected by the operator. The most common rod lengths used in MC5 Soil Sampling are the 60-inch and 48-inch rods.

#### ***1.25-inch Light-Weight Center Rods***

1.25-inch Light-Weight Center Rods (1.25-inch / 32-mm OD) are recommended for the inner rod string of the MC5 system when utilizing an outer casing of 48- or 60-inch long rods. Choose the light-weight rod length that matches the length of rods used for the outer casing (48-inch light-weight rods with 48-inch outer casing, etc.). Currently, standard Geoprobe® 1.25-inch probe rods must be used with 24-inch, 36-inch, and 1-meter MC5 Sample Tubes.

A weight reduction of up to 64% is provided by the 1.25-inch Light-Weight Center Rods over standard 1.25-inch probe rods. As a result, considerably less energy is expended when retrieving the 1.25-inch Light-Weight Center Rods from within the outer casing during operation of the MC5 System.

#### ***Sample Liners***

Sample liners are made of heavy-duty clear plastic for convenient inspection of the soil sample. Nominal lengths of 24 inches, 36 inches, 1 meter, 48 inches, and 60 inches are available. Choose the liner length corresponding to the length of the sample tube used (e.g. 60-inch liners with 60-inch sample tubes).

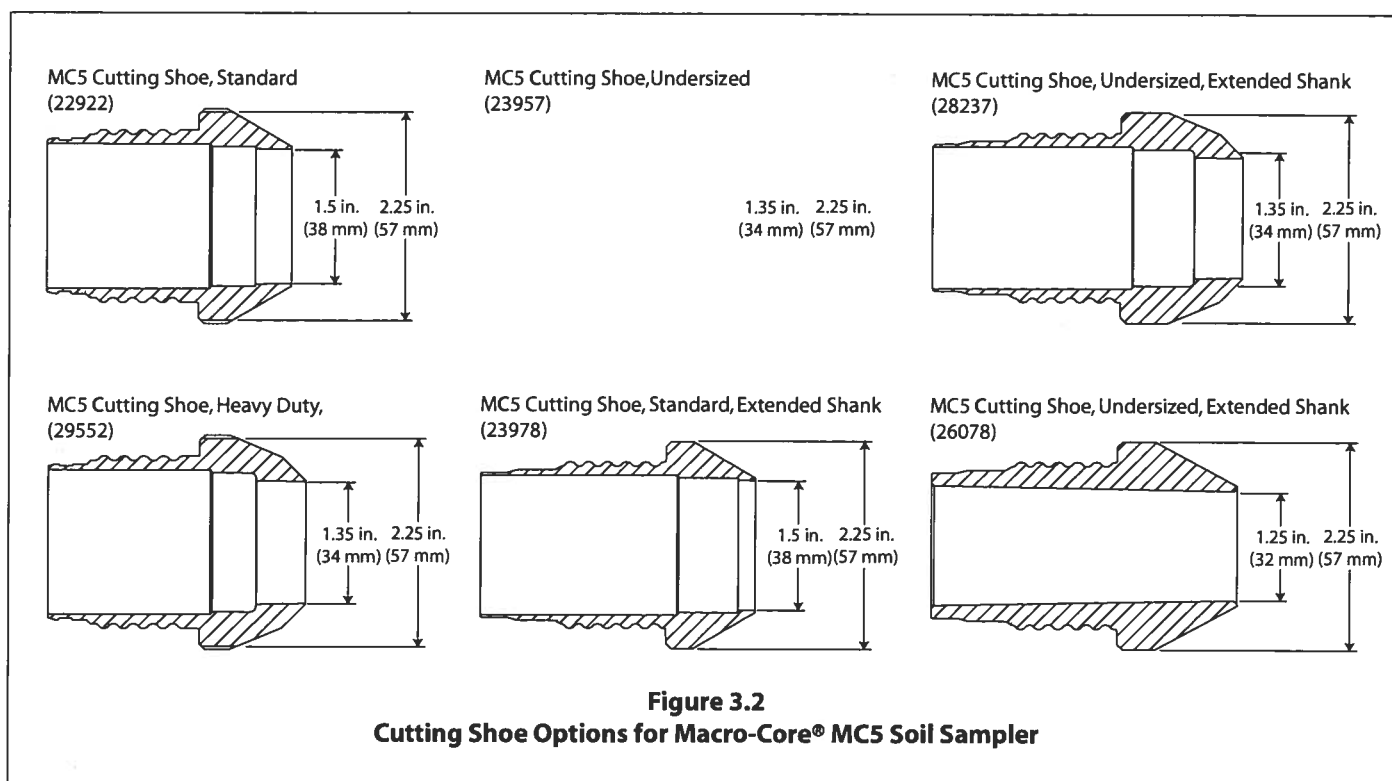
#### ***Cutting Shoes***

Six cutting shoes are available for use with the MC5 Soil Sampling System (Fig. 3.2). The extended shank cutting shoes (23978, 28237, and 26078) fit inside the sample liner and help soil pass freely into the liner. The other three cutting shoes (22922, 23957, 29552) require an MC Core Catcher (AT8531) or MC Spacer Ring (AT8532) in order to properly connect to the sample liners.

The most prominently used cutting shoes are the two "standard" cutting shoes (22922 and 23978). These cutting shoes collect a 1.5-inch (38-mm) diameter soil core.

Undersized cuttings shoes (23957, 28237, and 29552) collect a smaller 1.35-inch (34-mm) soil core and are used in formations with plastic clays or other soil types that lead to overfilling of the sampler liner. Of these, the 29552 and 28237 cutting shoes are also thicker at the leading end for increased durability in harsh conditions where cobbles or large gravel are present.

Soil formations with highly plastic clays may call for an even smaller soil core. In these conditions, a 26078 cutting shoe with its 1.25-inch (32-mm) soil core is most effective.



## 4.0 OPERATION

All parts shown in illustrations are those most commonly used configuration for the MC5 Sampling System. Refer to Section 3.0 for part numbers and additional tooling options.

### 4.1 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system according to project requirements. Parts should be inspected for wear or damage at this time. During sampling, a clean new liner is used for each soil core.

Cleaning inside the probe rods and MC5 sample tubes is accomplished with the nylon brushes and extension rods listed in Appendix A. Thread a nylon brush and handle onto an extension rod of suitable length. Using clean water and phosphate-free soap, cycle the brush inside the probe rod or sample tube to remove contaminants. Rinse with clean water and allow to air dry.

### 4.2 Field Blank

It is suggested that a field blank be taken on a representative sample liner prior to starting a project and at regular intervals during extended projects. Liners can become contaminated in storage. A field blank will prove that the liners do not carry contaminants which can be transferred to soil samples. The following information is offered as an example method which may be used to take a field blank. Make the appropriate modifications for the specific analytes of interest to the investigation.

#### *Example Procedure Required Equipment*

MC Liner .....	(1)	Distilled Water.....	(100 ml)
MC Vinyl End Caps .....	(2)	VOA Vial (or other appropriate sample container).....	(1)

1. Place a vinyl end cap on one end of the liner.
2. Pour 100 milliliters of distilled water (or other suitable extracting fluid) into the liner.
3. Place a vinyl end cap on the open end of the liner.
4. From the vertical position, repeatedly invert the liner so that the distilled water contacts the entire inner surface. Repeat this step for one minute.
5. Remove one end cap from the liner, empty contents into an appropriate sample container, and cap the container.
6. Perform analysis on the extract water for the analytes of interest to the investigation.

#### 4.3 Open-Tube Sampler Assembly

##### 1a. Using the MC Core Catcher

Place the open end of an MC Core Catcher over the threaded end of an MC5 Cutting Shoe (22992, 23957, 29552) as shown in Figure 4.2. Apply pressure to the core catcher until it snaps into the machined groove on the cutting shoe. The core catcher should be used in loose soils, especially saturated sands (non-cohesive soils). Use of the core catcher is not necessary in tough, cohesive soils or tight clays, and may interfere with sampling especially in soft clays. The "fingers" of the core catcher flex outward to let soil move into the liner while sampling.

##### 1b. Using the MC Spacer Ring



Figure 4.1. The spacer ring fits securely onto the MC5 Cutting Shoe.

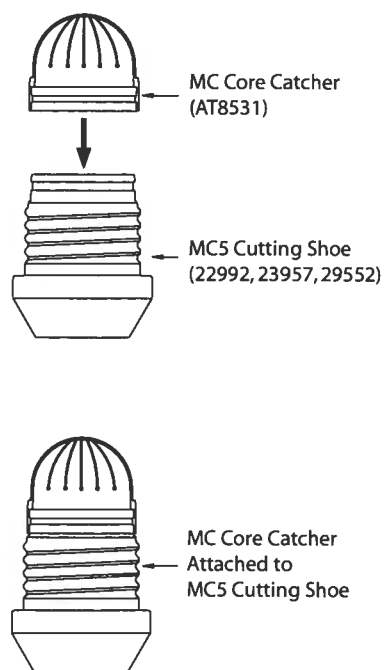


Figure 4.2  
Core Catcher Attachment

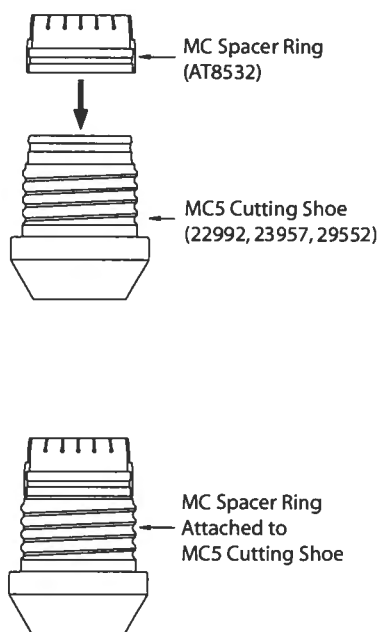


Figure 4.3  
Spacer Ring Attachment

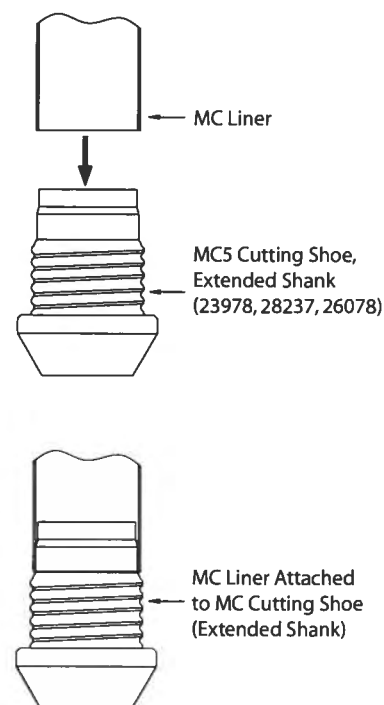


Figure 4.4  
Liner Attachment on  
Extended Shank



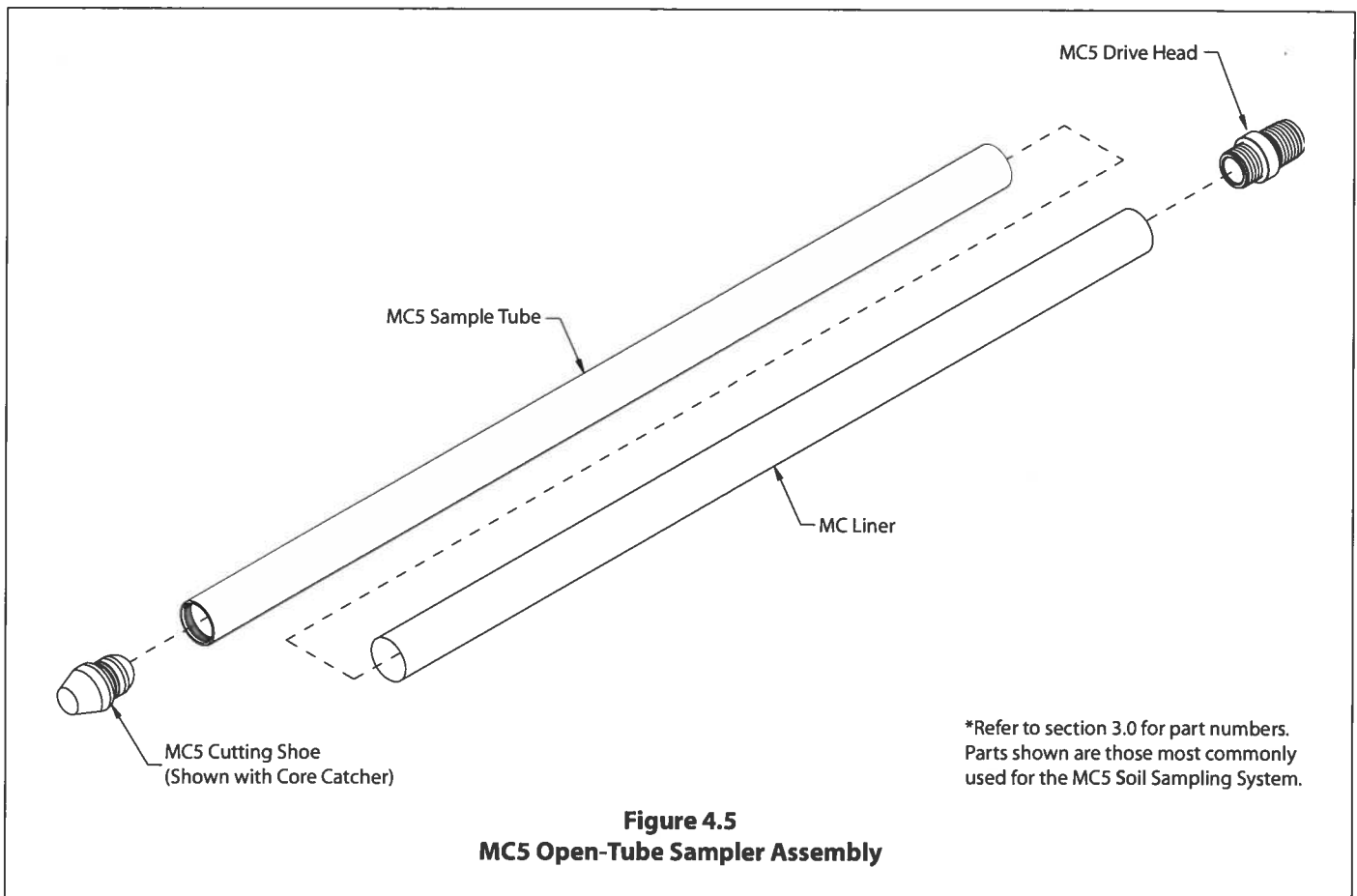
Push the base of an MC Spacer Ring onto the threaded end of an MC5 Cutting Shoe (22992, 23957, 29552) until it snaps into the machined groove on the cutting shoe (Fig. 4.1 and Fig. 4.3). Spacer rings should be used when sampling cohesive soils. It allows soil to pass freely over the junction between the liner and cutting shoe.

#### 1c. Using the Extended Shank Cutting Shoe

The cutting shoes with extended shanks (23978, 28237, 26078) do not use core catchers or spacer rings. MC5 Liners should securely slide onto the end of these cutting shoes (Fig. 4.4). The extended shank cutting shoes should only be used when sampling cohesive soils. When sampling loose soils, especially saturated sands (non-cohesive soils), a cutting shoe with an MC Core Catcher is recommended.

2. Place either end of the liner onto the spacer ring or core catcher (Fig. 4.6). If you are using a cutting shoe with an extended shank, do not use a spacer ring or core catcher (Fig. 4.7). The liner should fit securely onto the spacer ring, core catcher, or cutting shoe.
3. Slide whole assembly into either end of the sample tube (Fig. 4.8). Thread the cutting shoe onto the sample tube (Fig. 4.9). If the thread is clean, it should easily thread on by hand. In some cases, a wrench may be necessary for tightening. There shouldn't be a gap between the cutting shoe and sample tube.
4. Thread an MC5 Drive Head into the top of the sample tube (Fig. 4.10). Securely tighten the drive head by hand. Ensure that the end of the sample tube contacts the machined shoulder of the drive head.

