REMEDIAL DESIGN 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.
118 Petten Street
Rochester, New York

Prepared By: Day Environmental, Inc.
1563 Lyell Avenue
Rochester, New York 14609

Project No.: 5119R-15

Date: September 29, 2015 (revised May 18, 2016)

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I David D. Day, P.E., certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Design Work Plan – Phase 2 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).

DAVID D. DAY
No. 56922

David D. Day

David D. Day, Pres.

David D. Day, P.E.
President
Day Environmental, Inc.

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APPENDICES

1.0 INTRODUCTION

The subject property (Site) is addressed as 118 Petten Street, in the City of Rochester, Monroe County, New York. The Site consists of approximately 25-acres, 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 is 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 Design Work Plan (RDWP) was prepared under the NYSDEC Brownfield Cleanup Program (BCP) to address environmental conditions at the Site that are associated with two closed-in-place, approximately 550-gallon underground storage tanks (USTs) located in the vicinity of Building #6 (refer to Figure 3).

1.1 Background

A Remedial Action Work Plan – Phase 2 (RAWP) dated December 2012 was submitted to the NYSDEC. The NYSDEC provided conditional approval on June 26, 2013. The Applicant invoked dispute resolution on July 16, 2013. A meeting to discuss the informal dispute resolution issues was held on August 6, 2013. On September 19, 2013 the Department issued a letter proposing revisions to the Remedial Action Work Plan – Phase 2 and settlement to the informal dispute resolution. The September 19, 2013 letter with the proposed revisions was accepted on October 18, 2013 by Mr. Alan Knauf; thus, closing the informal dispute resolution.

1.2 Remedial Design Investigation

DAY performed the RDI in substantial conformance with Section 2.1 of the Remedial Action Work Plan – Phase 2, as modified by the NYSDEC’s September 19, 2013 conditional approval letter. The scope of work included the initial advancement of three test pits, the removal of piping associated with two closed-in-place, concrete-filled USTs, advancement of a fourth test pit, advancement and soil sampling at eleven test boring locations, installation of nine temporary groundwater monitoring wells (designated as TMW-1 through TMW-3, and TMW-5 through TMW-10) and one permanent groundwater monitoring well (designated as GM-MW-16A), groundwater sampling of the ten groundwater monitoring wells, and decommissioning of the nine temporary groundwater monitoring wells. Figure 3, Figure 4, and Figure 5 depict the UST locations as well as the test pit and monitoring well locations. Permanent monitoring well GM-MW-16A was installed as a replacement for previous groundwater monitoring well GM-MW16, which was destroyed during advancement of Test Pit TP1. Soil samples from test pits and test borings were submitted for laboratory analysis of target compound list (TCL) volatile organic compounds (VOCs) and tentatively identified compounds (TICs), and TCL semi-volatile organic compounds (SVOCs) and TICs. Lead was also analyzed on one-half of the soil samples. Groundwater samples were submitted for laboratory analysis of TCL VOCs and TICs. The RDI sample test results are summarized on Table 1 (Summary of detected VOCs – Soil Samples), Table 2 – Summary of Detected SVOCs – Soil Samples), Table 3 (Summary of Detected Lead – Soil Samples) and Table 4 (Summary of Detected VOCs – Groundwater Samples). Total TCL VOCs and TICs, as well as total SVOCs and TICs, detected in RDI soil samples are shown on Figure 4. Total TCL VOCs and TICs detected in RDI groundwater samples are shown on Figure 5.

Based on the findings of the RDI, provided below are conclusions:

- Two concrete-filled USTs, each approximately 550-gallon in size, were identified in Test Pit TP1. These USTs are located approximately one foot east of Building 6 and in proximity to a foundation footer. A structural engineer concluded that removal of the concrete-filled USTs would compromise the structural integrity of the building, so with the concurrence of the NYSDEC, the USTs were not removed. A pipe was connected to the tops of both USTs and entered the south wall of a large concrete slab. Additional piping was present running from the large concrete slab to the east.

- During pipe removal work, an assumed former pump dispenser concrete pad was identified to the east of the concrete-filled USTs (refer to Figure 3).

- Evidence of petroleum contamination in soil [i.e., staining, odors, elevated photoionization detector (PID) readings] appeared to be greatest within the area of the two concrete-filled USTs, at the location of the assumed former pump dispenser, and at the location of a pipe elbow located adjacent to Test Pit TP4. The majority of soil contamination is present within the saturated zone.

- Based on TCL VOC and TICs analytical results, petroleum contamination in groundwater also appears to be greatest within the location of the concrete-filled USTs and in the location of the assumed former pump dispenser.

- Based on analytical results (i.e., the ratio of concentrations of VOC TICs versus total VOCs, and SVOC TICs versus total SVOCs), the petroleum contamination appears to be weathered (i.e., comprised mostly of non-target petroleum-related compounds).

- In general, petroleum contamination in soil and groundwater appears to be delineated to the west, north and south, and is bounded to the east by the Genesee River.

2.0 REMEDIAL ACTIONS

The remedial alternative selected for the Site consists of various technical actions that are intended to perform remediation of the highest concentrations of contamination at the Site (referred to as the "source area"), reduce exposure to Site contaminants, and provide monitoring of groundwater to ensure that the contaminant levels are reducing. This remedial alternative is considered a Track 4 alternative. This section of the RDWP provides details on the components of actions that will be conducted in the area of the closed-in-place USTs as part of this remedial alternative. In general, the remedial actions will include:

- Site preparation.
- Source area soil removal and off-site disposal.
- Regenesis' Oxygen Release Compound (ORC)-Advanced® placed in excavations to reduce contaminant concentrations in saturated soil and groundwater in the areas of the closed-in-place USTs, the pipe elbow and the assumed former pump dispenser.
- Backfilling of excavations with earthen material acceptable to the NYSDEC.
- In-situ bioremediation via injection of ORC-Advanced® to reduce contaminant concentrations in saturated soil and groundwater in plume areas outside the excavation limits completed in the areas of the closed-in-place USTs, the pipe elbow and the assumed former pump dispenser.
- Groundwater monitoring to evaluate the effectiveness of the remedy at this area of concern.
- Characterization and disposal of remediation derived wastes.
- Incorporation of the work into a Final Engineering Report (FER) that will be prepared in accordance with DER-10 Section 5.8, 6 NYCRR Part 375-1.6(c), using the current FER template as provided on the NYSDEC website.

The site-specific health and safety plan (HASP) included in the RAWP-Phase 2 has been included in Appendix A. This HASP outlines the policies and procedures necessary to protect workers and the public from potential environmental hazards posed during project activities. The Safety Data Sheets (SDS) for the pellet form and powder form of ORC-Advanced® have been appended to the HASP.

It is currently planned that Paradigm Environmental Services, Inc. (Paradigm), which is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified analytical laboratory (ELAP #10958), will analyze samples of groundwater that are generated as part of this project. The quality assurance plan (QAPP) included in the RAWP – Phase 2 has been included as Appendix B. The QAPP has been supplemented with Regenesis' installation instructions for Direct Injection Slurry Applications and Excavation Applications of ORC-Advanced®.

2.1 Site Preparation

A utility stakeout will be completed and field checked prior to marking out the source area soil removal excavations described in Section 2.2, and the in-situ remediation injection points described in Section 2.6. With concurrence from the NYSDEC project manager, and to the extent deemed warranted, adjustments may be made in the field concerning the limits of excavation and locations of in-situ injection points to account for field conditions.