#### Sampler Assembly is Complete

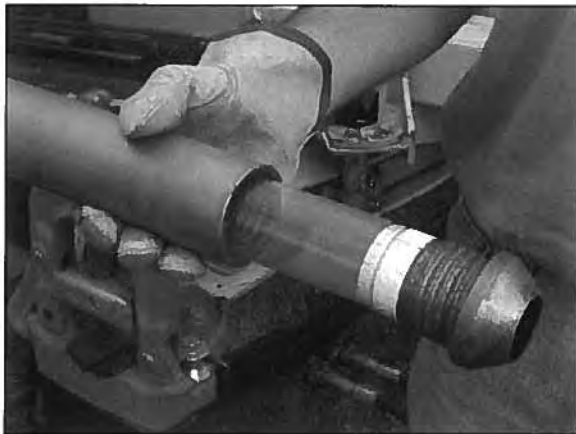




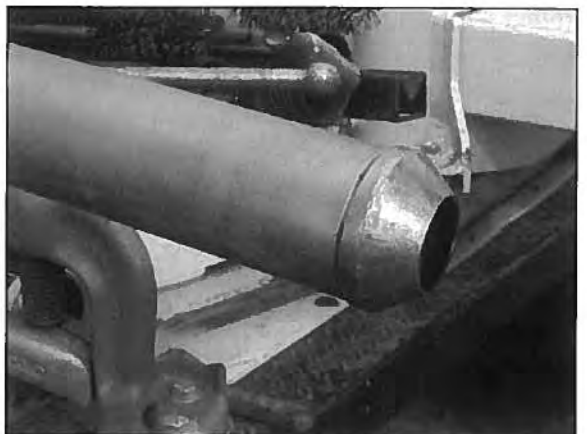
**Figure 4.6.** Place either end of the liner onto the spacer ring or core catcher. The liner should fit securely.



**Figure 4.7.** Place either end of the liner onto the extended shank cutting shoe. (This is used in place of a spacer ring or core catcher)



**Figure 4.8.** Slide whole assembly into either end of the sample tube.



**Figure 4.9.** Thread the cutting shoe onto the sample tube.



**Figure 4.10.** Thread the MC5 Drive Head onto the opposite end of the sample tube. Tighten by hand.

#### 4.4 MC5 Closed-Point Sampler Assembly

The Macro-Core® 1.25-inch Light-Weight Center Rod Sampling System seals the leading end of the sampler with a point (Fig. 4.11) assembly that is held in place with a 1.25-inch light weight center rod. Once advanced to the top of the sampling interval, the 1.25-inch Light-Weight Center Rods are removed from the probe rod string.

1. Install an O-ring in the machined groove on the piston rod point (Fig. 4.12).
2. Push the MC5 Closed Piston Point (28113 or 26865) completely into the cutting shoe as shown in Figure 4.12. Note that the standard point (28113) is used with 1.5-inch (38-mm) ID cutting shoes and the undersized point (26865) is for cutting shoes with a 1.35-inch (34-mm) ID.

##### 3a. Using the MC Core Catcher

Place the open end of an MC Core Catcher over the threaded end of an MC5 Cutting Shoe (22992, 23957, 29552) as shown in Figure 4.13. Apply pressure to the core catcher until it snaps into the machined groove on the cutting shoe. The core catcher should be used in loose soils, especially saturated sands (non-cohesive soils). Use of the core catcher is not necessary in tough, cohesive soils or tight clays, and may interfere with sampling especially in soft clays. The “fingers” of the core catcher flex outward to let soil move into the liner while sampling.



Figure 4.11. The MC5 Closed Piston Point slides into the cutting shoe.

##### 3b. Using the MC Spacer Ring

Push the base of an MC Spacer Ring onto the threaded end of an MC5 Cutting Shoe (22992, 23957, 29552) until it snaps into the machined groove on the cutting shoe (Fig. 4.14). Spacer rings should be used when sampling cohesive soils. It allows soil to pass freely over the junction between the liner and cutting shoe.

##### 3c. Using the Extended Shank Cutting Shoe

The cutting shoes with extended shanks (23978, 28237) do not use core catchers or spacer rings. MC5 Liners should securely slide onto the end of these cutting shoes (Fig. 4.15). The extended shank cutting shoes should only be used when sampling cohesive soils. When sampling loose soils, especially saturated sands (non-cohesive soils), a cutting shoe with an MC Core Catcher is recommended.

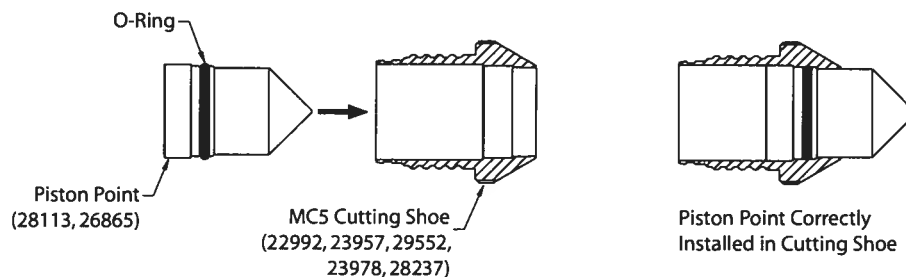
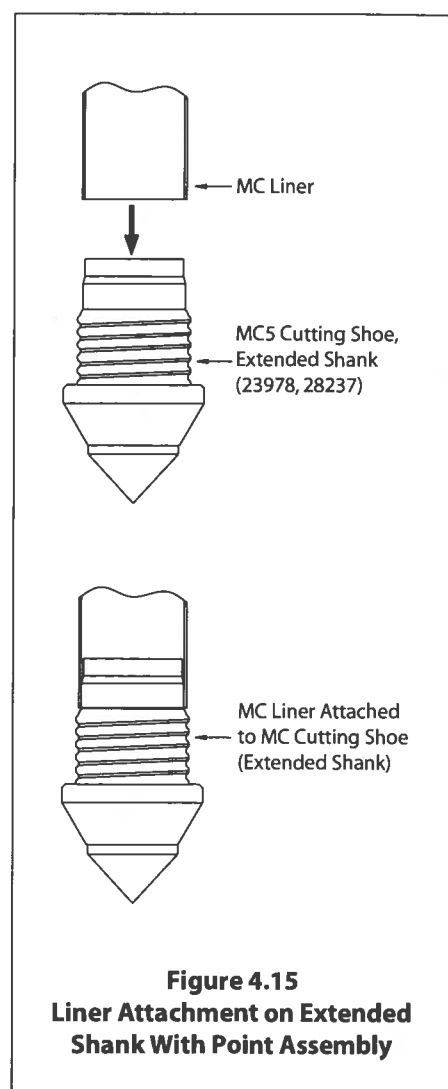
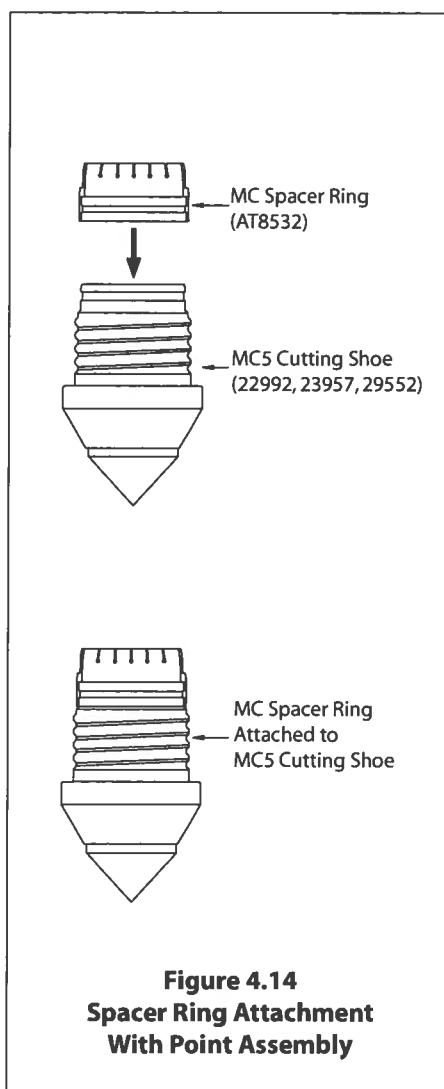
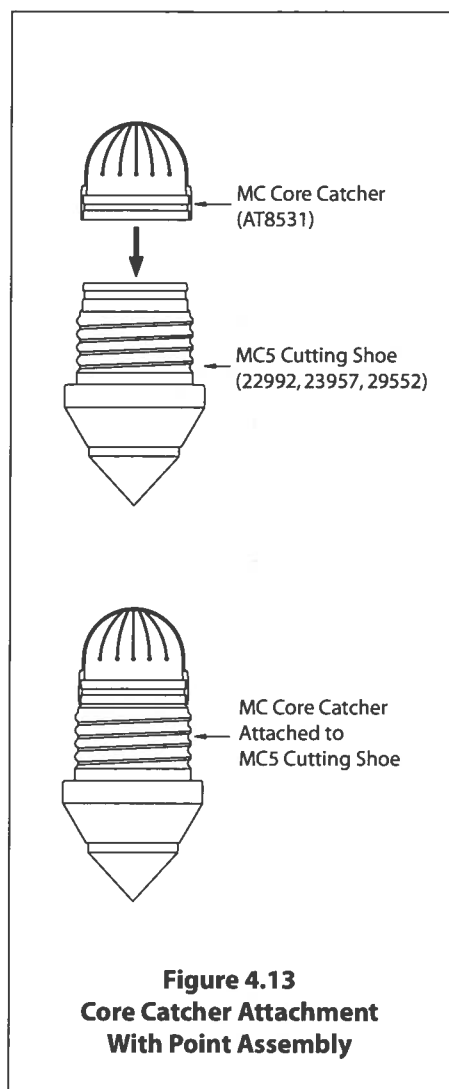


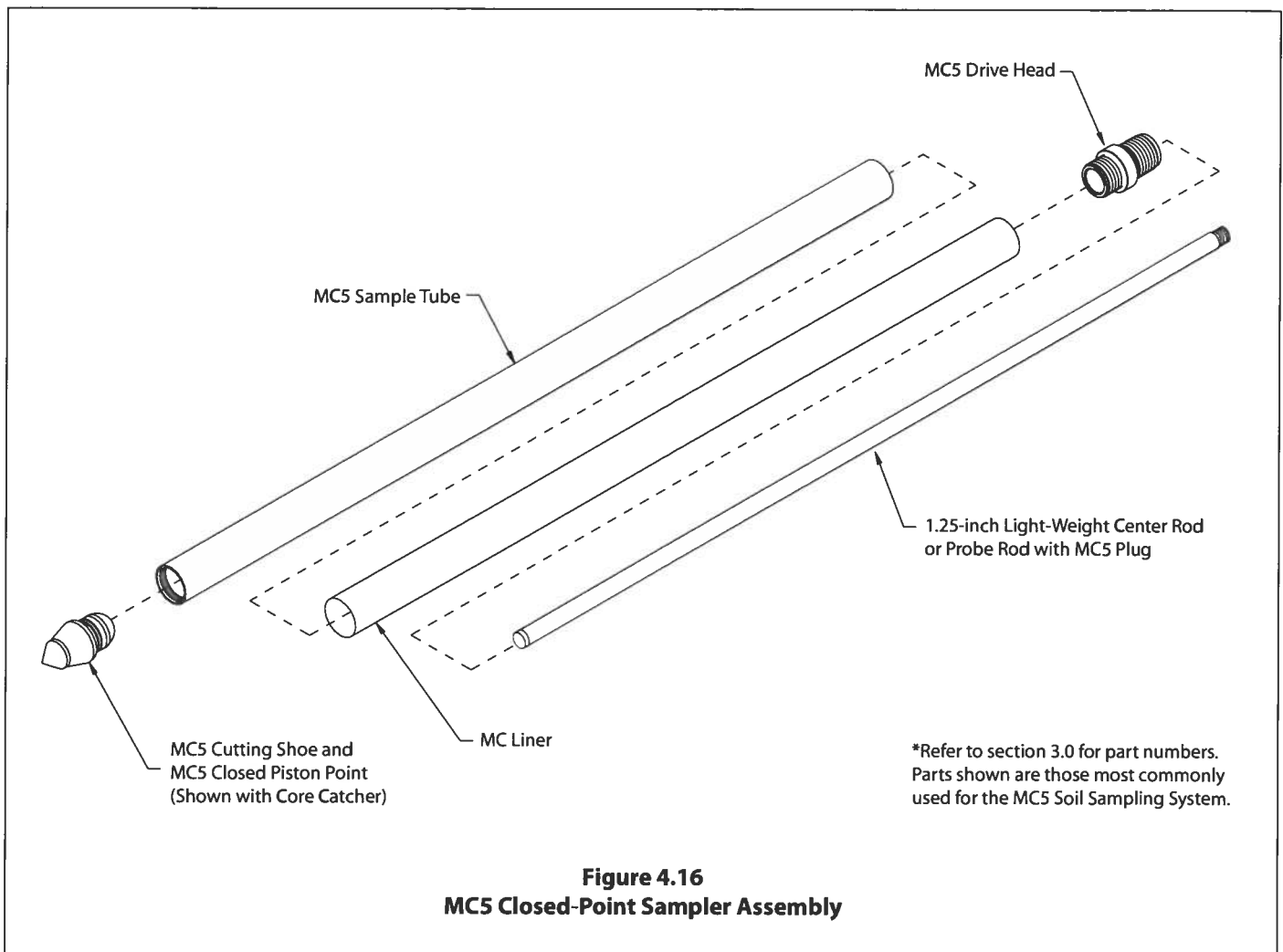
Figure 4.12  
Installation of MC5 Closed Piston Point Assembly in MC5 Cutting Shoe



**Refer to Figure 4.16 for MC5 Closed-Point Sampler Assembly**

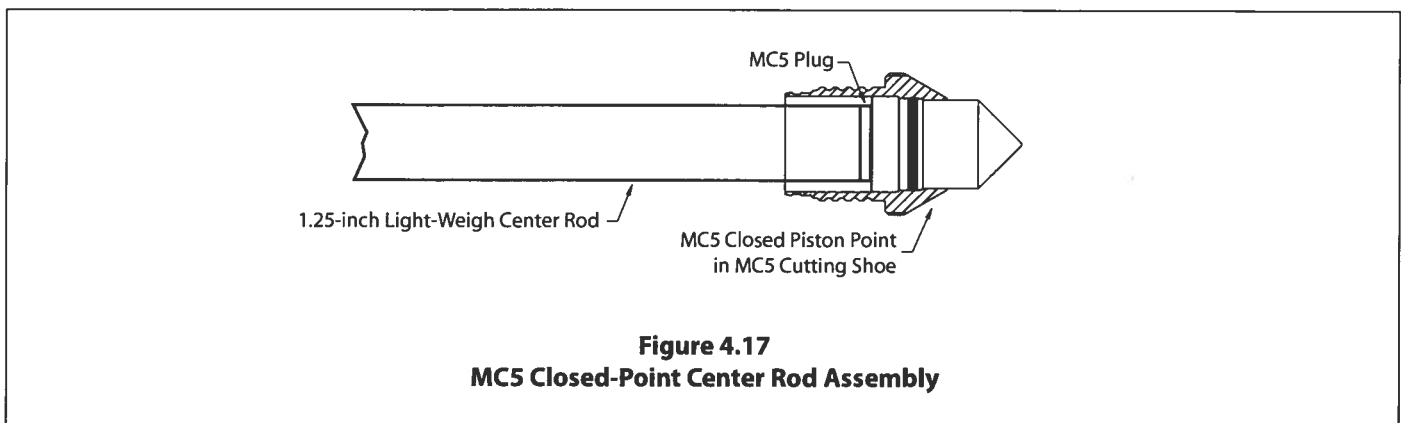
4. Place either end of the liner onto the spacer ring or core catcher (Fig. 4.18). If you are using a cutting shoe with an extended shank, do not use a spacer ring or core catcher (Fig. 4.19). The liner should fit securely onto the spacer ring, core catcher, or cutting shoe.
5. Slide whole assembly into either end of the sample tube (Fig. 4.20). Thread the cutting shoe onto the sample tube (Fig. 4.21). If the thread is clean, it should easily thread on by hand. In some cases, a wrench may be necessary for tightening. There shouldn't be a gap between the cutting shoe and sample tube.
6. Thread an MC5 Drive Head into the top of the sample tube. Securely tighten the drive head by hand. Ensure that the end of the sample tube contacts the machined shoulder of the drive head (Refer to Figure 4.10).

**continued on page 14**



7. Thread an MC5 Plug (23641) onto 1.25-inch light-weight center rod (Fig.4.22). Note that light-weight center rods are only available in 48-inch and 60-inch lengths. Utilize 1.25-inch probe rods if other lengths are required.
8. Insert the light-weight center rod and MC5 Plug into sample tube assembly (Fig.4.23), sending the plug end in first. Allow it to come in contact with the top of the Piston Point (Fig. 4.17).

#### Sampler Assembly is Complete





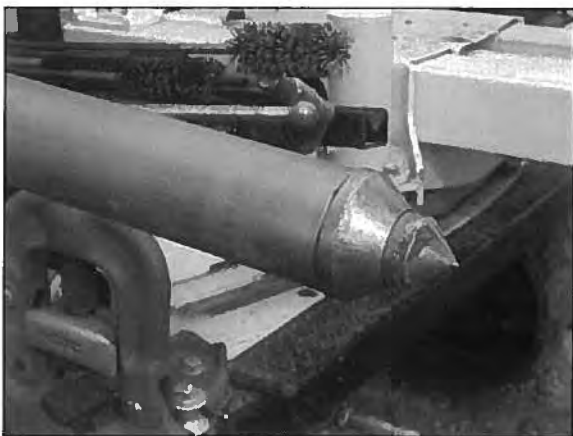
**Figure 4.18.** Place either end of the liner onto the spacer ring or core catcher. The liner should fit securely.



**Figure 4.19.** Place either end of the liner onto the extended shank cutting shoe. (This is used in place of a spacer ring or core catcher)



**Figure 4.20.** Slide whole assembly into either end of the sample tube.



**Figure 4.21.** Thread the cutting shoe and point onto the sample tube.



**Figure 4.22.** The MC5 Plug is threaded onto the end of the 1.25-inch light-weight center rod.



**Figure 4.23.** The MC5 Plug and a 1.25-inch light-weight center rod are inserted into the sample tube.

## 4.7 Open-Tube Sampling

The MC5 Open-Tube Sampler is used to gather continuous soil cores beginning from ground surface. A representative soil sample is obtained by driving the assembled sampler one sampling interval into the subsurface through undisturbed soil. Upon retrieving the sampler, the liner and soil core are removed. The sampler is then properly decontaminated, reassembled with a new liner, and inserted back down the same hole to collect the next soil core.

Instructions for operating the MC5 Open-Tube Sampler are given in this section.

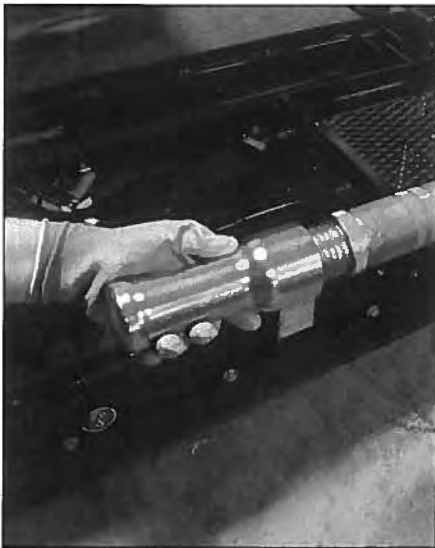
1. Place a drive cap onto the drive head (Fig. 4.24) of an assembled Open-Tube Sampler (Refer to Section 4.3 for sampler assembly).
2. Raise the probe unit hammer assembly to its highest position by fully extending the probe cylinder.
3. Position the MC5 Sampler directly under the hammer with the cutting shoe centered between the toes of the probe foot. The sampler should now be parallel to the probe derrick. Step back from the unit and visually check sampler alignment (Fig. 4.25).
4. Apply static weight and hammer percussion to advance the sampler until the drive head reaches the ground surface. (Fig. 4.27A)

**NOTE: Activate hammer percussion whenever collecting soil. Percussion helps shear the soil at the leading end of the sampler so that it moves into the sample tube for increased recovery.**

5. Raise the hammer assembly a few inches to provide access to the top of the sampler.
6. Remove the drive cap and thread a pull cap onto the sampler drive head (Fig. 4.26).
7. Lower the hammer assembly and hook the hammer latch over the pull cap. Raise the hammer assembly to pull the sampler completely out of the ground. If a winch is available, it can be used with a pull plate to retract the tool string. A Rod Grip Pull Handle can also be used to retract the tool string.
8. Proceed to Section 4.9 for instructions on recovering the soil core from the MC5 Sampler.

To sample consecutive soil cores, advance a clean sampler down the previously opened hole (Fig. 4.27B) to the top of the next sampling interval (Fig. 4.27C). Drive the tool string the length of the sampler to collect the next soil core (Fig. 4.27D). Switch to an MC5 Center Rod Sampler if excessive side slough is encountered.

**NOTE: Use caution when advancing or retrieving the sampler within an open hole. Low side friction may allow the sampler and probe rods to drop down the hole when released. To prevent equipment loss, hold onto the tool string with a pipe wrench when needed.**



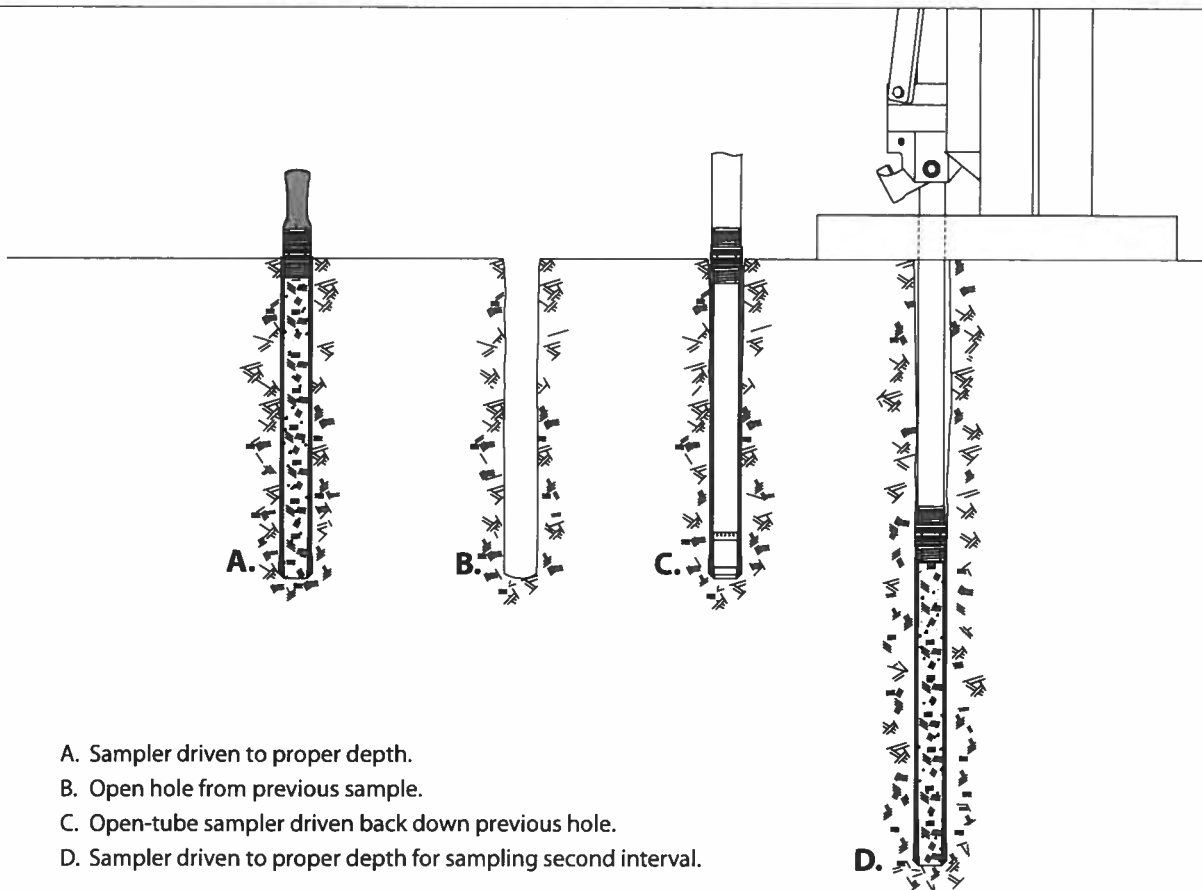
**Figure 4.24.** Place drive cap onto sampler drive head.



**Figure 4.25.** The sampler should be parallel to the probe derrick for driving.



**Figure 4.26.** The pull cap is one way to remove the sampler from the ground.



**Figure 4.27**  
**Phases of MC5 Open-Tube Soil Sampling**



## 4.8 Closed-Point Sampling with the MC5 Center Rod System

Material collapsing from the probe hole sidewall can make it difficult to collect representative soil cores from significant depths with an open-tube sampler. To overcome this problem, the MC5 Sampler can be equipped with a center rod assembly that will hold the piston point in place. This allows the sealed sampler to pass through the slough material and then it can be opened at the appropriate sampling interval.

Instructions for operating the MC5 Closed-Point Sampler are given in this section.

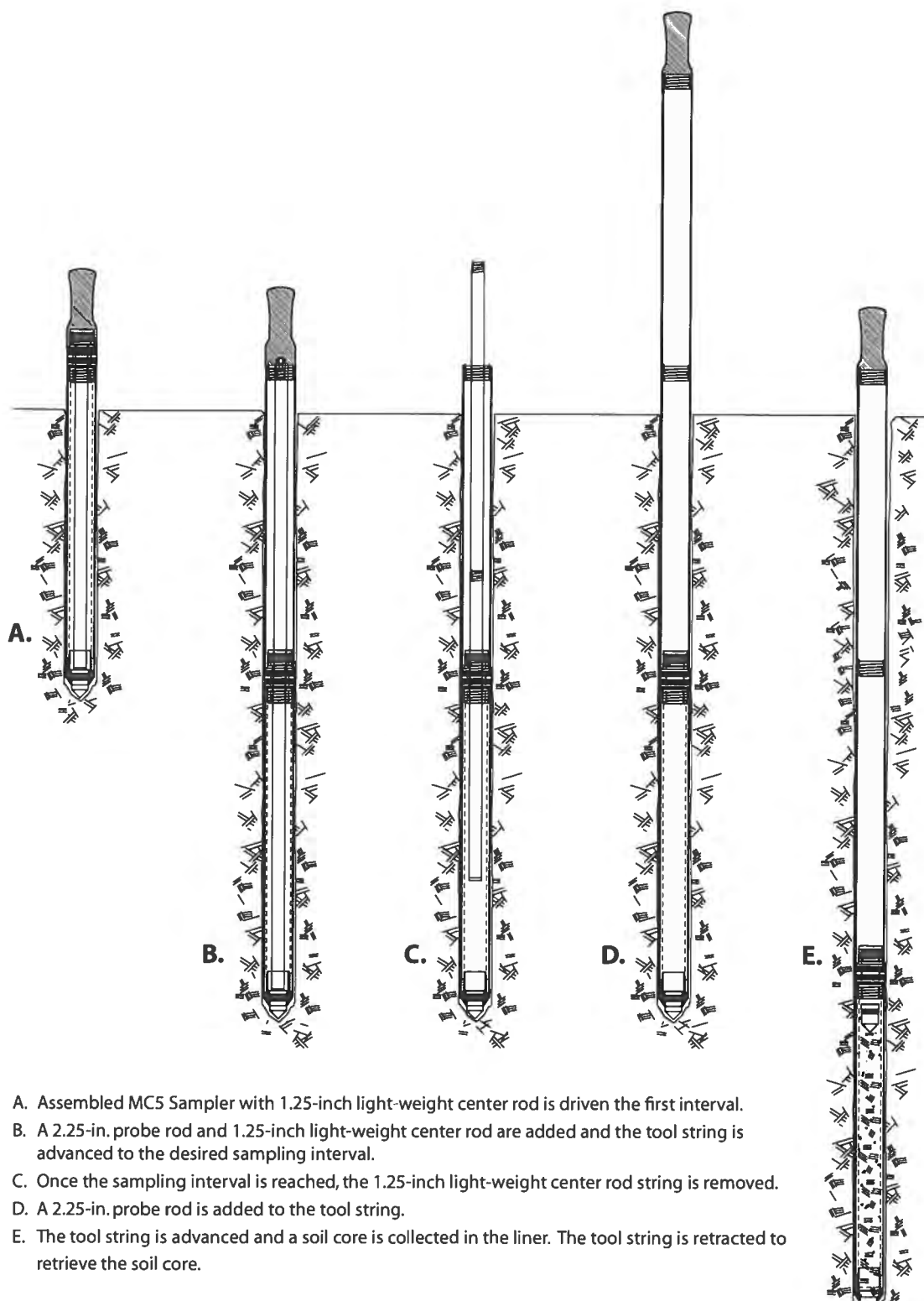
1. Place a drive cap onto the center rod and a drive cap onto the drive head of an assembled Closed-Point Sampler (Refer to Section 4.4 for sampler assembly).
2. Raise the probe unit hammer assembly to its highest position by fully extending the probe cylinder.
3. Position the MC5 Sampler directly under the hammer with the cutting shoe centered between the toes of the probe foot. The sampler should now be parallel to the probe derrick. Step back from the unit and visually check sampler alignment (Fig. 4.25).
4. Apply static weight and hammer percussion to advance the sampler until the drive head reaches the ground surface (Fig. 4.28A).
5. Add additional probe rods and 1.25-inch light-weight center rods to the tool string until the desired sampling interval is reached (Fig. 4.28B).
6. Once the sampling interval is reached, remove the center rod string (Fig. 4.28C).
7. Add an additional probe rod to the string and place a drive cap on the probe rod (Fig. 4.28D).
8. Advance the tool string to collect the soil core in the liner (Fig. 4.28E).

**NOTE: Activate hammer percussion whenever collecting soil. Percussion helps shear the soil at the leading end of the sampler so that it moves into the sample tube for increased recovery.**

9. Lower the hammer assembly and hook the hammer latch over the pull cap. Raise the hammer assembly to pull the first probe rod out of the ground. Remove the rod and place the pull cap on the next rod of the tool string. Continue pulling probe rods until the MC5 Sampler is brought to the ground surface. If a winch is available, it can be used with a pull plate to retract the tool string. An RG Handle is another option to retract the tool string.

**NOTE: Use caution when advancing or retrieving the sampler within an open hole. Low side friction may allow the sampler and probe rods to drop down the hole when released. To prevent equipment loss, hold onto the tool string with a pipe wrench when needed.**

10. Proceed to Section 4.9 for instructions on recovering the soil core from the MC5 Sampler.



**Figure 4.28**  
**Phases of MC5 Closed-Point Center Rod System**

## 4.9 Soil Core Recovery

The soil sample is easily removed from the MC5 Sampler by unthreading the cutting shoe and pulling out the liner (Fig. 4.29). A few sharp taps on the cutting shoe with a pipe wrench will often loosen the threads sufficiently to allow removal by hand. If needed, the exterior of the cutting shoe features wrench flats for attaching a wrench to loosen tight threads. With the cutting shoe removed, simply pull the liner and soil core from the sample tube (Fig. 4.31). A Hydraulic Liner Extruder is also available for mounting on your machine to remove liners (Fig. 4.30).

If the closed-point sampler is used, the piston point is now retrieved from the end of the liner (Fig. 4.32). Secure the soil sampler by placing a vinyl end cap on each end of the liner.

Undisturbed soil samples can be obtained from liners by splitting the liner. The MC Liner (AT8010) is used to make longitudinal cuts along the liner (Fig. 4.33).