2.2 Source Area Soil Removal and Off-Site Disposal

DAY and its subcontractors will remove "source area" petroleum-impacted soil at the Site as indicated on Figure 6 (i.e., from the location of the two closed-in-place USTs, the assumed former pump dispenser area and in the area of the pipe elbow). The removed petroleum-impacted soil and/or fill will be subsequently transported and disposed at a permitted landfill facility and in accordance with applicable local, State, and Federal regulations. A DAY representative will be on-site full-time to document and monitor this "source area" removal work. A DAY representative will also conduct health and safety air monitoring for VOCs and particulates during the removal work in accordance with provisions of the HASP and Community Air Monitoring Plan (CAMP). The subcontractor will either utilize this HASP or the components of its own HASP (submitted to the regulatory agencies) for the protection of its on-site workers.

Figure 6 shows the approximate limits of the "source area" removals [i.e., three areas totaling approximately 120-square-foot). The removed petroleum-contaminated soil and/or fill will be transported off-site by NYSDEC Part 364 permitted trucks for disposal at a NYSDEC-permitted landfill facility in accordance with applicable local, State, and Federal regulations. Currently, it is anticipated that the petroleum-contaminated soil will be used as cover at the landfill facility. If warranted in order to obtain landfill disposal approvals, samples of the soil to be disposed at the landfill will be collected and analyzed at a NYSDOH ELAP-certified analytical laboratory for parameters requested by the disposal facility.

As shown on Figure 6, the proximity of Building 6 and the associated building footer represent restricting factors concerning the extent of the excavations in the location of the out-of-service USTs, and the location of the Quonset hut limits the excavation in the location of the pipe elbow. As shown in Figure 6, soil will be excavated from three "source areas" that were identified during the RDI activities as containing the highest concentrations of petroleum contamination. To supplement remediation of residual contamination, a bioremediation application is planned at the bottom of each excavation (refer to Section 2.3) to be followed by in-situ aerobic bioremediation (refer to Section 2.6). As such, it is currently anticipated that confirmatory/documentation soil samples will not be collected from the three "source area" excavations.

It is currently anticipated that contaminated soils will be removed to depths of four feet or less. (Note, groundwater was encountered at a depth of about three feet bgs in this area). The estimated depth of soil removal in the location of the closed-in-place USTs is from zero to four feet below the ground surface (bgs). The estimated depth of soil removal in the location of the assumed former pump dispenser and the pipe elbow is zero to three feet bgs. Based on the lateral limits of the excavations (i.e., 92 square feet in the location of the closed-in-place USTs, 9 square feet in the location of the pipe elbow and 21 square feet in the location of the assumed former pump dispenser), it is estimated that approximately 460 cubic feet (i.e., approximately 17 cubic yards) of contaminated soil will be removed, which equates to approximately 28 tons when using a conversion factor of 1.65 tons/cubic yard.

It is anticipated that the source area soil removal will be conducted as follows:

- Mark out limits of excavations using tape measurements from control points or existing Site features.
- Start removing contaminated soil from the locations shown on Figure 6. To the extent possible, contaminated soil will be direct loaded into trucks or roll offs to minimize staging soils at the Site. If required, polyethylene plastic sheeting (minimum thickness of 12 mil) will be used as a barrier between petroleum impacted soils and the ground surface.
- Trucks and roll offs will be lined to ensure trucks leaving the Site are not releasing/discharging material on the Site or off-site roadways. Also, if soil is staged on-Site, the staging area will be constructed with a liquid collection system.
- If deemed necessary based on olfactory observations or CAMP results, BioSolve®, foam, or other material will be used during the excavation process to suppress petroleum odors and vapors during excavation activities.
- Tape measurements from existing site structures will be used to record the actual extent of the soil removal excavation limits for transfer to a geographic information system (GIS) or computer-aided design (CAD).
- A truck/equipment decontamination pad will be constructed so that soil/fill materials/liquid will not be tracked/released/discharged from the Site. To the extent deemed warranted, outbound heavy equipment and trucks will be decontaminated (swept/scraped/washed off) before leaving the Site.

2.2.1 Dewatering of Excavation (Contingency)

Based on observations made during the RDI and on the limited size of the excavations, it is unlikely that the excavations will require dewatering during removal work. However, if dewatering appears necessary, a frac tank or holding tank of appropriate size will be mobilized to the Site to collect groundwater from the excavation(s) as deemed necessary during the soil removal work. If dewatering is conducted, a sample of the staged water will be collected by DAY and subsequently tested by a NYSDOH ELAP-certified analytical laboratory. In order to characterize the staged water to evaluate pre-treatment and/or disposal options, it is anticipated that the sample will be tested for Purgeable Organics using Method 624 (or equivalent), possibly SVOCs using Method 625 (or equivalent) and/or other parameters as required by the disposal/treatment facility.

2.3 ORC-Advanced® Placed in Excavations

Subsequent to backfilling the excavations, Regenesis' ORC-Advanced® will be placed in the bottom of each excavation to assist in long-term biodegradation of residual petroleum contamination in saturated soil and groundwater. Based on recommendations from Regenesis, a total of approximately 325 pounds of ORC-Advanced® in pellet or powder form will be placed in the three source area soil removal excavations. The ORC-Advanced® will be placed in general accordance with the ORC-Advanced® excavation application installation instructions included in Appendix C. The material will be placed dry onto the bottom of the excavations at elevations that are likely within the groundwater table on at least a seasonal basis. ORC-Advanced® is a proprietary formulation of calcium oxy-hydroxide that produces a controlled release of oxygen for a period of up to 12 months. Once the material becomes hydrated by the groundwater, the patented Controlled Release Technology (CRT™) associated with ORC-Advanced® delivers oxygen consistently over an extended period of time, which is used to accelerate the rate of naturally occurring aerobic contaminant biodegradation in groundwater and saturated soils. Copies of the SDS for the pellet form and the powder form of ORC-Advanced® are included in Appendix A of the HASP.

2.4 Backfilling the Source Area Excavations

A select geotechnical fill material will be used at the excavations as backfill to replace the petroleum-contaminated soil that is removed. The replacement fill will meet the criteria of Section 5.4(e)5 of DER-10 (i.e., material not requiring chemical testing) and will be sourced from a New York State Department of Transportation (NYSDOT)-approved or NYSDEC-approved location. A Soil Import Form will be completed and NYSDEC approval will be obtained prior to the material coming onto the Site. The imported fill material will be placed into the excavations in one-foot lifts and compacted to the extent practicable.

2.5 Monitoring Well Installation, and Contingency for Replacement

Groundwater monitoring well GM-MW-15A will be installed to the east of former monitoring well GM-MW15 (as shown on Figure 8). Monitoring well GM-MW15 could not be located during RDI activities. In addition, groundwater monitoring well GM-MW-16A may require decommissioning in accordance with NYSDEC CP-43 during the source area soil removal work due to its proximity to one of the planned excavations. If so, one new groundwater monitoring well (to be designated as well GM-MW-16B) will be installed in the general location of GM-MW-16A, which is shown on Figure 8. Also, groundwater monitoring well GM-MW-41 will be installed in the location of the assumed former pump dispenser, and groundwater monitoring wells GM-MW-40, GM-MW-39, and GM-MW-38 will be installed to the north, west, and south of the planned remediation areas (as shown on Figure 8). A Geoprobe Systems drill-rig will be used to install the wells. It is anticipated that a boring will be advanced to 12 feet below the ground surface at each new well location. A one-inch inner diameter polyvinyl chloride (PVC) well will then be constructed inside each boring. Each new well will consist of a ten-foot long 10-slot PVC screen threaded to solid PVC riser that extends to the ground surface and is equipped with a cap or J-plug. A sand pack will be placed in each borehole annulus up to one foot below the bottom of the PVC screen and at least one foot above the top of the PVC screen. At each new well location, a minimum one-foot thick bentonite seal (i.e., hydrated bentonite pellets or chips) will be placed in the annulus above the sand pack, a Portland cement bentonite grout will be used to fill the annulus above the bentonite seal to about one foot below the ground surface, and a flush-mount curb box will then be cemented in-place with concrete. Groundwater monitoring well construction diagrams will be completed for each groundwater monitoring well installed.