**Figure 4.29.** Remove the MC5 Cutting Shoe and liner from the MC5 Sampler Tube.



**Figure 4.30.** The Hydraulic Liner Extruder helps remove the liner.



**Figure 4.31.** MC5 Liner filled with soil core.



**Figure 4.32.** MC5 Closed Piston Point is retrieved from the top of the liner.



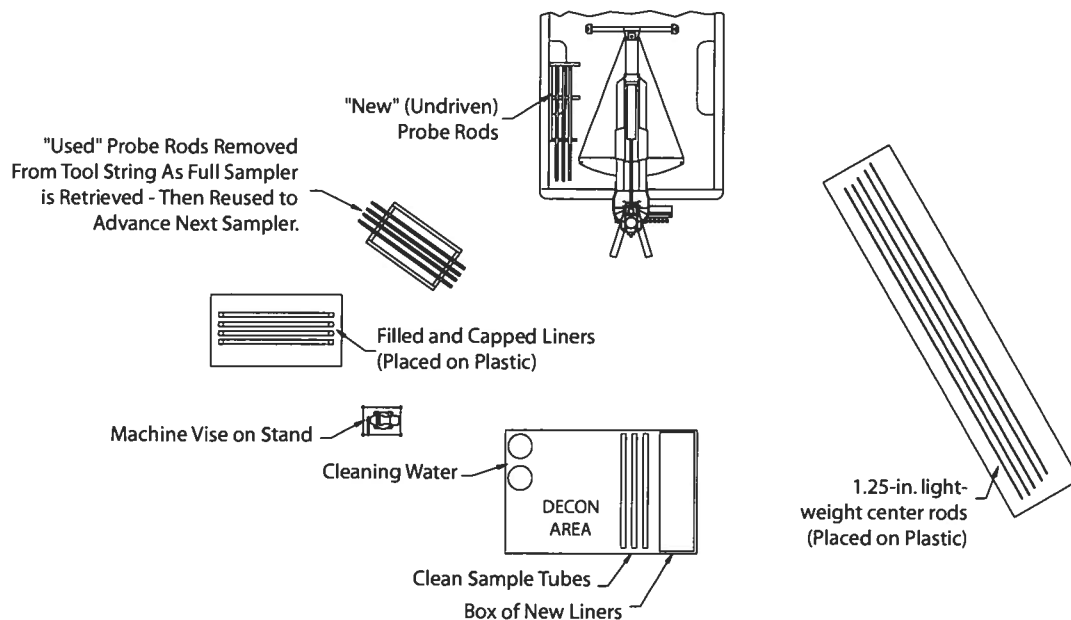
**Figure 4.33.** MC Liner Cutter makes two longitudinal cuts in PVC Liners.

#### 4.10 Tips to Maximize Sampling Productivity

The following suggestions are based on the collective experiences of Geoprobe® operators:

1. Organize your truck or van. Assign storage areas to all tools and equipment for easy location. Transport sample tubes, probe rods, 1.25-inch light-weight center rods, and liners in racks. Above all, minimize the number of items lying loose in the back of your vehicle.
2. Take three or four samplers to the field. This allows the collection of several samples before stopping to clean and decontaminate the equipment. A system is sometimes used where one individual operates the probe while another marks the soil cores and decontaminates the used samplers.
3. A machine vise is recommended. With the sampler held in a vise, the operator has both hands free to remove the cutting shoe, drive head, and sample liner. Cleanup is also easier with both hands free. Geoprobe® offers an optional machine vise (FA300).
4. Organize your worksite. Practice with the sampler to identify a comfortable setup and then use the layout whenever sampling. A collapsible table or stand is handy to hold decontaminated sampler tubes and liners. Equipment may also be protected from contamination by placing it on a sheet of plastic on the ground.

Instead of counting probe rods for each trip in-and-out of the probe hole, identify separate locations for "new" rods and "used" rods. Collect the first sample from the open hole using "new" rods. As each probe rod is removed during sampler retrieval, place it in the "used" rod location. Now advance a clean sampler back down the same hole using all of the rods from the "used" location. Add one "new" rod to the string and then drive the tools to collect the next soil core. Once again, remove each probe rod and place it in the "used" rod location as the sampler is retrieved. Repeat this cycle using all the "used" rods to reach the bottom of the probe hole, and one "new" rod to fill the sampler.



**Figure 4.36**  
**Equipment Layout Example to Maximize Sampling Productivity**

5. Cleanup is very important from the standpoint of operation as well as decontamination. Remove all dirt and grit from the threads of the drive head, cutting shoe, and sample tube with a nylon brush (BU700). Without sufficient cleaning, the cutting shoe and drive head will not thread completely onto the sample tube and probe rods. The threads may be damaged if the sampler is driven in this condition.

Ensure that all soil is removed from inside the sample tube. Sand particles are especially troublesome as they can bind liners in the sampler. Full liners are difficult to remove under such conditions. In extreme cases, the soil sample must be removed from the liner before it can be freed from the sample tube.

## 5.0 REFERENCES

Geoprobe Systems®, 2003. *Tools Catalog, V.6.*

## APPENDIX A ALTERNATIVE PARTS

<b><u>Geoprobe® Tools and Equipment</u></b>	<b><u>Part Number</u></b>
Drive Cap, GH40 Series, Threaded, 2.25 in.....	25362
Drive Cap, GH60 Series, Threaded, 2.25 in.....	25363
Drive Cap, GH60 Series, Threaded, 2.125 in.....	15673
Nylon Brush, Macro-Core® Tool.....	BU700
Nylon Brush, 2.25-in. and 2.125-in. probe rods.....	BU2125
Extension Rod Handle.....	AT69
Extension Rod (60-in.) .....	10073
Extension Rod (48-in.) .....	AT671
Extension Rod (36-in.) .....	AT67

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this brochure are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe Systems®.



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## **ATTACHMENT 3**

### **Paradigm Quality Assurance Plan**



# PARADIGM ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, New York 14608 (585) 647-2530

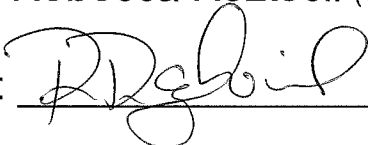
## Standard Operating Procedure

Title: ENVIRONMENTAL LABORATORY QUALITY  
MANUAL

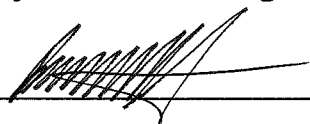
Effective Date: April 9, 2012

Revision: 2.10

Author: Rebecca Roztocil (QA Officer)

Signed: 

Approved By: Bruce Hoogesteger (Technical Director)

Signed: 

Annual Review:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_ Title: \_\_\_\_\_

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**Revision Record**

<u>Rev. No.</u>	<u>Date</u>	<u>Responsible Person</u>	<u>Change</u>
2.00	2/14/05	R.Roztocil	Complete format change.
2.01	4/21/05	R.Roztocil	14. Defined resumption of work order.
2.02	5/25/06	R.Roztocil	Added revision history. 3.1 Added document structure 8. Changed MDL terminology to LOD and LOQ. 13. Added intro/header to QC 14. Clearer definition of non-conforming work. 19c. Managerial review list. 21. Added project file audits. 22. List of reporting requirements and measurement uncertainty. App.B – Org chart revision. App.C – Made current. App.D – Pres. Chart rev.
2.03	4/13/07	R.Roztocil	15. Expanded/clarified corrective action proc. 17. Expanded/clarified preventive action. 19b. Specified time frame for audit resolution. 22. Added estimation of analytical uncertainty.
2.04	6/18/07	R.Roztocil	22. Added sub lab ID, Revision ID, and written Client notification of non-Conforming instruments. 23. Inserted section for Records. 24. Changed confidentiality Section to 24 and added Requirement for documented Approval to release to third Parties. 25. Changed references to Section 25.
2.05	6/4/08	R.Roztocil	Added annual review to title page. Shuffled order of appendices.

<u>Rev. No.</u>	<u>Date</u>	<u>Responsible Person</u>	<u>Change</u>
2.06	2/19/10	R.Roztocil	Updated Org. Chart (App.B) and Pres. Tables (App.C)
2.07	5/26/10	R.Roztocil	Changed record retention for potable water analyses, added provision of transfer of records pending transfer of ownership.
2.08	3/4/11	R.Roztocil	Clarification of controlled copy Indicator, Appendix F, clarification Of PT schedule.
2.09	4/13/11	R.Roztocil	Improved appendix F, revised org. chart, TD/QAO duty chart, preventive action.
2.10	3/22/12	R.Roztocil	Updates to section 13, 20, 21, org chart, appendix F.

## **Distribution List**

<u>Location</u>	<u>Personnel</u>
Technical Director's Office	Technical Director
QA Office	QA Officer
Environmental Laboratory	Technical Staff

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## **1. Quality Policy**

This laboratory Quality Manual is written with the objective of setting forth Paradigm's basic philosophy for assuring that data supplied to our clients is technically and legally valid and properly documented for use in environmental decision making. This document describes the basic structure, which underlies all laboratory activities, and allows the laboratory to fulfill Paradigm's corporate commitments to Quality.

The Paradigm laboratory Quality Manual is built upon a small number of very important principles. These are: use of appropriate materials and properly calibrated equipment, successful participation in the NYS ELAP proficiency testing and assessment programs, adherence to standardized methods, a clear sample tracking system, a comprehensive quality control program which includes routine internal audits with management review, and a documentation and monitoring system for internal and external assessment of performance. These principles, applied to the details of day to day lab activities assure each client that their data meets the highest standards.

The quality policy is communicated to all employees during the training of new hires. It is reviewed on a yearly basis with all employees and the review is documented in writing.

This manual also incorporates a number of quality, process and documentation standards as set forth in the NELAC [National Environmental Laboratory Accreditation Conference] guidelines, and in the New York State ELAP (Environmental Laboratory Accreditation Program) Manual.

## **2. Accredited Test Methods**

Please refer to Appendix F for a copy of Paradigm Environmental Services list of approved methods.

## **3. Quality System**

The quality system defined in the quality manual applies to all personnel who perform activities affecting quality. All employees are responsible for the quality system. The individual SOPs define specific employee responsibilities.

The quality manual is maintained current and up-to-date by the Quality Manager (QAO) to reflect changes to the system. The laboratory defines its policy for each applicable standard element in the quality manual.

The criteria used to assess the quality of each analysis conducted by employees of Paradigm Environmental Services, Inc. are clearly defined in the analysis-specific in-house SOP. All staff are required to read the analytical SOP and provide

documentation of training prior to being allowed to conduct analyses by themselves. Analytical work is reviewed for acceptable quality control prior to being reported, and all reports are reviewed by the Technical Director prior to being signed and issued to the client.

Any support services contracted by Paradigm Environmental will be reviewed for any potential impact to the quality system. This includes, but is not limited to, janitorial and housekeeping cleaning supplies, any equipment and instrument maintenance and support performed, courier services and any off-site storage services. Refer to the organizational chart in the appendices for the relationship of these services to the management.

### 3.1 Document Structure

- Level 1 – Quality Manual
- Level 2 – Quality Procedures
- Level 3 – Work Instructions and Test Procedures
- Level 4 – Quality Records

## 4. Job Descriptions of Staff

### ***Technical Director - Degree and experience required***

The Technical Director has overall responsibility for the procedure in use in the lab, and the conduct of all lab personnel. Working through the lab supervisory staff, the director ensures that proper methods are in use, and that they are being performed in a compliant fashion. In the event of prolonged absence, the duties of the Technical Director will be filled as described in the chart below:

<b><u>Duty</u></b>	<b><u>Assigned to:</u></b>
Final report review and sign-off	Individuals identified in Data Review SOP with authority.
Final SOP review and sign-off	QAO or departmental supervisors
Review and approval of new work	Departmental supervisors
PT review	QAO and/or departmental supervisors
Corrective Action Review / approval	Existing system is sufficient (analyst, supervisor, QAO)

***Lab Manager - Degree and experience required***

In addition to departmental duties of a Lab Supervisor (see description below) the Lab Manager is responsible for the coordination of lab-wide activities. This may include staff and equipment resource assessment, establishment of lab working hours and hiring/general training. The Lab Manager may act as an alternate to the Technical Director for report review and sign-off. The Lab Manager works with the Technical Director to evaluate feasibility of adding new test procedures to lab operations.

***Lab Supervisor - Degree and experience required***

The primary area of responsibility for this position is the overall operation of his or her designated area. Responsibilities include tracking and scheduling of sample workload with coordinating of personnel and equipment to achieve turnaround objectives. The Supervisor is the technical expert in their designated area, and must have a thorough understanding of all applicable methodologies. The Supervisor documents and tracks QC data and other compliance measures to assure that the client and regulatory data quality objectives are being met. The Supervisor interacts with the clients on sample status and technical questions. Works with the Technical Director to establish QC documents systems and to make sure instrumentation and support personnel are being used as effectively as possible.

***Lab Analyst - Degree and/or experience required***

The primary area of responsibility for this position is sample preparation and analysis of solid, water, or air samples for environmental pollutants. This person works under the general direction of the Lab Supervisor, but operates with autonomy, exercising independent judgment and decision making on a day to day basis. Must know and understand the full details of the analytical methods performed and have demonstrated proficiency in those methods. Must understand and comply with all requirements for frequency and acceptance limits of method QC. The Analyst is responsible for following lab documentation procedures, troubleshooting of equipment and methods, and generations of reports. May interact with clients on sample status and interpretation of results.

***Lab Technician - Entry Level - No education or experience required***

The primary responsibility for this position is following specific technical procedures for the preparation of asbestos or environmental samples in a consistent fashion, compliant with the written methods. Duties may include glassware and other material or reagent preparation, sample preparation and routine analysis.

***Sample Receipt Manager - Degree and/or experience required***

Responsible for receiving client samples at the lab. Notes condition of samples, preservation, and holding times. Reviews C-O-C for analytical requests. Creates ID numbers and labels all containers. The Sample Receipt Manager is the first point at contact for clients upon receipt. The manager will try to resolve all analytical request issues at the time of receipt by corresponding with the customer.

**Quality Assurance Officer– Degree and experience required**

Responsible for maintaining the integrity of the data reported to clients through oversight and review of all quality related functions of the laboratory. Verifies that all people responsible for performing all lab functions, including log-in, prep, and analysis are doing so in conformance with the referenced methods, and with all internal standard operating procedures. Works with lab supervisors and technicians to correct any problem area identified through routine QC samples or systems audits. Communicates with the state and accrediting authorities concerning accreditation, audits, and proficiency evaluations. In the event of prolonged absence, the duties of the Quality Assurance Officer will be filled as described in the chart below:

<b><u>Duty</u></b>	<b><u>Assigned to:</u></b>
PT Entry	Technical Director
Audits (annual, project file)	Technical Director
Annual Training	Departmental supervisors
Integrity Training	Data Integrity Advisor
Hood Flows	Assigned to quarterly rotation
Management of certs/ application renewals	Technical Director
SOP's	Departmental supervisors
QM	Technical Director

**5. Document Control**

All SOPs shall have a rev #, an effective date, a "prepared by", and an "approved by" component. When a document is initially circulated, it will not have an effective date on the cover page. The effective date will be added after all personnel qualified to perform the analysis have reviewed the new document (with changes highlighted) and have indicated they have reviewed the new document and agree to abide by its policies. At such times as the method's SOP is updated and accepted into practice, the existing version will be collected from all locations, and replaced with a copy of the new version. Documentation of collection and replacement should be clear, and will form an ongoing record in the QA file. All successive revisions of method SOP's are kept in archives for future reference, with the date replaced clearly written on the



cover along with the revision number of the document it was superceded by. Employee training files include documentation of which SOP revision number the employee has been trained in.

Controlled documents are identified by the red-ink notation in the upper outer corner of every page indicating the document number. Any document without this notation in red ink is not a controlled copy. The notation indicates the copy number, and total number of controlled copies available.

All SOPs and internal controlled documents are reviewed once per year. If a document is revised during the year the revision record in the document shall demonstrate review. If a document has not been revised during the year, the review record shall be the signature of the person responsible for the document and the date of the review.

The documentation in each employee's training file clearly indicates which revision of a document the employee has trained under. If a document is revised during a year, each employee has documentation in their training file to verify the fact that the employee has read, understands, and agrees to follow the rules and policies set forth in the new revision of the document.

All data, including prep logs, calibration records and QC records are retained for a minimum of five years. Potable water records are required to be retained for ten years, except lead and copper results which need to be retained for twelve years. The purpose of this is to allow historical reconstruction of the final result.

## **6. Traceability of Measurements**

All acids, solvents, standards, reagents, thermometers and equipment purchased must be issued with certificates of analysis from the vendor such that their calibration is traceable to NIST or other certifying organization. Reference standards, such as Class S weights and NIST thermometers, are used for calibration only and are calibrated by an outside organization that can provide documents with traceability to NIST. All volumetric glassware purchased is Class A.

## **7. Review of all New Requests, Tenders and Contracts**

Client Service personnel and the Technical Director review all new, non-routine work for the necessary physical, personnel and information resources prior to undertaking new work. They also verify the lab personnel have the necessary knowledge and experience. If the review uncovers any deficiencies, potential conflicts, inappropriate accreditation status or other inability to perform the new work, the client is notified prior to starting the work.

In cases where the laboratory capacity is at its limit, the Laboratory Supervisors communicate to the Client Service personnel a general inability to accept new work due to

capacity. In any situation where a client's results may be delayed, the client is notified immediately and the necessary steps are taken to ensure the satisfaction of the client. Typically, the work would be subcontracted to an appropriate, NYSDOH accredited lab for any request that could not be accommodated for technical or capacity limitations.

## 8. Calibration/Verification of Test Procedures

Quantitation of analyte concentration is determined relative to a standard calibration curve. The concentration and number of points on a curve are usually specified in the individual methods. The lowest point of the calibration curve serves as the lower quantitation limit for the test. Samples reading above the highest calibration standard (or linear range for ICP-AES) are diluted into the calibration range or qualified appropriately, as being above the calibration range report. The validity of all calibration curves is verified using a second source standard traceable to a national standard, when available. Re-calibrations are performed if calibration checks fall outside of method acceptance windows. Calibration checks which shows a greater degree of sensitivity are allowed if the analyte is not present in the sample. Sufficient raw data are retained to reconstruct the calibration used to calculate the sample result.

All results of samples must be within the calibration range (bracketed by standards). Any results reported outside the calibration range must be reported with a qualifier. No data may be reported if it is associated with an unacceptable calibration unless appropriately qualified.

***LODs and Reporting Limits (LOQ)*** - Many Paradigm analytical reports contain a column or field indicating the lowest concentration at which each analyte will be reported. This may be in the form of a <5.0 ug/l or ND <5.0 ug/l. These values are the reporting limits or "limits of quantitation (LOQ)" at which the analyte can be detected with confidence and quantitated with accuracy. The LOQ are also chosen to be responsive to any known regulatory action limits. LOQ are different from statistically determined detection limits (LODs), which are the theoretical lower limit of detection in "ideal" samples. LOD studies are performed annually. LOQ are set at or above the statistical LOD and the lowest calibration standard is always at the LOQ.

## 9. Sample Handling

### A. Sample Acceptance Policy

The Chain-of-Custody should be reviewed for analytical requests specified and for sample ID information. Any ambiguity should be resolved ASAP (i.e. direct VS TCLP / dissolved VS total metals, etc.). Correlation of samples to C-O-C, uniqueness of sample ID and containers also need to be checked and reviewed with the customer if needed. In the event an inappropriate preservation, holding time or container is received, the significance should be reviewed with the client. Analysis should proceed only with the approval of the client and with an understanding of the necessary qualifications. Many clients work with the lab on a continual basis. Where the client has demonstrated an acceptance of qualified sample conditions and reports, the analysis may proceed without case by case communication. Jobs are reviewed to ensure that equipment, personnel, reagents etc., are all available and sufficient to meet technical and client

requirements. The Chain of Custody also has, clearly printed on its reverse, clearly detailed terms and conditions for sample acceptability. If available equipment, personnel, reagents etc., is not sufficient, the client will be contacted to discuss possible extended turnaround, or the impacted samples will be subcontracted to meet the requirements.

## B. Sample Receipt Protocol

The U.S. EPA and the New York Department of Health have both developed extensive requirements for appropriate sample bottles, necessary preservation and maximum holding times. Paradigm always works with these guidelines to ensure the data is compliant and fully usable for regulatory purposes. A table of analytes (methods), with associated container types, preservation, and holding times is included as Appendix C to this QA Plan.

Samples are checked for appropriate preservation, container and holding time upon receipt. When 4°C preservation is mandated by the method, the sample must be between 0-6°C, or be "on ice" if coming directly from a local sampling location. Deviations will be noted on the Chain of Custody.

## C. Procedures for Handling Submitted Samples

All samples received at Paradigm laboratories should be accompanied by a Chain-of-Custody (C-O-C). The C-O-C serves several important purposes. Legally, it documents the transfer of the sample from the client to Paradigm. Second, it shows the tests which are requested and indicates a sampling date from which holding times may be determined. Finally, the C-O-C serves as a cross-reference from the samples Field ID to the assigned Laboratory ID. Information from the client C-O-C is transferred to an internal Log-in notebook for additional in house use. A unique laboratory ID number is assigned to each client sample at this point. Preservation (or lack of) is noted in the Log-in notebook. Lack of Preservation is recorded on the C-O-C. All client, sample, and analysis request information is logged into a PC based sample tracking system. The tracking program generates a work-list used by the analysts to identify work requests.

Samples are generally stored at 4°C from the time of receipt to the time of disposal. A few exceptions exist, such as wipes, waste oils, and lead paint chips which do not require preservation. Samples and extracts or digests are discarded after 30 days from receipt, or the expiration of their holding time, whichever is sooner. Paradigm reserves the right to return unused sample to the client for disposal if the material is significantly in excess of analytical requirements.

The sample receipt manager or their designee compiles a 'waste tracking list' by comparing lab results with New York State's Department of Environmental Conservation regulatory guidelines for disposal of hazardous waste. The list

provides every sample's laboratory ID number and a classification. The classifications are PCB (poly-chlorinated biphenyls), mercury, flammable, solid hazardous, solid non-hazardous, volatile, and dump. (A waste tracking list is provided in the appendix) Each sample is disposed of according to its classification. See the Waste Management standard operating procedure for a more detailed description of how these samples are disposed.

Organic extractions, metal digests, TCLP (toxicity characteristics leaching procedures extracts) and other analyzed wastes are disposed of according to their individual standard operating procedures.

## 10. Laboratory Environment

Laboratory space is maintained to be free from contamination using good housekeeping practices and smoking is prohibited. Specific work areas are defined and access is controlled. Work areas include: entries into the laboratory, sample log-in and storage, laboratory analysis areas, chemical and waste storage area, and data handling areas.

Where multiple uses of a laboratory area are incompatible or present a potential conflict, the affected laboratory areas are dedicated to a single purpose. Specifically, the use of methylene chloride for solvent extractions is incompatible with the analysis of methylene chloride by EPA methods 601, 8010, 624, and 8260. As defined in the method SOP's, analysts who perform either of those procedures are restricted from entry into the conflicting areas during performance of those tasks.

## 11. Procedures for Calibration, Verification and Maintenance of Equipment

All equipment in use at Paradigm Environmental is serviced by trained personnel, often supplied by the equipment vendor. Each piece of equipment is assigned its own maintenance log book, or maintenance may also be documented in the instrument run log. Detailed records are kept on all maintenance activities for each piece of equipment as to the date and nature of the maintenance and the person providing the service, as well as the problem requiring maintenance. Any defective piece of equipment is taken out of service until it can be shown to be working properly.

Support equipment calibrations are verified annually using NIST traceable references. This includes balances, thermometers, refrigerators and incubators. Mechanical volumetric pipettors are checked for accuracy quarterly and recorded.

## 12. Verification Practices

**Proficiency Samples and Audits** - One means by which laboratory performance can be assessed is through independent check samples. Paradigm participates in New York's Department of Health Environmental Laboratory Approval Program, which includes semi-annual proficiency checks covering Potable and Non-Potable Water, Solid and Hazardous

Waste, and Air and Emissions. ELAP certification is contingent on continuing good performance for those proficiency checks. Paradigm receives an on-site audit biennially from an ELAP auditor who verifies adherence to "good laboratory practices" and provides a deficiency report for areas that need improving. Generally good lab practices, along with satisfactory responses to any deficiency statements are a requirement for continuing ELAP certification.

Paradigm certificates of approval are available to clients at any time upon request. The New York programs incorporate all the criteria necessary to certify compliance with NELAP standards.

**Standards and Reference Standards** - All analytical stock standards are purchased from reputable national suppliers or NIST, who QC their purity or concentration and provide corresponding certification. As a crosscheck against possible formulation errors, all standards are verified at Paradigm against standards from an independent manufacturer. Intermediate stocks and working standards are prepared by volumetric dilution from stock material. Each stock and working standard is assigned a unique laboratory ID number that is recorded in a standards preparation book. The standard in use is documented in daily instrumental run log.

### 13. Internal Quality Control Measures

The data acquired from quality control (QC) procedures, specifically blanks and LCSs, are used to estimate the quality and usability of analytical data, to determine the need for corrective action, and to interpret results after corrective actions are implemented. Each method SOP clearly defines the method QC requirements and appropriate corrective action. QC limits are generated on a quarterly basis from historical QC data using the mean plus or minus three standard deviations. Where mandated by the test method or appropriate to the analysis, QC limits may be assigned as stated in the analytical method. Analytical data generated with QC samples (blanks and LCSs) that fall within prescribed acceptance limits indicate the test method was in control. Data generated with QC samples (blanks and LCSs) that fall outside QC limits indicate the test method was out of control. These data are considered suspect and the corresponding samples are reanalyzed or reported with qualifiers if reanalysis is not possible. Spikes and duplicates run on real-world samples, also called matrix QC, are not used to assess method performance and are not used to generate historical QC limits. These QC samples only provide information relative to that particular sample and are highly influenced by the degree of homogeneity of the sample.

**Blanks** - Blanks are the QC element, which show that the analytical system is free from contamination. A method blank is lab pure water or a known matrix (i.e. a clean filter or wipe) taken through the entire preparation and analysis process. The method blank shows whether reagents, glassware and ambient conditions have introduced contamination (defined as presence of the analyte above the reporting limit) into the system. A contaminated blank requires re-analysis of the batch, or qualification of the associated data. Other types of blanks, such as instrumental blanks or trip blanks are also used in some circumstances to isolate a particular portion of the sampling and analysis process. The primary purpose of blanks is to identify potential "false positives" in field samples. Blanks are run with every preparatory or analytical batch.

**Laboratory Control Samples** - A Laboratory Control Sample (LCS) is laboratory pure water or a known blank matrix (clean filter or wipe or blank soil vessel) into which a select group of analytes are spiked at a known concentration. The LCS is then carried through all subsequent preparation and analysis steps. The recoveries are compared to established limits and checked for acceptability. Acceptable recovery indicates that the method is in control, and unacceptable recovery indicates that the method is out of control. Unacceptable LCSs lead to rejection of the batch and re-analysis, or qualification of the affected data. The LCS is a recovery check in the absence of a sample specific matrix effect. LCSs are assigned once per 20 samples or prep batch.

**Surrogates and Matrix Spikes** - Surrogates are compounds that are similar but not identical to the method analytes of interest. They are generally restricted to use in organic methods. Matrix spikes can be performed for any method. In both cases, a known quantity of a compound is spiked into a sample at the initiation of sample preparation, and the percent which is recovered upon completion of the analysis is determined. The recovery data, when compared to historical statistics and LCS recoveries, gives an indication of sample specific matrix effects which may be occurring in the sample. Data for which significant matrix effects are indicated are qualified on the final report. Surrogates are run in every field and QC sample. Matrix Spikes are run once per 20 samples or once per week when sufficient excess sample is available, whichever is more frequent.

**Interlaboratory Round Robin Testing** – Twice a year Paradigm Environmental Services, Inc. participates in PT testing of NYSDOH PT samples. The ELAP program has accepted participation in PT studies as fulfilling the requirements of Inter-Laboratory Testing.

**Matrix Spike Duplicates or Sample Replicates** - Method precision is assessed via spiked or unspiked replicates. The agreement between the two replicate results is used to assess variability in both the performance of the method and in the sample matrix. Percent differences outside the method limits result in re-analysis or qualification of the data. Replicates are run once per 20 samples or once per batch when sufficient excess sample is available, whichever is more frequent.

## 14. Control of Non-Conforming Environmental Testing

Each method SOP contains a section dedicated to corrective action measures to be implemented when the method QC is not in control. If it is not possible to achieve flawless QC, results may be reported with appropriate data qualifiers. Non-Conforming work also extends to all aspects of the quality assurance system where deviations from established control measures will cast doubt on analytical data. All employees have the authority to halt analyses that do not meet the QC requirements set forth in the method SOP. The analyst who stops the work shall immediately notify the lab supervisor, QA Officer or Technical Director. All employees also have the authority to issue a resumption of work order when it can be proven all aspects of QC are being met.

Corrective Action Reports are written when non-conforming work is significant, or the report is sent to the client prior to the discovery of the non-conforming work. If necessary, the client is notified and the defective reports are recalled.

## 15. Corrective Action Procedures

Failure of any part of the QC system leads automatically to a corrective action. A contaminated blank requires isolation and removal of the source of contamination. A failed reference standard requires preparation of new calibration and/or reference standards. A failed LCS requires the method to be reviewed in its entirety and the offending step(s) corrected, etc. These actions are described in detail in each SOP. Corrective actions follow a stepwise process: investigate the failure; identify the probable cause or source of the problem; implement a correction; verify the problem is corrected, and; document the steps. Corrective actions are documented in run logs, prep logs or standard logs, as appropriate. Where a QC failure can not be corrected due to loss of sample or other factor, all associated data is documented and qualified appropriately in the final report to clients.

Where opportunities for corrective actions are identified during quarterly project file audits, the Quality Assurance Officer (QAO) documents the person responsible for generating the corrective action and the time frame during which the corrective action will be completed. In cases where the corrective action will affect data that has already been sent to the possession of the client, the client will be notified within 48 hours. Where possible, the corrective actions regarding that data will also be issued within those 48 hours. If the time frame is not possible the client will be made aware.

Corrective actions are also undertaken for proficiency testing samples that are scored as unsatisfactory. The original data, including all preparatory procedures and calculations, is scrutinized as to the possible undetected error. The original sample may be reanalyzed and additional quality control standards may be purchased to promote the investigation. All efforts into the investigation relating to the cause of the unsatisfactory score is documented and kept on file.

## 16. Exceptionally Permitted Departures from Policies and Procedures or from Standard Specifications

*Departures from standard policies and procedures are not permitted under normal circumstances. The QA/QC and internal audit functions are all designed to assure that in -place specifications and procedures are adhered to, and if not, that there is a feedback mechanism in place to alert supervising and management personnel to any deviations.*

Where such allowances are *known* to occur (i.e. – if a calibration check deviates high but the sample analyte is non-detect) the results can be used without further qualification. For any situation not addressed in the method SOPs, supervising review is critical. As described in other sections of this manual, deviations from procedures or control limits will generate an investigation and corrective action report, describing what was found, what the potential consequences are, and what actions are needed to prevent a recurrence.

Where there are specific reasons why a policy or method or procedure may not be appropriate, the deviation must be approached in a systematic way. First, the reason for proposing a nonstandard approach must be described. Second, the limitations and consequences of the proposed approach must be anticipated and defined. Finally, the

potential impact of the change on client results must be addressed, and appropriate means of qualifying reported data determined.

A proposed deviation from policy, and all associated steps, must be reviewed and approved by the lab supervisor, management, and quality control staff. The deviations must be defined as to specific samples, time period, or extent of application. Typical scenarios may involve a complex site-specific matrix for which no ideal method exists, or a client with a reduced quality objective where data is for screening or preliminary purpose only.

## **17. Preventive Action**

Preventive action is the pro-active process used to identify opportunities for improvement. Preventive action does not stem from a reaction to a complaint or problem, otherwise it would be classified as a corrective action. All employees have the authority to recommend preventive action. Recommendations may be made to either the QA Officer, Lab Supervisor, or Technical Director. Before any preventive action is initiated, the responsible party must design a preventive action plan. This plan must detail the implementation of the preventive action, and monitor and document the process. Preventive actions and improvements to established systems will be discussed and documented at weekly lab meetings. Improvement of lab practices is an ongoing activity, and opportunities to increase method performance and reliability should be capitalized on wherever possible.

## **18. Complaints**

A client may have questions or concerns regarding the reported results they receive. If they have quality concerns, the file should be pulled and audited relative to compliance with method QC. Results of the audit finding should be clearly communicated to the client and documented in the file. In the event a lab error is identified, a system audit must be performed, and a corrective action plan implemented. A record is maintained of all complaints and the actions taken by the laboratory.

### **18.5 Compliments**

A client may actually think the laboratory did a good job. This should be documented and a non-corrective action plan implemented.