2.6 In-Situ Remediation Using ORC-Advanced®

In-situ aerobic bioremediation will be performed to remediate contamination in subsurface soil and groundwater at injection points outside the footprint of the "source area" removal excavations. ORC-Advanced® will be used to treat the contamination. The primary goal of the in-situ remediation will be to provide long-term treatment of residual contaminants with ORC-Advanced®. A description of the ORC-Advanced® is provided in Section 2.3.

Using existing data from the RDI report, Regenesis was consulted regarding the amounts of ORC-Advanced® that should be used for the in-situ application. Based on recommendations from Regenesis, a total of approximately 200 pounds of ORC-Advanced® in powder form will be injected at remediation areas A and B shown on Figure 7. The ORC-Advanced® will be injected using the direct-push injection method in general accordance with ORC-Advanced® direct-injection installation instructions included in Appendix C. Injection pump selection and pump cleaning are also discussed in Regenesis' instructions included in Appendix C.

Figure 8 shows 18 planned injection points for in-situ remediation outside the three "source area" soil removal excavations. For the purposes of this RDWP, it is presumed that the ORC-Advanced® delivery radius of influence (ROI) at each injection point will be five feet, and that approximately 11.1 pounds of ORC-Advanced® mixed with appropriate amounts of potable water from the City of Rochester Municipal supply system will be injected at each of the 18 injection points. However, the actual number and location of injection points, and quantities of ORC-Advanced® to be injected at each injection point may vary depending upon field conditions encountered.

A USEPA Class V UIC Inventory form will be completed and provided to the USEPA and the NYSDEC prior to performing subsurface amendment injections. Approval will be obtained from the USEPA prior to conducting any injections at the Site. A copy of the approval will be provided to the NYSDEC prior to the start of injections.

2.7 Groundwater Monitoring

A performance groundwater monitoring program will be implemented to track remedial progress and confirm its effectiveness. The groundwater monitoring program will be implemented using one existing groundwater monitoring well (designated as GM-MW-16A) and five proposed groundwater monitoring wells (designated as GM-MW-15A and GM-MW-38 through GM-MW-41) to ensure that the remedy was effective. The locations of these monitoring wells are shown on Figure 7 and Figure 8. Monitoring well GM-MW-16A provides monitoring information on groundwater quality in the location of the out-of-service USTs, and monitoring well GM-MW-41 provides monitoring information on groundwater quality in the location of the assumed former pump dispenser and pipe elbow. Monitoring wells GM-MW-15A, and GM-MW-38 through GM-MW-40 provide monitoring information in relation to groundwater quality around the treated areas including but not limited to: evaluating the effectiveness of oxygen being delivered and dispersed in the groundwater; determining if contaminant concentrations are decreasing; and, monitoring whether the contaminant plume was pushed outward during the injection work.

[Note, If monitoring well GM-MW-16A is decommissioned during the soil removal work, then replacement monitoring well GM-MW-16B will be installed and used for the groundwater monitoring.]

The results of the groundwater monitoring completed as part of the RDI will be used as baseline data for comparison to performance groundwater monitoring results. To supplement this baseline data, a bailer will be used to collected groundwater samples from the six wells (GM-MW-16A [or GM-MW-16B], GM-MW-15A and GM-MW-38 through GM-MW-41) prior to starting injection work. Water quality measurements on each baseline sample will be taken for parameters such as dissolved oxygen, redox potential, pH, temperature, conductivity, and turbidity. As the injection work progresses, at least two more rounds of water quality measurements will be obtained from the six wells in order to assist in evaluating the delivery and dispersement of the ORC-Advanced®.

It is anticipated that performance groundwater monitoring events will be conducted quarterly for a minimum of one year. The first quarterly groundwater monitoring event will commence approximately three months after completion of the remediation outlined in Section 2.6. The quarterly groundwater monitoring is included in the project schedule provided in Section 4.0. Long-term groundwater monitoring may also be a requirement of the Site Management Plan (SMP), and the scope, frequency, and duration will be determined based on the results of the RDWP quarterly performance groundwater monitoring, and consultation with, and approval from, the NYSDEC Project Manager.

Conventional purge and sample methods will be used to collect the quarterly performance groundwater monitoring samples (refer to QAPP). It is anticipated that each performance groundwater monitoring event will include collecting a groundwater sample from groundwater monitoring wells GM-MW-15A, GM-MW-16A (or GM-MW-16B), and GM-MW-38 through GM-MW-41 for water quality measurements and analytical laboratory testing using the analytical protocol outlined in Section 3.0 of the QAPP included in Appendix B. Water quality measurements will include performance monitoring parameters such as dissolved oxygen, redox potential, pH, temperature, conductivity, and turbidity, as well as groundwater elevation. The procedures and equipment used during the purging and groundwater sampling, and the field measurement data obtained, will be documented on Monitoring Well Sampling Logs (copy included with QAPP in Appendix B).

Each round of performance monitoring groundwater samples will be tested by Paradigm for TCL VOCs including TICs using USEPA Method 8260. Each round will also include testing of a trip blank for TCL VOCs and TICs, completing a matrix spike/matrix spike duplicate (MS/MSD), and completing a Data Usability Summary Report (DUSR) on the laboratory package in accordance with provisions set forth in the QAPP. The laboratory analytical package will be in an acceptable electronic data deliverable format as defined by the NYSDEC. The detected concentrations of VOCs for each groundwater monitoring event will be compared on a summary table to NYSDEC TOGS 1.1.1 groundwater standards and guidance values.

2.8 Contingency Plan

Field conditions will be monitored during and after the injection work to identify problems that may occur in the subsurface that are related to the injection work. Some possible concerns and solutions are detailed below:

If surfacing occurs, one or more contingency actions may include, but will not be limited to:

- Adding bentonite and/or Portland cement grout to the surfacing locations (e.g., previous test boring, temporary well or injection point locations).
- Pounding wood stakes into the ground at surfacing locations (e.g., previous test boring, temporary well or injection point locations).
- Decreasing injection pressures and/or volumes at specific injection points, and increasing the number of injection points.
- Using a drum vac to cleanup surfaced material if extensive surfacing is occurring.
- Placing berm or other engineering controls around surfacing locations.

If inadequate injectate is being delivered to the subsurface, or oxygen distribution is inadequate, one or more contingency actions may include, but will not be limited to:

- Increasing injection pressures and/or volumes.
- Increasing or decreasing water content of injectate mixture.
- Increasing the number of injection points.

If excessive contaminant migration occurs, one or more contingency actions may include, but will not be limited to:

- Decreasing injection pressures and/or volumes at specific injection points, and increasing the number of injection points.
- Treating areas where contaminants migrated.

If fugitive emissions occur, one or more contingency actions may include, but will not be limited to:

- Use of Biosolve® or similar vapor suppressant.
- Decreasing injection pressures and/or volumes.
- Increasing the number of injection points.

2.9 Remediation Derived Wastes

It is anticipated that well purging water, decontamination water and solid waste will be generated during various stages of this project. These wastes will be handled, characterized and disposed off-site in accordance with applicable regulations, and in accordance with DER-10 Section 3.3(e). It is currently anticipated that soil will be transported and disposed off-site at a NYSDEC-approved regulated landfill facility, and that containerized well purge water and decontamination water will be transported and disposed off-site at a publicly owned treatment works (POTW) or other NYSDEC-approved disposal facility.