## **19. Internal Audit and Data Review**

### **A. Data Review**

Final results are manually or automatically transferred into an electronic spreadsheet for formatting and printing of the final report. Initial data review takes place at the analyst / supervisor level. Calculations and transcriptions are checked for errors, and QC measures are checked for acceptability. The finished report from each lab section is compiled in an "in-progress" file, and when all parts of the job are complete, it is sent to the Laboratory Technical Director. The Technical Director again reviews the report for QC acceptability, proper transcription and "reasonableness". Any deviations from standard method



compliance windows with a potential impact on final data usability is to be noted in the final report to the client. The Technical Director provides full sign-off for the report, which is then sent to the client. This process is described in full in the Data Review SOP.

Each calendar quarter, the QA Officer audits five project files pulled at random from the prior quarter. This review is to verify that all data integrity requirements are being met and to assess compliance with all other elements of SOPs and Quality Systems.

#### B. Internal Quality System Audits

Annual audits are required to be performed using the most recent revision of the ELAP assessor checklists. These checklists cover every aspect of the New York State/NELAC laboratory certification manual. Any deficiencies are compiled, and the resolution of each deficiency is assigned to a particular individual. A time frame for the resolution of the deficiency is established and records are kept pertaining to the resolution, the data completed, and all follow-up observations.

Quarterly, the QA Officer selects five random finished projects and performs an in-depth audit which traces all aspects of the project back to its initial log-in. Any findings or deficiencies uncovered during one of these audits are presented to the entire laboratory group during a weekly quality control meeting. An individual is assigned to be responsible for the resolution of the deficiency and a time frame is established for the completion of the work. Where the findings relate to general laboratory practice, the time frame may vary. Completion is generally expected within two weeks, although this may fluctuate due to the severity of the finding. Any finding that affects the data reported to a client requires immediate resolution. The client must be notified of the defect and resolution within forty-eight hours. Detailed records are kept of all findings and follow-up investigations relating to quarterly project file audits.

#### C. Managerial Review

A comprehensive review of the laboratory performance and quality systems must be performed annually for company management. This review will be performed in the quarter prior to the close of the company fiscal year (generally April to June) to allow for new equipment budgeting.

The review will encompass the following items:

- a. The suitability of policies and procedures;
- b. Reports from managerial and supervisory personnel;
- c. The outcome of recent internal audits;
- d. Corrective and preventive actions;
- e. Assessment by external bodies;
- f. The results of proficiency tests;
- g. Any changes in the volume and type of work undertaken;
- h. Feedback from clients;
- i. Complaints;

- j. Other relevant factors such as quality control activities, resources and staff training.

## **20. Training and Review of Personnel Qualifications**

*Initial* – Each applicant's resume is reviewed by management with respect to requirements for education and experience.

*General* - Review of Environmental Quality Systems Manual upon hire and written statement agreeing to abide by company technical and ethical policies. In addition, all employees regardless of duties are provided an employee manual upon hire explaining overall rights and responsibilities. This manual details the actions to be taken in the event of employee misconduct. All employees are also required to undergo training in data integrity. Each employee must have a signed statement (Appendix A) stating their agreement to abide by the ethical and legal responsibilities addressed in the training class and understanding of the penalties incurred for breaching data integrity.

*Technical* - All technicians / analysts participating in sample preparation and analysis must demonstrate competency in their portion of the procedure. They must have proper documentation of their Demonstration of Capability (DOC) for each accredited method the analyst conducts. This will ordinarily be done by a performance of a LCS or Spike sample, and a replicate study showing suitable recovery according to the method.

A training file will be maintained for each individual containing the raw data supporting a demonstration of proficiency for each test which they perform. Documentation of proficiency is only complete with review by the Technical Director and the QA Officer. This documentation is performed prior to an analyst conducting a test for the first time, and yearly after that on an on-going basis.

## **21. Data Integrity**

Upon hire, each employee will be trained in data integrity. Annual training is also required for all employees. A record of the training and a signed attestation by the trainee shall be placed into their training file.

All employees are educated with respect for the need for honesty and full disclosure of all issues relating to data integrity, and how this relates to the mission of the company. Employees must understand all data integrity procedures, the quality system, and the possible serious consequences to violation of integrity including termination of employment.

Initially and annually each employee must document their data integrity training by attending the data integrity training session. At the training session each employee will be given an administrative SOP compliance form specific to the Data Integrity SOP to sign. By signing this form the employee will be attesting to abide by the Paradigm Environmental Code of Ethics and the integrity statements found in both the Data Integrity SOP and the Quality Manual SOP. Additionally, each employee will receive a copy of the Data Integrity Training presentation to keep for reference. Specific examples

of breaches are discussed and an emphasis is placed on written narration by the analyst in cases where analytical data may be useful, but is not completely compliant with all QC measures. Details are available in the Data Integrity SOP.

Each calendar quarter, the QA Officer audits five project files pulled at random from the prior quarter. This review is to verify that all data integrity requirements are being met and to assess compliance with all other elements of SOPs and Quality Systems.

## **22. Reporting Analytical Results**

Clients are always provided with a paper hardcopy of the final report. Clients may also request their data by fax, e-mail, or verbally. Paradigm Environmental will only remit results in a fashion other than hardcopy by direct request of the client. The original signed hardcopy is the only certified result. All other formats are strictly for the convenience of the client.

The results of each test carried out by the laboratory are reported accurately, clearly, and objectively. The following information is included on every report of laboratory analysis for the benefit of the client:

- a. Title;
- b. Name, phone number and address of the laboratory, with a name of a person for contact in case of questions;
- c. Unique identification of the report and each page;
- d. Name and address of client, and project name if applicable;
- e. Description and unambiguous identification of the tested sample including the client identification code;
- f. Identification of results derived from any sample that did not meet sample acceptance requirements;
- g. Date of receipt of sample, date and time of sample collection, date(s) of analysis and time of sample preparation if holding time is less than 72 hours;
- h. Identification of test method used;
- i. If the laboratory collected the sample, a reference to sampling procedure;
- j. Clear qualification of any data not meeting QC requirements;
- k. Results, with all supporting data;
- l. When requested, a statement of the estimated uncertainty of the result;
- m. Signature and title of the person accepting responsibility for the content of the report;
- n. Clear identification of data supplied by subcontracted laboratories, and
- o. Clear identification of numerical results with values outside quantitation limits.

The procedure for estimating the uncertainty of analytical measurements makes use of the extensive database of method performance data which is updated on a regular basis. This data set includes statistics regarding method precision and accuracy, which are used in setting in-house acceptance limits. Both of these method performance elements have a bearing on determinations of uncertainty, and they are the foundation of our procedure. We work with the 99% confidence interval in our assessment of uncertainty. The Window of Uncertainty at the 99% confidence interval is defined by upper and lower boundaries around a specific value, calculated as follows:

$$\text{Upper Boundary} = (\text{Reported Value}) \times \left[ \frac{\% \text{ Recovery @ upper acceptance limit}}{\text{Average \% Recovery}} \right]$$

$$\text{Lower Boundary} = (\text{Reported Value}) \times \left[ \frac{\% \text{ Recovery @ lower acceptance limit}}{\text{Average \% Recovery}} \right]$$

All reports clearly identify subcontracted laboratories by the ELAP laboratory ID number.

Where errors are identified in previously released data, the reports will be revised and reissued to the client. The revised report will be distinguishable from the original by inclusion of the "Date Re-issued", located in the upper right of the header.

Clients will be notified in writing if any equipment used to derive results in any report is found to be working outside acceptable limits.

## 23. Records

Analytical records include all raw data, strip charts, printouts, calculations, forms, and logbooks. Quality records include reports from internal audits and management reviews as well as records of corrective and preventive actions. All records are retained for at least five years, with the exception of potable water records which must be kept for a minimum of ten years, twelve for potable water lead and copper.

In the event the company goes out of business all clients will be notified and offered the opportunity to collect all records if they so desire, before a specific date. The notification will also clearly state that at the conclusion of the stated time period, all data will be destroyed. In the event of a transfer of ownership all records will pass to the new owner.

## 24. Confidentiality and Proprietary Rights

Information provided to or generated by Paradigm is considered confidential between Paradigm and its client. Data and reports are only released to the client specified on the Chain of Custody unless Paradigm receives explicit instructions from the client to release information to other parties. These instructions must be documented within the file.

Visitors to Paradigm are accompanied by Paradigm personnel at all times and are not allowed access to files or data systems.

## **25. References**

NYS ELAP manual

NELAC manual, section 5, July 2002

Standard Methods for the Examination of Water and Wastewater

SW846 Methods Volume

EPA 200 series methods, 40CFR 136

## **Appendix A – Code of Ethics**

### **PARADIGM ETHICS POLICY**

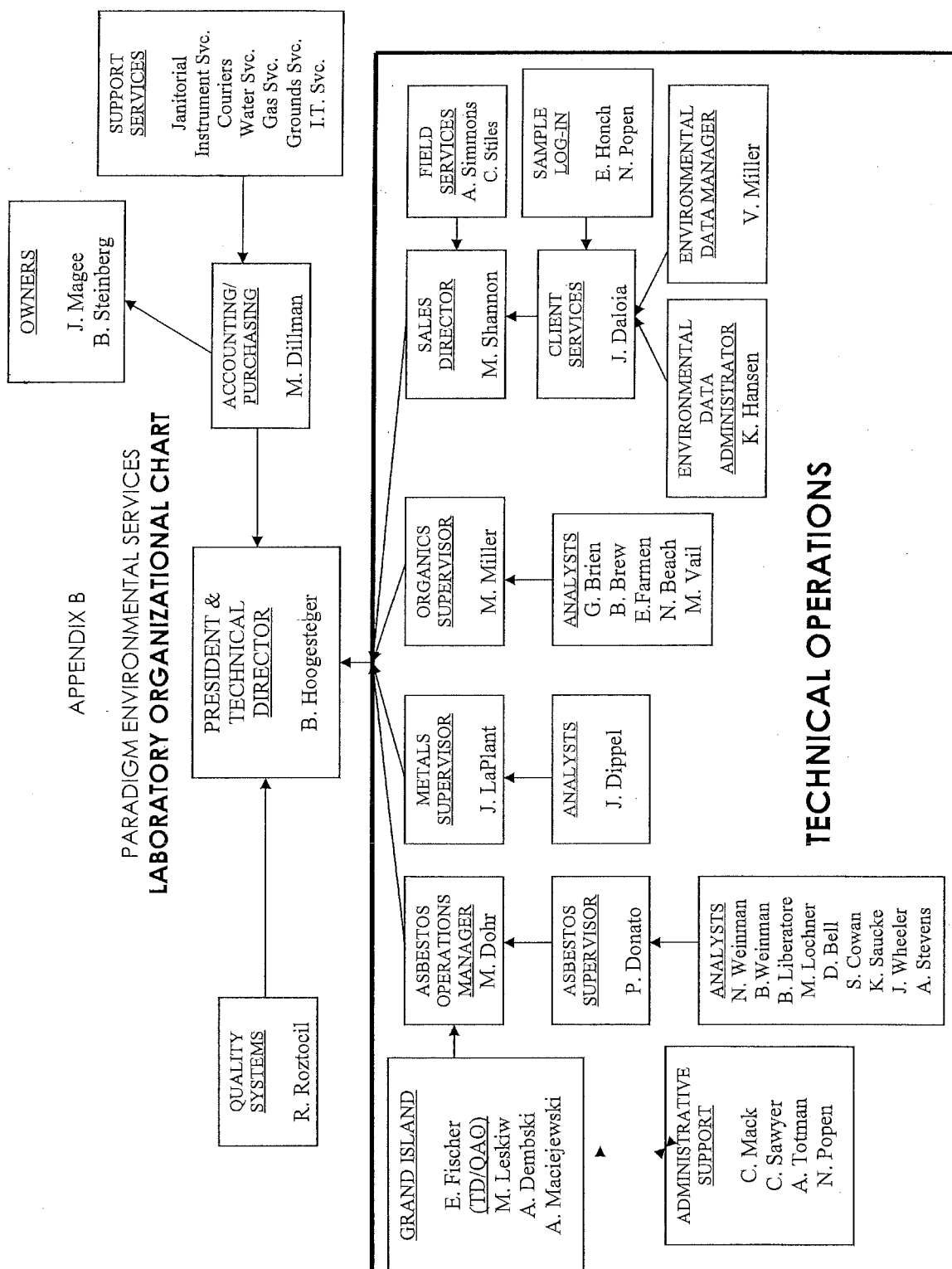
All Paradigm staff involved in the generation, reporting, or discussion of laboratory data must agree to abide by the following:

1. To cooperate in elevating and maintaining the professional status of independent scientific, engineering and testing firms and in securing recognition of the value of services rendered by them.
2. To assert competency only in work for which adequate equipment and personnel are available or adequate preparation has been made.
3. To have a clear understanding with the client as to the extent and kind of services to be rendered, especially in fields where different grades of characters of services are offered.
4. To endeavor in reports to make clear the significance and limitations of findings reported.
5. To safeguard reports as far as possible against misinterpretation or misuse, and to contend against such misinterpretation or misuse.
6. To oppose and refrain from incompetent and fraudulent inspection, sampling, analysis, testing, consultation, development and research work.
7. To deal openly, honestly, and fairly in all business and financial matters with employees, clients and the public.

"I will strive to: Maintain a high level of personal integrity and professional competence. Understand, promote, and implement the laws, guidelines, and standards with regard to the conduct and reporting of studies under my jurisdiction. Protect confidential information. Report findings accurately and honestly and make recommendations impartially. Avoid circumstances where my professional judgement may be compromised or where a conflict of interest could occur or be perceived to occur. Maintain an objective attitude toward evaluation of study integrity regardless of any external influences."

*Society of Quality Assurance in the U.S.*

## APPENDIX B – ORGANIZATIONAL CHART





APPENDIX C, TABLE 1

Paradigm Environmental Services, Inc. CONTAINERS, PRESERVATION, & HOLDING TIMES NON-AQUEOUS				
<i>* Do not freeze samples</i>				
PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
% Water, GC	10 g/40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	14 days
% Water, Karl Fischer	10 g/40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	28 days
Ammonia	5 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
B, Mo, Sn, Ti, Si	5 g	glass jar	$\leq 6^{\circ}\text{C}$	6 months
Bomb/IC Cl, Br, I, F	5 g	glass jar, no headspace	None	28 days
BTU	40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	28 days
Chloride	5 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
Chromium, Hexavalent	5 g	p, g	$\leq 6^{\circ}\text{C}$	30 days
Cyanide, Total	3 g	glass jar	$\leq 6^{\circ}\text{C}$	14 days
Flashpoint 1010	30 g	glass jar	$\leq 6^{\circ}\text{C}$	N/A
Fluoride	5 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
Formaldehyde	5 g	glass jar	$\leq 6^{\circ}\text{C}$	14 days
Glycols, APC	2 oz.	glass jar	$\leq 6^{\circ}\text{C}$	7 days
Glycols, GC	2 oz.	glass jar	$\leq 6^{\circ}\text{C}$	14 days
Ignitability 1030	50 g	p, g	room temp	N/A
Nitrate	5 g	glass jar	$\leq 6^{\circ}\text{C}$	48 hours
Nitrite	5 g	glass jar	$\leq 6^{\circ}\text{C}$	48 hours
Oil & Grease	25 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
Ortho-phosphate	100 g	glass jar	$\leq 6^{\circ}\text{C}$	48 hours
Paint Filter Test	100 g	p, g	$\leq 6^{\circ}\text{C}$	N/A
pH	5 g	p, g	$\leq 6^{\circ}\text{C}$	15 min after addition of water
Phenolics, Total	5 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
Phosphorus, Total	3 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days
Radon (air)	N/A	cassette	N/A	7 days
Reactivity	20 g	glass jar	$\leq 6^{\circ}\text{C}$	7 days
Solids (various)	50 g	glass jar	$\leq 6^{\circ}\text{C}$	7 days
Specific Gravity	50 ml	N/A	N/A	N/A
Sulfate	5 g	glass jar	$\leq 6^{\circ}\text{C}$	28 days

Sulfide	10 g	glass jar	<=6°C	7 days
TKN	3 g	glass jar	<=6°C	28 days
TOC	5 g	VOA vial	<=6°C	28 days
TOX	20 g	glass jar	<=6°C	28 days
TS, TVS	10 g	p, g	<=6°C	7 days

Appendix C, Table 2.

Paradigm Environmental Services, Inc. CONTAINERS, PRESERVATION, & HOLDING TIMES NON-AQUEOUS				
<i>* Do not freeze samples</i>				
PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
<b>METALS</b>				
Flame/ICP Metals	5 g	glass jar	None	6 months
Mercury	5 g	glass jar	None	28 days
TCLP	10 g	glass jar	None	6 months, except 28 days for Hg
<b>ORGANICS</b>				
8260 TCL, Stars, TCL + Stars; BTEX; MTBE; 8015 GRO	40 g	glass jar*	<=6°C	14 days
TCLP Voa	10 g	glass jar*	<=6°C	14 days
PCBs	5 g	glass, plastic	<=6°C	1 year/ 1 year
PCBs (OIL)	2 g	glass, plastic	<=6°C	1 year/ 1 year
8270 ABN, Stars; Pest; Herb; 8015 DRO; 310.13 PHC/TPH	35 g	glass jar	<=6°C	14 days/40 days
TCLP Svoa	25 g	glass jar	<=6°C	14 days/40 days
* no headspace				

Appendix C, Table 3.

Paradigm Environmental Services, Inc. CONTAINERS, PRESERVATION, & HOLDING TIMES AQUEOUS				
<i>* Do not freeze samples</i>				
PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
% water GC	40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	14 days
% water Karl Fisher	40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	28 days
Acidity	100 ml	p,g, no headspace	$\leq 6^{\circ}\text{C}$	14 days
Alkalinity, Total	100 ml	p,g, no headspace	$\leq 6^{\circ}\text{C}$	14 days
Ammonia as N	25 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
B, Mo, Au, Sn, Ti, Si	50 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{HNO}_3$ pH <2	6 months
BOD5, BOD28	500 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours
Bromide	25 ml	p,g	None	28 days
BTU	40 ml	voa vial (unpres)	$\leq 6^{\circ}\text{C}$	28 days
CBOD5	500 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours
Chloride	100 ml	p,g	None	28 days
Chlorine Demand	1000 ml	p,g	$\leq 6^{\circ}\text{C}$	7 days
Chromium, Hexavalent	100 ml	p,g	$\leq 6^{\circ}\text{C}$	24 hours
COD	25 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Color, PCU	100 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours
Conductivity	50 ml	p, g	$\leq 6^{\circ}\text{C}$	28 days
Cyanide-Total & Amen.	100 ml	p,g	$\leq 6^{\circ}\text{C}$ , NaOH, .6g ascorbic acid pH >12	14 days
DOC	4 oz jar	p, g	$\leq 6^{\circ}\text{C}$ , pres after filtering w/ $\text{H}_3\text{PO}_4$	28 days
Eh	4 oz jar	p,g	None	ASAP - field parameter
Flashpoint 1010	30 ml	glass	$\leq 6^{\circ}\text{C}$	N/A
Fluoride	125 ml	p,g	None	28 days
Formaldehyde	100 ml	p,g	$\leq 6^{\circ}\text{C}$	14 days
Glycols, APC	2 oz jar	glass	$\leq 6^{\circ}\text{C}$	7 days
Glycols, GC	2 oz jar	glass	$\leq 6^{\circ}\text{C}$	7 days
Hardness	100 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{HNO}_3$ pH <2	6 months
MBAS (surfactants)	250 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours
Nitrate	25 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours

Nitrate-Nitrite	100 ml	p, g	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Nitrite	75 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours
Oil & Grease/Silica gel	1000 ml	glass	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Orthophosphate	100 ml	p,g	$\leq 6^{\circ}\text{C}$ , filter within 15 min	48 hours
pH	10 ml	p,g	$\leq 6^{\circ}\text{C}$	Analyze within 15 min
Phenolics, Total	500 ml	glass	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Phosphorus, Total	50 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Reactivity	500 ml	glass	$\leq 6^{\circ}\text{C}$	7 days
Residual Chlorine	20 ml	p, g	$\leq 6^{\circ}\text{C}$	ASAP - field parameter
Settleable Solids	1000 ml	p, g	$\leq 6^{\circ}\text{C}$	48 hours
Silica	50 ml	p	$\leq 6^{\circ}\text{C}$	28 days
Solids, Dissolved (TDS)	100 ml	p,g	$\leq 6^{\circ}\text{C}$	7 days
Solids, Suspended (TSS)	200 ml	p,g	$\leq 6^{\circ}\text{C}$	7 days
Specific Gravity	50 ml	N/A	N/A	N/A
Sulfate	25 ml	p,g	$\leq 6^{\circ}\text{C}$	28 days
Sulfide	25 ml	p,g	$\leq 6^{\circ}\text{C}$ , NaOH + zinc acetate pH >9	7 days
Temperature	field test	p,g	None	15 minutes
TKN	100 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
TOC	25 ml	p,g	$\leq 6^{\circ}\text{C}$ , $\text{H}_3\text{PO}_4$ pH <2	28 days
TOX	250 ml	glass	$\leq 6^{\circ}\text{C}$ , $\text{H}_2\text{SO}_4$ pH <2	28 days
Turbidity	50 ml	p,g	$\leq 6^{\circ}\text{C}$	48 hours

Appendix C, Table 4.

Paradigm Environmental Services, Inc. CONTAINERS, PRESERVATION, & HOLDING TIMES AQUEOUS				
<b>* Do not freeze samples</b>				
PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
<b>METALS</b>				
Flame/ICP Metals	200 ml	p,g	HNO <sub>3</sub> pH <2	6 months
Mercury	100 ml	p,g	HNO <sub>3</sub> pH <2	28 days
<b>ORGANICS</b>				
8260 TCL, Stars, TCL + Stars; 624; 601/602; BTEX; MTBE; TICS	2x40 ml	VOA vial	<=6°C, HCl pH <2	14 days
* Voa 600 series (WW) – analyst will check for residual chlorine after analyzing the sample and record the result on the COC				
*unpreserved voas HT 7 days				
TCLP Voa	40 ml minimum	glass	<=6°C, filter into HCl vial	14 days
Pesticides - 8081	1 Liter	glass	<=6°C	7 days/ 40 days
Pesticides - 608	1 Liter	glass	<=6°C, pH 5-9, 0.5 ml 10% soln Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if Cl present; adjust pH with 5% NaOH or H <sub>2</sub> SO <sub>4</sub> soln if needed	7 days/ 40 days if Cl and pH correct; if not, 72 hours
8270 ABN	1 Liter	glass	<=6°C	7 days/ 40 days
625 ABN, 610	1 Liter	glass	<=6°C, 0.5 ml 10% soln Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if Cl present	7 days/ 40 days
608 PCB	1 Liter	glass	<=6°C, 0.5 ml 10% soln Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if Cl present	1 year
8082 PCB	1 Liter	glass	<=6°C	1 year
8270 Stars, 310.13 TPH/PHC, Herbicides, PCB 8082	1 Liter	glass	<=6°C	7 days/ 40 days
TCLP Svoa, Pest, Herb	1 Liter for all; 250 ml ea. when separate	glass	<=6°C	7 days/ 40 days

<b>BACTERIOLOGY</b>				
Coliform, Total (DW)	100 ml	Coli Bottle	$\leq 6^{\circ}\text{C}$ , 0.008% $\text{Na}_2\text{S}_2\text{O}_3$	30 hours
Coliform, Total (WW)	100 ml	Coli Bottle	$\leq 6^{\circ}\text{C}$ , 0.008% $\text{Na}_2\text{S}_2\text{O}_3$	8 hours
Fecal Coli (NPW)	100 ml	Coli Bottle	$\leq 6^{\circ}\text{C}$ , 0.008% $\text{Na}_2\text{S}_2\text{O}_3$	6 hours
Standard Plate Count (DW)	100 ml	Coli Bottle	$\leq 6^{\circ}\text{C}$ , 0.008% $\text{Na}_2\text{S}_2\text{O}_3$	8 hours
Standard Plate Count (WW)	100 ml	Coli Bottle	$\leq 6^{\circ}\text{C}$ , 0.008% $\text{Na}_2\text{S}_2\text{O}_3$	8 hours

**Appendix C, Table 5.  
Container Codes**

<b>Container</b>	<b>Size</b>	<b>Code</b>
Voa Vials – with HCl		V1, V2, etc.
Voa Vials – unpreserved		VU
Glass Ambers – wide mouth	250 ml	S1
	500 ml	S2
	1000 ml	S3
Ambers – straight sided jars	8 oz.	AG8
Clear wide mouth jars	2 oz	G1
	4 oz	G2
	8 oz	G3
HDPE wide mouth jars	50 ml	P1
	100 ml	P2
	250 ml	P3
	500 ml	P4
	1000 ml	P5
Plastic Bags		PB
Coliform Sampler (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> )		C
Miscellaneous Glass		MG
Miscellaneous Plastic		MP
Air Cassettes		A
Tedlar Bags		AV
TO-15 Canisters		T
Miscellaneous (not glass or plastic)		MI

## APPENDIX D, FRONT VIEW

**CHAIN OF CUSTODY****PARADIGM ENVIRONMENTAL SERVICES, INC.**

179 Lake Avenue  
Rochester, NY 14608  
(585) 647-2530 • (800) 724-1997  
FAX: (585) 647-3311

REPORT TO:		INVOICE TO:	
COMPANY:	LAB PROJECT #	CLIENT PROJECT #	
ADDRESS:			
CITY:	STATE:	ZIP:	TURNAROUND TIME: (WORKING DAYS)
PHONE:	FAX:		
ATTN:	ATTN:	QUOTE #	STD OTHER
PROJECT NAME/SITE NAME:			
COMMENTS:			

DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	CONTAMINANTS	REMARKS	PARADIGM LAB SAMPLE NUMBER
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

LAB USE ONLY BELOW THIS LINE

Sample Condition: Per NELAC/ELAP 210/241/242/243/244

Receipt Parameter		NELAC Compliance	
Container Type:		Y	N
Preservation:		Y	N
Holding Time:		Y	N
Temperature:		Y	N

Sampled By	Date/Time	Total Cost:
Relinquished By	Date/Time	
Received By	Date/Time	P.I.F.
Received @ Lab By	Date/Time	



## APPENDIX D, REVERSE

### PARADIGM ENVIRONMENTAL SERVICES, INC.

#### GENERAL TERMS AND CONDITIONS LABORATORY SERVICES

1. These terms and conditions embody the whole agreement of the parties in the absence of a signed and executed contract between the Laboratory (LAB) and Client. They shall supercede all previous communications, representations, or agreements, either verbal or written, between the parties. The LAB specifically rejects all additional, inconsistent, or conflicting terms, whether printed or otherwise set forth in any purchase order or other communication from the Client to the LAB. The invalidity or unenforceability in whole or in part of any provision, term, or condition hereof shall not affect in any way the validity or enforceability of the remainder of Terms and Conditions. No waiver by LAB of any provision, term, or condition hereof or of any breach by or obligation of the Client hereunder shall constitute a waiver of such provision, term, or condition on any other occasion or a waiver of any other breach by or obligation of the Client. This agreement shall be administered and interpreted under the law of the state which services are proctored.
2. **Warranty.** Recognizing that the nature of many samples is unknown and that some may contain potentially hazardous components, LAB warrants only that it will perform testing services, obtain findings, and prepare reports in accordance with generally accepted analytical laboratory principals and practices at the time of performance of services. LAB makes no other warranty, express or implied.
3. **Scope and Compensation.** LAB agrees to perform the services described in the chain of custody which those terms and conditions are attached. Unless the parties agree in writing to the contrary, the duties of LAB shall not be construed to exceed the services specifically described.  
  
Payment terms are net 30 days from the date of invoice. All overdue payments are subject to an interest charge of one and one-half percent (1-1/2%) per month or a portion thereof. Client shall also be responsible for costs of collection, including payment of reasonable attorney fees if such expense is incurred. The prices, unless stated, do not include any sales, use or other taxes. Such taxes will be added to invoice prices when required.
4. **Prices.** Compensation for services performed will be based on the current Lab Analytical Fee Schedule or on verbal quotations agreed to in writing by the parties.
5. **Methods.** Where applicable, LAB will use analytical methodologies which are in substantial conformity with the U.S. Environmental Protection Agency (EPA), State Agency, American Society for Testing and Materials (ASTM), Standard Methods for the Examination of Water and Wastewater, or other recognized methodologies. LAB reserves the right to deviate from these methodologies if necessary or appropriate due to the nature or composition of the sample or otherwise, based on the reasonable judgment of LAB. Deviations, if any, will be made on a basis consistent with recognized standards of the industry and/or LAB's standard operating procedures.
6. **Limitations of Liability.** In the event of any error, omission, or other professional negligence, the sole and exclusive responsibility of LAB shall be to re-perform the deficient work at its own expense and LAB shall have no other liability whatsoever. All claims shall be deemed waived unless made in writing and received by LAB within ninety (90) days following completion of services.  
  
Lab shall have no liability, obligation, or responsibility of any kind for losses, costs, expenses, or other damages (including but not limited to any special, indirect, incidental or consequential damages) with respect to LAB's services or results.  
  
All results provided by LAB are strictly for the use of its clients and LAB is in no way responsible for the use of such results by clients or third parties. All results should be considered in their entirety, and LAB is not responsible for the separation, detachment, or other use of any portion of these results.
7. **Hazard Disclosure.** Client represents and warrants that any sample delivered to LAB will be preceded or accompanied by complete written disclosure of the presence of any hazardous substances known or suspected by Client. Client further warrants that any sample containing any hazardous substance that is to be delivered to LAB will be packaged, labeled, transported, and delivered properly and in accordance with applicable laws.
8. **Sample Handling.** Prior to LAB's acceptance of any sample (or after any revocation of acceptance), the entire risk of loss or of damage to such sample remains with Client. Samples are accepted when receipt is acknowledged on chain of custody documentation. In no event will LAB have any responsibility for the action or inaction of any carrier shipping or delivering any sample to or from LAB premises.  
  
Disposal of hazardous waste samples is the responsibility of the Client. If the Client does not wish such samples returned, LAB may add storage and disposal fees to the federal invoice. Maximum storage time for samples is 30 days after completion of analysis unless modified by applicable state or federal laws. Client will be required to give the LAB written instructions concerning disposal of these samples.  
  
Lab reserves the absolute right, exercisable at any time, to refuse to receive delivery of, refuse to accept, or revoke acceptance of any sample which, in the sole judgment of LAB (a) is of unsuitable volume, (b) may be or become unsuitable for or may pose a risk in handling, transport, or processing for any health, safety, environmental or other reason whether or not due to the presence in the sample of any hazardous substance, and whether or not such presence has been disclosed to LAB by Client or (c) if the condition or sample date make the sample unsuitable for analysis.
9. **Legal Responsibility.** Lab is solely responsible for performance of this contract, except any obligation assigned pursuant to item #10, and no affiliated company, director, officer, employee, or agent shall have any legal responsibility hereunder, whether in contract or tort, including negligence.
10. **Assignment.** Lab may assign its performance obligations under this contract to other parties, as it deems necessary. LAB shall disclose to Client any assignee (subcontractor) by ELAP ID # on the submitted final report.
11. **Force Majeure.** Lab shall have no responsibility or liability to the Client for any failure or delay in performance by LAB, which results in whole or in part from any cause or circumstance beyond the reasonable control of LAB. Such causes and circumstances shall include, but not limited to, acts of God, acts or orders of any government authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, difficulties or delays in transportation, mail or delivery services, inability to obtain sufficient services or supplies from LAB's usual suppliers, or any other cause beyond LAB's reasonable control.
12. **Law.** This contract shall be continued under the laws of the State of New York without regard to its conflicts of laws provision.
13. **Sample Receipt.** The sample conditions are documented upon receipt in accordance with the acceptance criteria dictated by NYSDOH. The lab takes all information provided by the client to be accurate, and does not attempt to verify this information (i.e., sample dates, preservations, etc.) By signing this Chain of Custody, it serves as a work order by the client to proceed with sample analysis in the condition received by the laboratory.