3.0 FINAL ENGINEERING REPORT

The work outlined in this RDWP will be incorporated into a Final Engineering Report (FER), along with the other corrective actions that comprise the remedy for this Site. This FER will be completed using the NYSDEC current template and in accordance with DER-10 Section 5.8. The FER will include: a summary of the work completed; field documentation; scaled figures depicting the limits of the “source area” soil removal excavations, injection point locations, groundwater monitoring well locations; analytical laboratory sampling documentation and test results; data tables; and documentation concerning the transport and disposal of contaminated soil and other remediation-derived wastes. The FER will be provided to Genesee Marina, Inc. and regulatory agencies.

Information and data for the first round of groundwater monitoring results will be included in the FER. Information and data for the subsequent round of groundwater monitoring results will be provided to the regulatory agencies in a supplemental groundwater monitoring report.

4.0 PROJECT SCHEDULE

The project schedule, including the specific tasks, task duration and completion dates, for the remedial scope of work described in this Work Plan is summarized below.

Task	Duration (weeks)	Completion Date*
Work Plan Approval	0	---
Site Preparation, NYSDEC Fact Sheet Review	4	4
Soil Removal, ORC-Advanced Placement, Backfilling	2	6
In-Situ ORC-Advanced injections beyond excavation footprints	2	8
Water quality performance monitoring during In-Situ ORC-Advanced injections	2	8
Performance Groundwater Monitoring – 3 month sampling event	1	21
Performance Groundwater Monitoring – 6 month sampling event	1	34
Performance Groundwater Monitoring – 9 month sampling event	1	47
Performance Groundwater Monitoring – 12 month sampling event	1	60
Incorporate RDWP into FER	8	TBD

*Weeks following NYSDEC approval of the RDWP.

Adherence to this schedule will be monitored and the status of the work will be described in monthly progress reports to be submitted to NYSDEC.

5.0 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.

NYSDEC CP-51: Soil Cleanup Guidance, October 21, 2010.

Remedial Action Work Plan – Phase 2, Former Underground Storage Tank Area; 118 Petten Street, Rochester, New York; Brownfield Cleanup Program, NYSDEC Site ID. C828130, December 2012; prepared by Day Environmental, Inc., as modified by the NYSDEC conditional approval letter dated September 19, 2013.

Remedial Design Investigation – Phase 2 Report, Former Underground Storage Tank Area; 118 Petten Street, Rochester, New York; Brownfield Cleanup Program, NYSDEC Site ID. C828130, August 2015; prepared by Day Environmental, Inc.

6.0 ACRONYMS

BCP	Brownfield Cleanup Program
bgs	Below Ground Surface
CAD	Computer-Aided Design
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CRT	Controlled Release Technology
DAY	Day Environmental, Inc.
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
GIS	Geographic Information System
HASP	Health and Safety Plan
H-V	Harbortown Village District
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
ORC	Oxygen Release Compound
Paradigm	Paradigm Environmental Services, Inc.
PID	Photoionization Detector
POTW	Publicly Owned Treatment Works
PPM	Parts Per Million
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RAWP	Remedial Action Work Plan
RDI	Remedial Design Investigation
RDWP	Remedial Design Work Plan
ROI	Radius Of Influence
SDS	Safety Data Sheet
SVOC	Semi-Volatile Organic Compound
TCL	Target Compound List
TIC	Tentatively Identified Compound
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

FIGURES

Last Date Saved: 11 May 2016   Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-8-Gen Mar Locus

SITE:
Genesee Marina
118 Petten Street
Rochester, New York

NOTE:

Topo imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West and Rochester East, dated 1978.

Site Coordinates:

43° 14' 36.98"N   77° 36' 50.96"W

Date
05-11-2016

Drawn By
ANM

Scale
AS NOTED

day
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

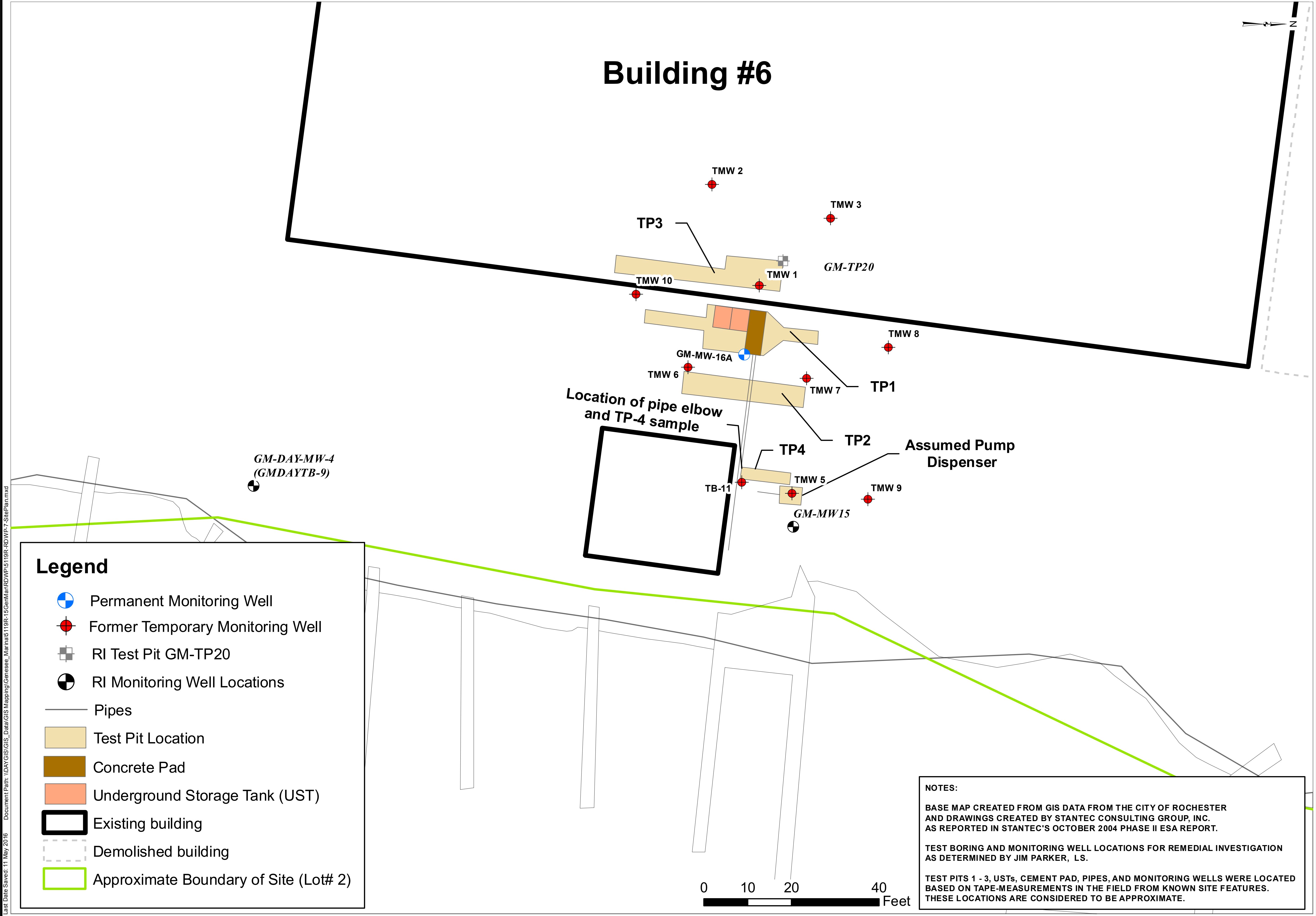
Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK
(NYSDEC SITE NO. C828130)

BROWNFIELD CLEANUP PROGRAM

Drawing Title
Project Locus Map

Project No.
5119R-15

FIGURE 1



Legend

- ◐ Permanent Monitoring Well
- ⊕ Former Temporary Monitoring Well
- ▨ RI Test Pit GM-TP20
- ◑ RI Monitoring Well Locations
- — Pipes
- 🟨 Test Pit Location
- 🟫 Concrete Pad
- 🟧 Underground Storage Tank (UST)
- ⬛ Existing building
- ⬚ Demolished building
- 🟩 Approximate Boundary of Site (Lot# 2)

NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

TEST BORING AND MONITORING WELL LOCATIONS FOR REMEDIAL INVESTIGATION AS DETERMINED BY JIM PARKER, LS.