Appendix E

**PARADIGM ENVIRONMENTAL SERVICES LABORATORY  
EQUIPMENT LIST**

**ASBESTOS**

- 1 JEOL TEM-100CX Transmission Electron Microscope
- 1 SPI Plasma Prep II air filter asher/etcher
- 1 Denton Vacuum Carbon Coater
- 4 Olympus BH-2 Polarized/Phase Contrast Microscopes
- 2 Olympus Stereo Microscopes
- 2 Airfiltronix Hoods
- 2 Final Air Hoods
- 1 Thermolyne 4800 Furnace
- 1 Mettler Toledo Balance AB104
- 1 Quick Fix Acetone Vaporizer
- 1 BGI Acetone Vaporizer
- 2 Fisher Scientific 1'x1' Hot Plates

**METALS**

- 1 Perkin-Elmer Optima 3300 DV ICP  
Perkin-Elmer AS-90 Autosampler  
Computer with Windows NT and Perkin-Elmer Winlab Software, Printer
- 1 Perkin-Elmer FIMS 100 Mercury Cold Vapor analyzer  
Perkin-Elmer As-44 Autosampler  
Computer with Windows NT and Perkin-Elmer Winlab software, Printer

## **ORGANICS**

- 1 Hewlett-Packard 6890 Gas Chromatograph  
Hewlett-Packard 5973 Mass Spectrometer  
EST Enchon Purge and Trap  
EST 8100 Autosampler
- 1 Hewlett-Packard 5890 Gas Chromatograph  
Electron Capture Detector / ECD  
Hewlett-Packard 7673 Autosampler
- 1 Hewlett-Packard 5890 Gas Chromatograph  
Flame Ionization Detector  
Hewlett-Packard 7673 Autosampler
- 1 Agilent 6890 Gas Chromatograph  
Agilent 5973 Mass Spectrometer  
Agilent 7683 Autosampler
- 1 Agilent 6890 Gas Chromatograph with Micro ECD  
Agilent 7683 Autosampler
- 1 Thermo Trace GC  
DSQ Mass Spectrometer  
Entech 7032A-L Autosampler  
Entech 7100A Preconcentrator  
Entech 4600A Dynamic Dilutor  
Entech 3100A Canister Cleaner  
Barnstead International 3513 Oven

## **MISCELLANEOUS**

- 1 Shimadzu AUY220 Analytical Balance
- 1 Farberware Drying Oven
- 1 Thelco Model 6 Incubator
- 1 Market Forge Sterilmatic Autoclave
- 1 Fisher Accumet pH meter, Model 15

**MISCELLANEOUS CONTINUED**

- 1 Hoodaire 6' Fume Hood
- 1 Kewaunee 6' Fume Hood
- 2 Fisher Scientific 1'x1' Hot Plates
- 2 Environmental Express SC154 Hot Block Digestors
- 1 Sonics and Materials 375 Watt Probe Sonicator
- 1 Setra EL-2000S Toploading Balance
- 1 Vortex Genie
- 1 FS3 Fisher Scientific Sonicator
- 1 Corning Scholar 171 Stirrer
- 1 VWR Scientific Turbidity Meter
- 1 Environmental Express 6 position TCLP Spinner
- 1 Labconco RapidVap
- 1 Orion Model 105 Conductivity Meter

## APPENDIX F – APPROVED TEST METHODS

<u>Category</u>	<u>Method</u>	<u>Accrediting Body</u>		
*Primary AB				
<u>Potable Water:</u>				
• Total Coliform	Colilert	NY*		
<u>Non-Potable Water</u>				
• Semi-Volatiles	EPA 8270C	NY*	PA	
	EPA 625	NY*	PA	
• Volatiles	EPA 8260B	NY*	PA	OK
	EPA 624	NY*	PA	
• PCBs	EPA 8082A	NY*	PA	
	EPA 608	NY*	PA	
• Pesticides	EPA 8081B	NY*	PA	
	EPA 608	NY*		
• Metals	EPA 6010B	NY*		
	EPA 200.7 Rev. 4.4	NY*	PA	
	EPA 245.1 Rev. 3.0	NY*	PA	
	EPA 7470A	NY*	PA	
• Hardness	EPA200.7 Rev. 4.4	NY*		
• Hydrogen Ion (pH)	EPA 9040B	NY*		
	SM18-21 4500-HB	NY*	PA	
• Conductivity	SM18-21 2510B	NY*		
• Temperature	SM18-21 2550B	NY*	PA	
• Total Residual Chlorine	SM18-21 4500-CIG	NY*		
• Turbidity	EPA 180.1 Rev. 2.0	NY*		
• Prep Methods	EPA 3005A	NY*		
	EPA 3510C	NY*	PA	
	EPA 5030B	NY*	PA	
	EPA 5035	NY*		
	EPA 3580	NY*		
	EPA 3585	NY*		

### **Air and Emissions**

- |                   |                              |     |       |
|-------------------|------------------------------|-----|-------|
| • Metals          | NIOSH 7300                   | NY* |       |
| • Asbestos Fibers | NIOSH 7400 A Rules           | NY* |       |
| • Asbestos TEM    | NIOSH 7402                   | NY* |       |
|                   | 40 CFR 763 TEM APX A No. III | NY* | NVLAP |

### **Solid and Hazardous Waste**

- |                    |                         |     |       |
|--------------------|-------------------------|-----|-------|
| • Semi-Volatiles   | EPA 8270C               | NY* | PA    |
| • Pesticides       | EPA 8081A, EPA 8081B    | NY* | PA    |
| • PCBs             | EPA 8082, EPA 8082A     | NY* | PA    |
| • Volatiles        | EPA 8260B               | NY* | PA    |
| • Metals           | EPA 6010B               | NY* | PA    |
|                    | EPA 7471A, EPA          | NY* | PA    |
| • DRO/GRO          | EPA 8015B               | NY* | PA    |
| • Corrosivity      | EPA 9045C               | NY* |       |
| • Ignitability     | EPA 1010, EPA 1030      | NY* | PA    |
| • pH               | EPA 9045C               | NY* |       |
| • Asbestos Friable | EPA 600/M4/82/020       | NY* | NVLAP |
|                    | Item 198.1 of Manual    | NY* |       |
| • Asbestos PLM NOB | Item 198.6 of Manual    | NY* |       |
| • Asbestos TEM NOB | Item 198.4 of Manual    | NY* |       |
| • Prep Methods     | EPA 3050B               | NY* | PA    |
|                    | EPA 3550B               | NY* | PA    |
|                    | EPA 3580                | NY* | PA    |
|                    | EPA 3585                | NY* | PA    |
|                    | EPA 5030B               | NY* |       |
|                    | EPA 5035                | NY* | PA    |
|                    | APP. 14.2 HUD JUNE 1995 | NY* |       |
|                    | EPA 1311                | NY* | PA    |

## **ATTACHMENT 4**

**Table 1**  
**(Analytical Laboratory Testing Program)**

**Table 1**  
**Analytical Laboratory Testing Program**  
**Quality Assurance Project Plan**  
**118 Petten Street**  
**Rochester, New York**  
**(NYSDEC Site ID C828130)**

Task	Sample Matrix	Parameter	Field Samples	Trip Blanks	MS/MSD	Field Blanks	Analytical Methods	Reporting Levels	Corresponding SCGs
Remedial Design Samples from Test Pits	Soil	STARS VOCs & TICS	Up to 3	0	1	1	EPA Method 8260	ASP-B	Part 375 SCOs for Unrestricted Use, Restricted Commercial Use, and Protection of Groundwater
	Soil	STARS SVOCs & TICS	Up to 3	0	1	1	EPA Method 8270	ASP-B	Part 375 SCOs for Unrestricted Use, Restricted Commercial Use, and Protection of Groundwater
Remedial Design Samples from Test Borings	Soil	STARS VOCs & TICS	10	0	0	1	EPA Method 8260	ASP-B	Part 375 SCOs for Unrestricted Use, Restricted Commercial Use, and Protection of Groundwater
Remedial Design Samples from Temporary Monitoring Wells and Existing Monitoring Well GM-MW16	Water	STARS VOCs & TICS	11	1	1	0	EPA Method 8260	ASP-B	TOGS 1.1.1 Groundwater Standards and Guidance Values
Waste Characterization Samples (Tank Contents)	Liquid, sludge or solid	STARS VOCs & TICS	Unknown	0	0	0	EPA Method 8260	ASP-B	Disposal Facility Requirements
	Liquid, Sludge or Solid	Flashpoint	Unknown	0	0	0	EPA Method 1010 or 1030	ASP-B	Disposal Facility Requirements
Waste Characterization Sample (Decontamination Water and Well Purge Water)	Liquid	Purgeable Organics	1	0	0	0	EPA Method 624	ASP-B	Disposal Facility Requirements
	Liquid	SVOCs	1	0	0	0	EPA Method 625	ASP-B	Disposal Facility Requirements



## **ATTACHMENT 5**

**Test Pit Log, Test Boring Log, Temporary Monitoring  
Well Construction Diagram, and Well Sampling Log**



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ENVIRONMENTAL CONSULTANTS

AN AFFILIATE OF DAY ENGINEERING, P.C.

Project #: \_\_\_\_\_

Project Address: \_\_\_\_\_

Date: \_\_\_\_\_

TEST PIT TP- \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_

DAY Representative: \_\_\_\_\_

Test Pit Depth: \_\_\_\_\_

Contractor: \_\_\_\_\_

Depth to Water: \_\_\_\_\_

Equipment: \_\_\_\_\_

Depth (ft)	PID Reading (ppm)	Samples Collected	PID Headspace (ppm)	Sample Description	Notes
1-					1-
2-					2-
3-					3-
4-					4-
5-					5-
6-					6-
7-					7-
8-					8-
9-					9-
10-					10-
11-					11-
12-					12-
13-					13-
14-					14-
15-					15-
16-					16-

## Notes:

1) Water levels were made at the times and under conditions stated. Fluctuations of groundwater levels may occur due to seasonal factors and other conditions.

2) Stratification lines represent approximate boundaries. Transitions may be gradual.

3) PID readings are referenced to a benzene standard measured in the headspace above the sample using a MiniRae 2000 equipped with a 10.6 eV lamp.

4) NA = Not Available or Not Applicable

TEST PIT TP- \_\_\_\_\_

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AN AFFILIATE OF DAY ENGINEERING, P.C.

Project #: \_\_\_\_\_  
Project Address: \_\_\_\_\_  
DAY Representative: \_\_\_\_\_  
Drilling Contractor: \_\_\_\_\_  
Sampling Method: \_\_\_\_\_

Ground Elevation: \_\_\_\_\_ Datum: \_\_\_\_\_  
Date Started: \_\_\_\_\_ Date Ended: \_\_\_\_\_  
Borehole Depth: \_\_\_\_\_ Borehole Diameter: \_\_\_\_\_  
Completion Method: ☐ Well Installed ☐ Backfilled with Grout ☐ Backfilled with Cuttings  
Water Level (Date): \_\_\_\_\_

**Test Boring TMW-**

Page 1 of 2

Depth (ft)	Blows per 0.5 ft.	Sample Number	Sample Depth (ft)	% Recovery	N-Value or RQD%	Headspace PID (ppm)	PID Reading (ppm)	Sample Description	Notes
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

Notes: 1) Water levels were made at the times and under conditions stated. Fluctuations of groundwater levels may occur due to seasonal factors and other conditions.  
2) Stratification lines represent approximate boundaries. Transitions may be gradual.  
3) PID readings are referenced to a benzene standard measured in the headspace above the sample using a MiniRae 2000 equipped with a 10.6 eV lamp.  
4) NA = Not Available or Not Applicable  
5) Headspace PID readings may be influenced by moisture

**Test Boring TMW-**

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Project #: \_\_\_\_\_  
Project Address: \_\_\_\_\_  
DAY Representative: \_\_\_\_\_  
Drilling Contractor: \_\_\_\_\_  
Sampling Method: \_\_\_\_\_

Ground Elevation: \_\_\_\_\_ Datum: \_\_\_\_\_  
Date Started: \_\_\_\_\_ Date Ended: \_\_\_\_\_  
Borehole Depth: \_\_\_\_\_ Borehole Diameter: \_\_\_\_\_  
Completion Method: ☐ Well Installed ☐ Backfilled with Grout ☐ Backfilled with Cuttings  
Water Level (Date): \_\_\_\_\_

**Test Boring TMW-**

Page 2 of 2

Depth (ft)	Blows per 0.5 ft.	Sample Number	Sample Depth (ft)	% Recovery	N-Value or RQD%	Headspace PID (ppm)	PID Reading (ppm)	Sample Description	Notes
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									

Notes: 1) Water levels were made at the times and under conditions stated. Fluctuations of groundwater levels may occur due to seasonal factors and other conditions.  
2) Stratification lines represent approximate boundaries. Transitions may be gradual.  
3) PID readings are referenced to a benzene standard measured in the headspace above the sample using a MiniRae 2000 equipped with a 10.6 eV lamp.  
4) NA = Not Available or Not Applicable  
5) Headspace PID readings may be influenced by moisture

**Test Boring TMW-**

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TEMPORARY MONITORING WELL CONSTRUCTION DIAGRAM

Project #:				<b>MONITORING WELL TMW-</b>
Project Address:				
DAY Representative:		Ground Elevation: _____ Datum: _____		
Drilling Contractor:		Date Started: _____ Date Ended: _____		
		Water Level (Date): _____		
Refer to Test Boring Log TBW- for Soil Description		_____ Height of Stickup (ft)		
		← Ground Surface		
		_____ Depth to Top of Well Screen (ft)		
		_____ Diameter of Borehole (in)		
		Backfill Type _____		
		_____ Inside Diameter of Well (in)		
		Type of Pipe _____ Screen slot size _____		
_____ Depth to Bottom of Well Screen (ft)				
Notes: 1) Water levels were made at the times and under conditions stated. Fluctuations of groundwater levels may occur due to seasonal factors and other conditions. 2) NA = Not Available or Not Applicable				
				<b>MONITORING WELL TMW-</b>

S:\Fieldforms\Monitoring Well Installation Log (revised October 2006)

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**DAY ENVIRONMENTAL, INC.  
MONITORING WELL SAMPLING LOG**

**WELL TMW-**

**SECTION 1 - SITE INFORMATION**

**SITE LOCATION:** \_\_\_\_\_ **JOB #:** \_\_\_\_\_  
 \_\_\_\_\_ **DATE :** \_\_\_\_\_  
**SAMPLE COLLECTOR(S):** \_\_\_\_\_  
**WEATHER CONDITIONS:** \_\_\_\_\_ **PID IN WELL (PPM):** \_\_\_\_ **LNAPL** \_\_\_\_ **DNAPL** \_\_\_\_

**SECTION 2 - PURGE INFORMATION**

**DEPTH OF WELL [FT]:** \_\_\_\_\_ (MEASURED FROM TOP OF CASING - T.O.C.)  
**STATIC WATER LEVEL (SWL) [FT]:** \_\_\_\_\_ (MEASURED FROM T.O.C.)  
**THICKNESS OF WATER COLUMN [FT]:** \_\_\_\_\_ (DEPTH OF WELL - SWL)  
**CALCULATED VOL. OF H<sub>2</sub>O PER WELL CASING [GAL]:** \_\_\_\_\_ **CASING DIA.:** \_\_\_\_\_

**CALCULATIONS:**  

<u>CASING DIA. (FT)</u>	<u>WELL CONSTANT(GAL/FT)</u>	<u>CALCULATIONS</u>
3/4" (0.0625)	0.023	VOL. OF H <sub>2</sub> O IN CASING = DEPTH OF WATER COLUMN X WELL CONSTANT
1" (0.0833)	0.041	
1 1/4" (0.1041)	0.063	
2" (0.1667)	0.1632	
3" (0.250)	0.380	
4" (0.3333)	0.6528	
4 1/2" (0.375)	0.826	
6" (0.5000)	1.4688	
8" (0.666)	2.611	

**CALCULATED PURGE VOLUME [GAL]:** \_\_\_\_\_ (3 TIMES CASING VOLUME)  
**ACTUAL VOLUME PURGED [GAL]:** \_\_\_\_\_  
**PURGE METHOD:** \_\_\_\_\_ **PURGE START:** \_\_\_\_\_ **END:** \_\_\_\_\_

**SECTION 3 - SAMPLE IDENTIFICATION AND TEST PARAMETERS**

SAMPLE ID #	DATE / TIME	SAMPLING METHOD	ANALYTICAL SCAN(S)

**SECTION 4 - WATER QUALITY DATA**

SWL (FT)	TEMP (°C)	pH	CONDUCTIVITY (mS/cm)	TURBIDITY (NTU)	DO (mg/L)	ORP (mV)	VISUAL