TEST PITS 1 - 3, USTs, CEMENT PAD, PIPES, AND MONITORING WELLS WERE LOCATED BASED ON TAPE-MEASUREMENTS IN THE FIELD FROM KNOWN SITE FEATURES. THESE LOCATIONS ARE CONSIDERED TO BE APPROXIMATE.

Last Date Saved: 11 May 2016 Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-7-SitePlan.mxd

DESIGNED BY	DATE
JAD	05-2016
DRAWN BY	DATE DRAWN
CPS/ANM	05-2016
SCALE	DATE ISSUED
AS NOTED	05-11-2016

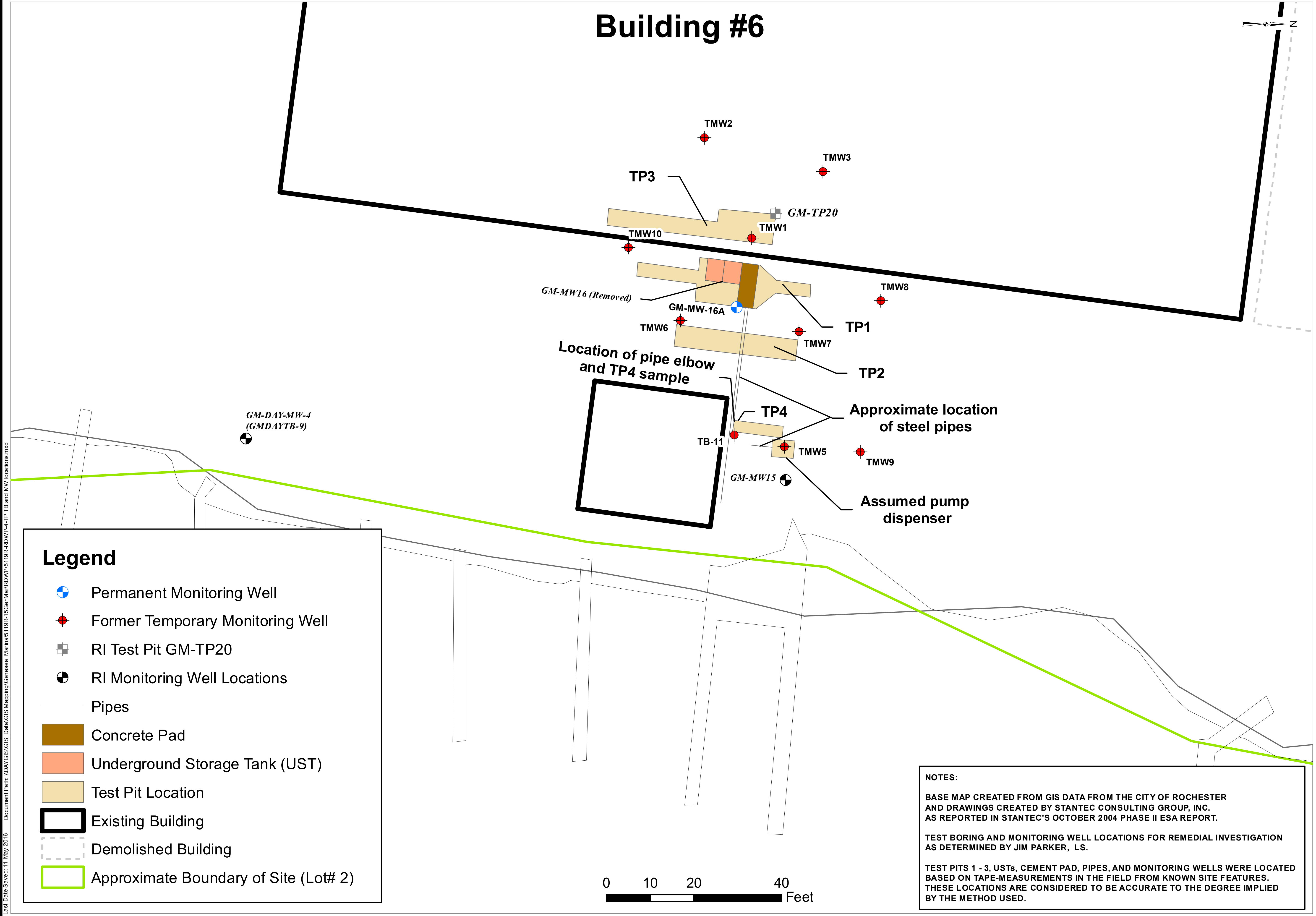
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK
REMEDIAL DESIGN INVESTIGATION

Drawing Title
Test Pit, Test Boring, and Groundwater Monitoring Well Locations

Project No.
5119R-15

FIGURE 2



Legend

◐	Permanent Monitoring Well
⊕	Former Temporary Monitoring Well
▨	RI Test Pit GM-TP20
◑	RI Monitoring Well Locations
—	Pipes
🟫	Concrete Pad
🟧	Underground Storage Tank (UST)
🟨	Test Pit Location
⬜	Existing Building
⬚	Demolished Building
🟩	Approximate Boundary of Site (Lot# 2)

NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

TEST BORING AND MONITORING WELL LOCATIONS FOR REMEDIAL INVESTIGATION AS DETERMINED BY JIM PARKER, LS.

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DESIGNED BY	DATE
HMM	05-2016
DRAWN BY	DATE DRAWN
CPS/ANM	05-2016
SCALE	DATE ISSUED
AS NOTED	05-11-2016

DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK

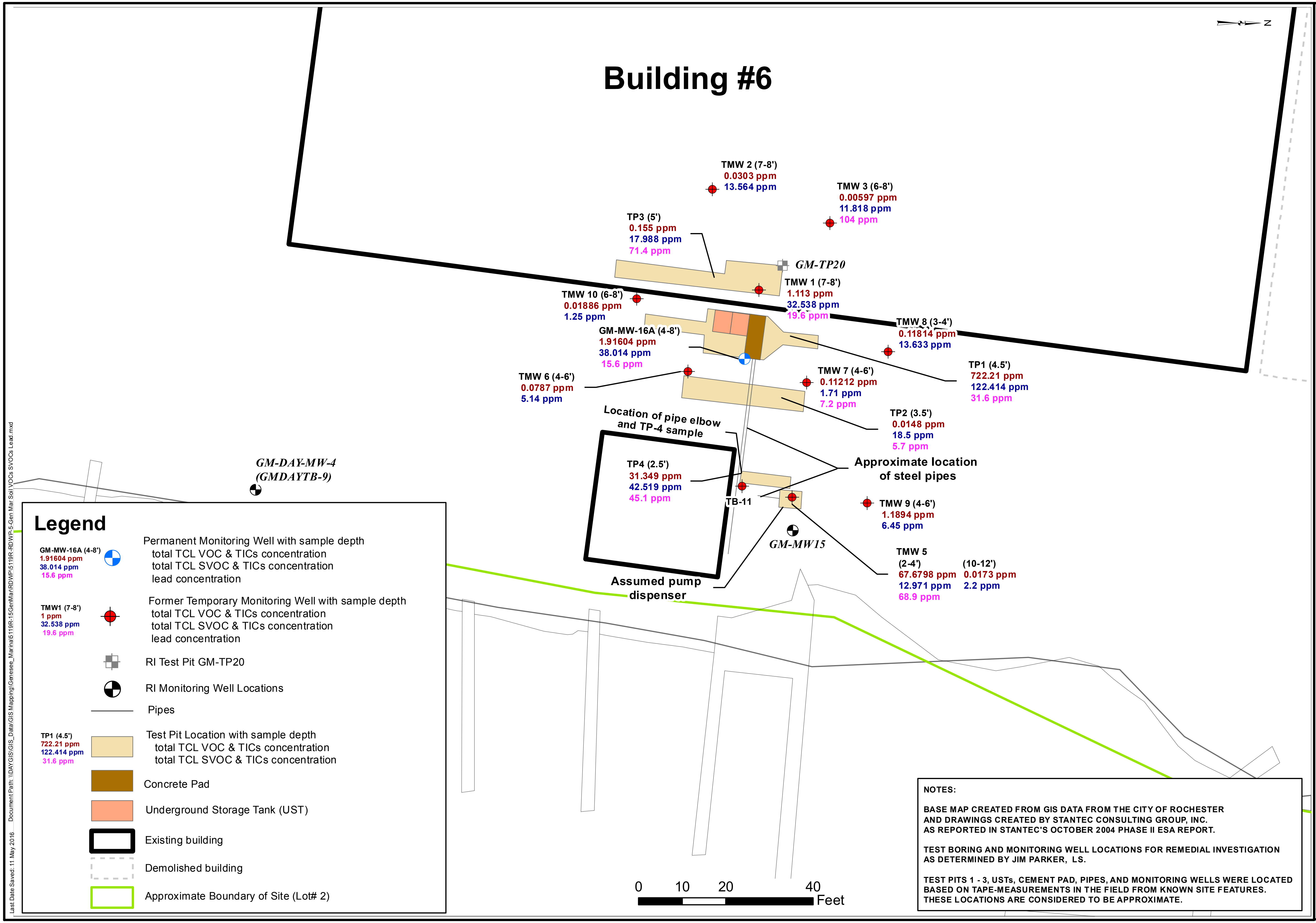
BROWNFIELD CLEANUP PROGRAM

Drawing Title
Test Pit, Test Boring, and Groundwater Monitoring Well Locations

Project No.
5119R-15

FIGURE 3

Last Date Saved: 11 May 2016   Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-4-TP TB and MW locations.mxd



Legend

GM-MW-16A (4-8') 1.91604 ppm 38.014 ppm 15.6 ppm	◕	Permanent Monitoring Well with sample depth total TCL VOC & TICs concentration total TCL SVOC & TICs concentration lead concentration
TMW1 (7-8') 1 ppm 32.538 ppm 19.6 ppm	⊕	Former Temporary Monitoring Well with sample depth total TCL VOC & TICs concentration total TCL SVOC & TICs concentration lead concentration
	▚	RI Test Pit GM-TP20
	◕	RI Monitoring Well Locations
	—	Pipes
TP1 (4.5') 722.21 ppm 122.414 ppm 31.6 ppm	▭	Test Pit Location with sample depth total TCL VOC & TICs concentration total TCL SVOC & TICs concentration
	■	Concrete Pad
	■	Underground Storage Tank (UST)
	▭	Existing building
	⬚	Demolished building
	▭	Approximate Boundary of Site (Lot# 2)

NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

TEST BORING AND MONITORING WELL LOCATIONS FOR REMEDIAL INVESTIGATION AS DETERMINED BY JIM PARKER, LS.

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Last Date Saved: 11 May 2016 Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-5-Gen Mar Soil VOCs SVOCs Lead.mxd

DESIGNED BY HMM	DATE 03-2016
DRAWN BY CPS/ANM	DATE DRAWN 03-2016
SCALE AS NOTED	DATE ISSUED 05-11-2016

DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

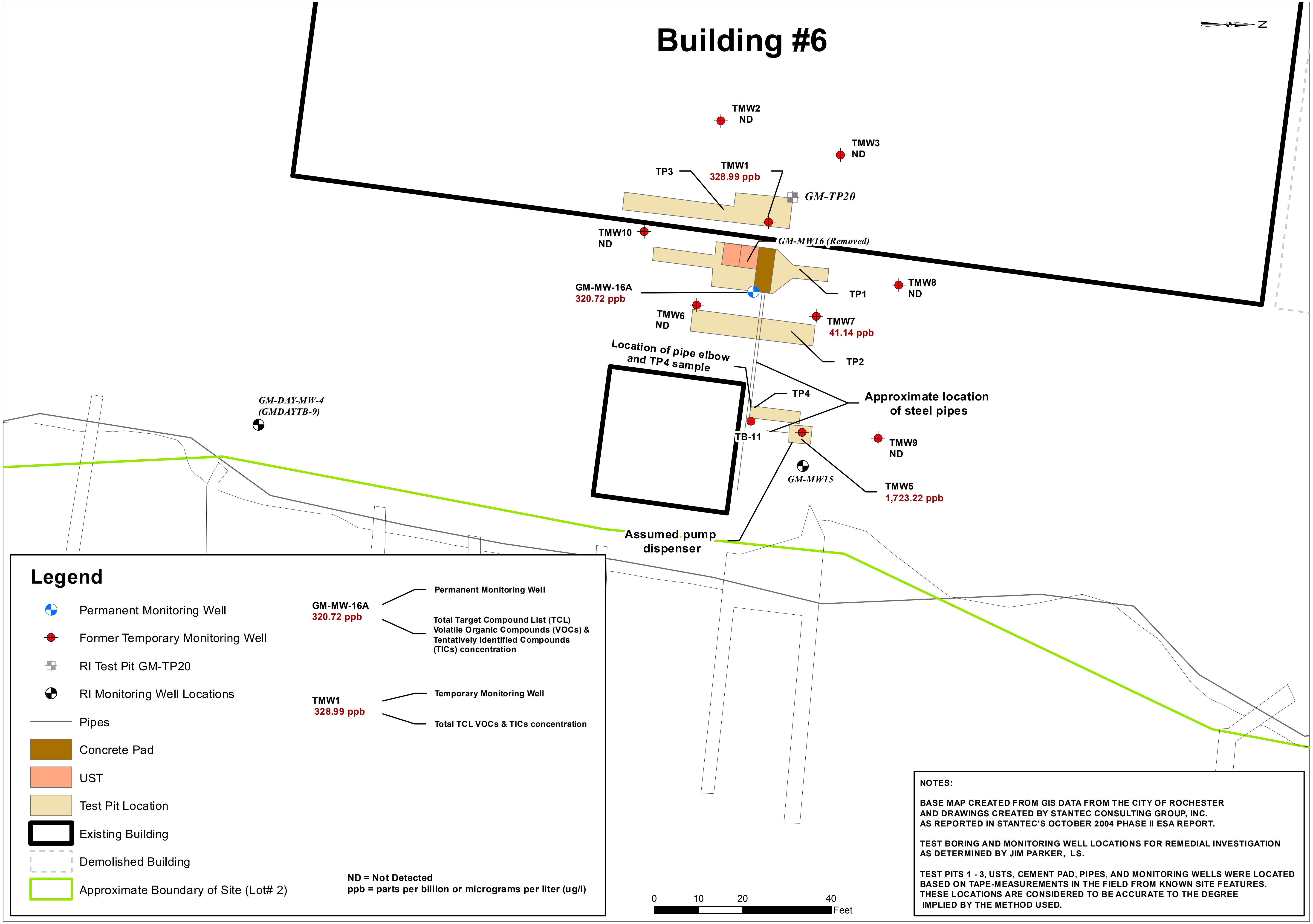
Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

Drawing Title
Total TCL VOCs & TICs and TCL SVOCs & TICS in Soil Samples from Test Pit and Test Boring Locations

Project No.
5119R-15

FIGURE 4



Legend

◐	Permanent Monitoring Well
⊕	Former Temporary Monitoring Well
▨	RI Test Pit GM-TP20
◑	RI Monitoring Well Locations
—	Pipes
🟫	Concrete Pad
🟧	UST
🟨	Test Pit Location
⬛	Existing Building
⬚	Demolished Building
🟩	Approximate Boundary of Site (Lot# 2)

GM-MW-16A — Permanent Monitoring Well

320.72 ppb — Total Target Compound List (TCL) Volatile Organic Compounds (VOCs) & Tentatively Identified Compounds (TICs) concentration

TMW1 — Temporary Monitoring Well

328.99 ppb — Total TCL VOCs & TICs concentration

ND = Not Detected
ppb = parts per billion or micrograms per liter (ug/l)

NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

TEST BORING AND MONITORING WELL LOCATIONS FOR REMEDIAL INVESTIGATION AS DETERMINED BY JIM PARKER, LS.

TEST PITS 1 - 3, USTS, CEMENT PAD, PIPES, AND MONITORING WELLS WERE LOCATED BASED ON TAPE-MEASUREMENTS IN THE FIELD FROM KNOWN SITE FEATURES. THESE LOCATIONS ARE CONSIDERED TO BE ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-6-Gen Mar GW VOCs.mxd

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DATE 05-2016	DATE DRAWN 05-2016	DATE ISSUED 05-11-2016

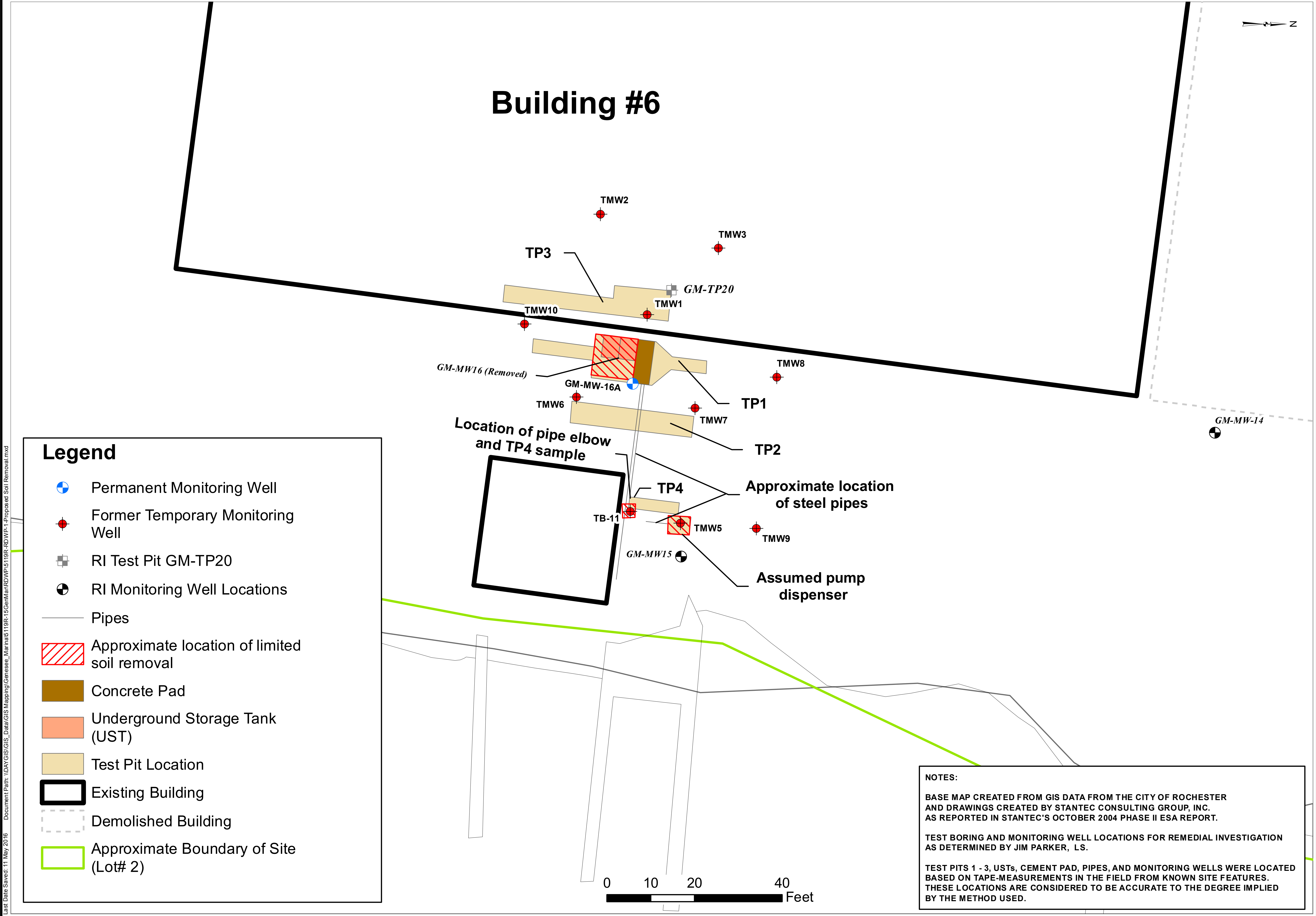
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM

Drawing Title
Total TCL VOCs & TICs Detected in Groundwater Samples

Project No.
5119R-15

FIGURE 5



NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

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DESIGNED BY: HMM	DATE: 05-2016
DRAWN BY: CPS	DATE DRAWN: 05-2016
SCALE: AS NOTED	DATE ISSUED: 05-11-2016

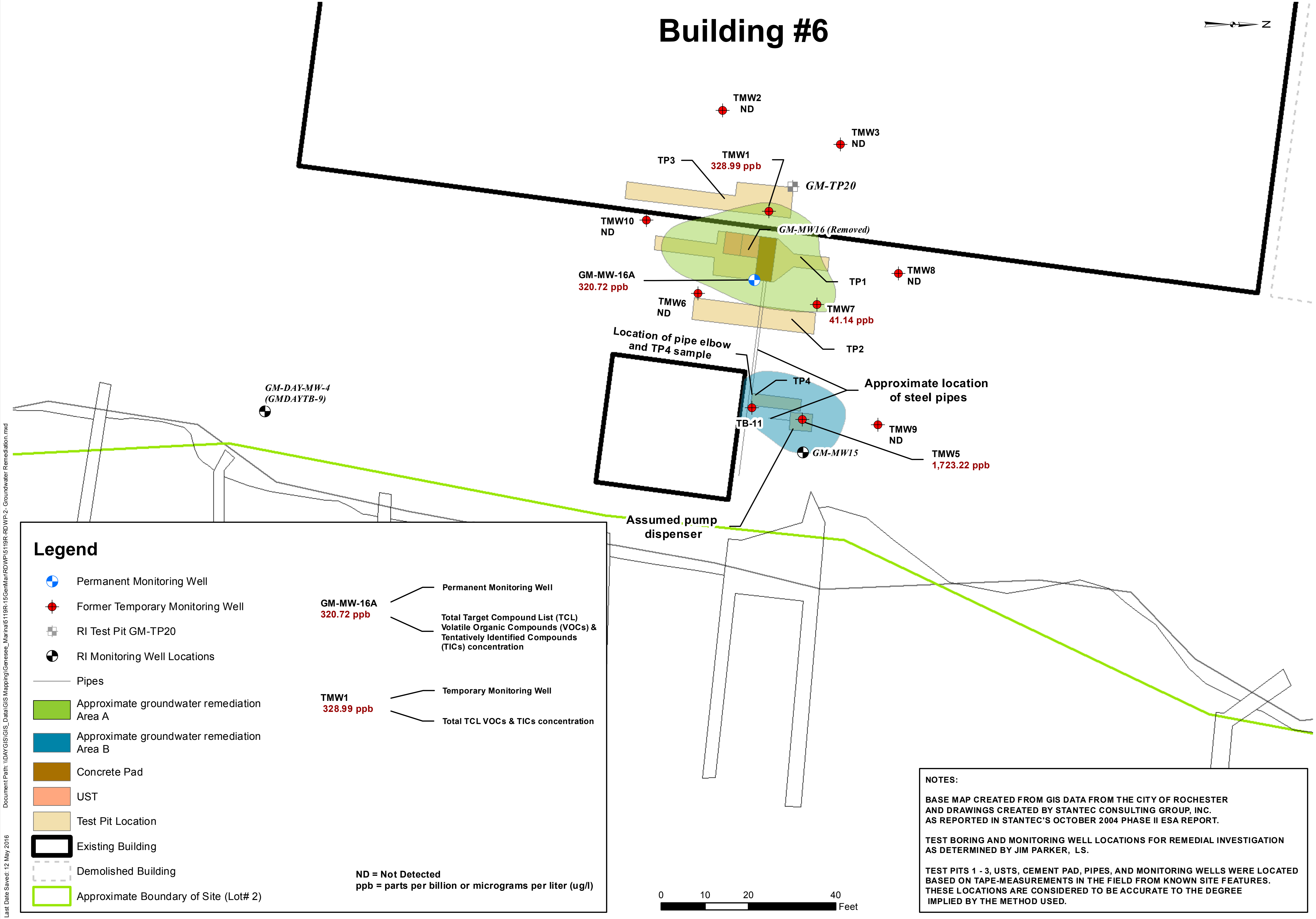
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM

Drawing Title
Site Plan with Approximate Selective Soil Removal Areas

Project No.
5119R-15

FIGURE 6



Legend

◐	Permanent Monitoring Well
●	Former Temporary Monitoring Well
▨	RI Test Pit GM-TP20
◑	RI Monitoring Well Locations
—	Pipes
🟩	Approximate groundwater remediation Area A
🟦	Approximate groundwater remediation Area B
🟫	Concrete Pad
🟧	UST
🟨	Test Pit Location
☐	Existing Building
⬚	Demolished Building
🟩	Approximate Boundary of Site (Lot# 2)

GM-MW-16A — Permanent Monitoring Well
320.72 ppb — Total Target Compound List (TCL) Volatile Organic Compounds (VOCs) & Tentatively Identified Compounds (TICs) concentration

TMW1 — Temporary Monitoring Well
328.99 ppb — Total TCL VOCs & TICs concentration

ND = Not Detected
ppb = parts per billion or micrograms per liter (ug/l)

NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

TEST BORING AND MONITORING WELL LOCATIONS FOR REMEDIAL INVESTIGATION AS DETERMINED BY JIM PARKER, LS.

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Last Date Saved: 12 May 2016 Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-2- Groundwater Remediation.mxd

DESIGNED BY HMM	DATE 05-2016	
DRAWN BY CPS	DATE DRAWN 05-2016	
SCALE AS NOTED	DATE ISSUED 05-11-2016	

DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

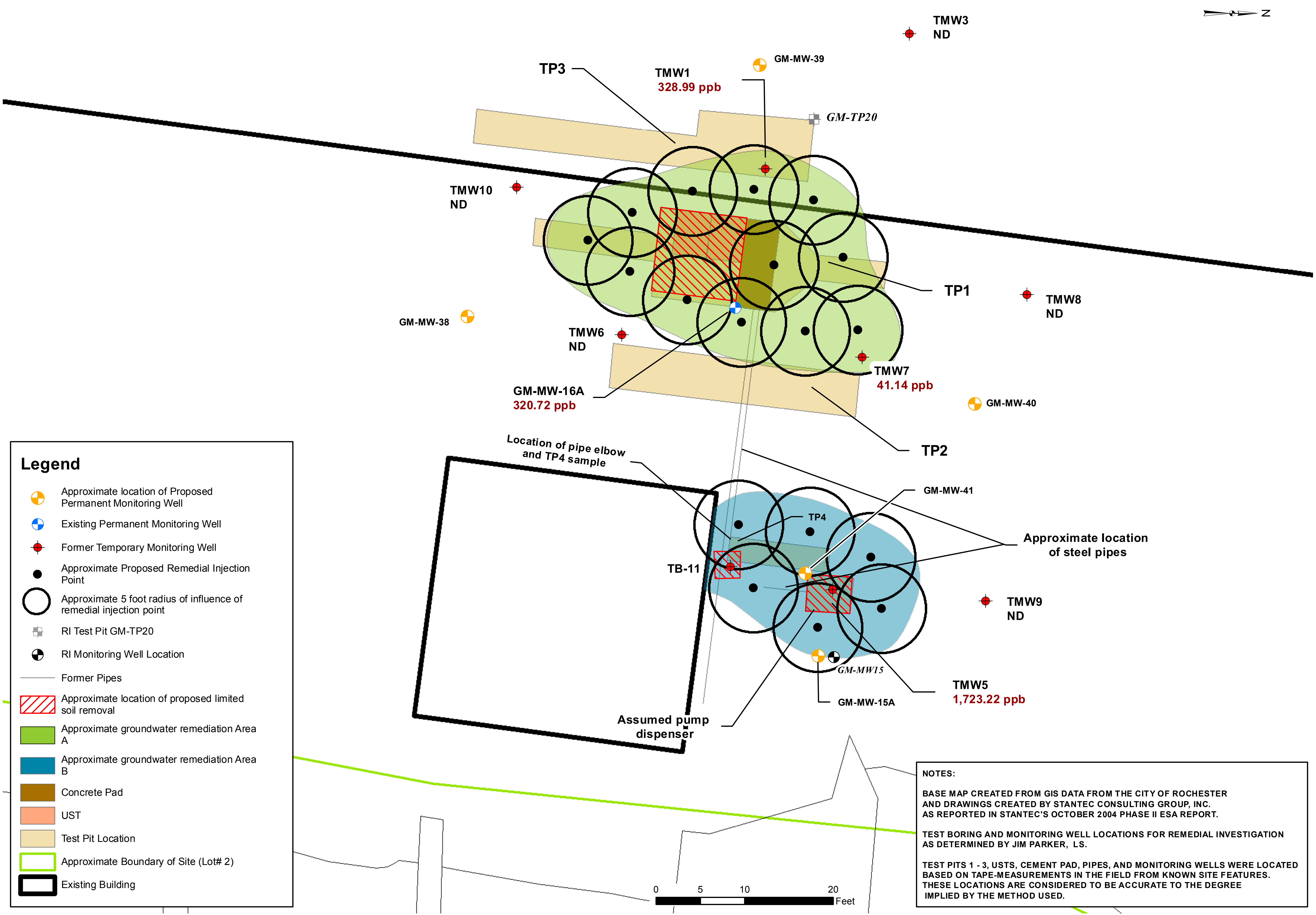
Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

Drawing Title
Site Plan with Approximate Groundwater Remediation Areas

Project No.
5119R-15

FIGURE 7



NOTES:

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

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Last Date Saved: 11 May 2016
Document Path: \\DAYGIS\GIS_Data\GIS Mapping\Genesee_Marina\5119R-15GenMar\RDWP\5119R-RDWP-3- Proposed Remediation .mxd

DESIGNED BY	DATE
HMM	05-2016
DRAWN BY	DATE DRAWN
CPS	04-2016
SCALE	DATE ISSUED
AS NOTED	05-11-2016

DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
GENESEE MARINA
118 PETTEN STREET
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

Drawing Title
Site Plan with Approximate In-Situ Injection Locations
(Assumed 5' Radius of Influence)

Project No.
5119R-15

FIGURE 8

TABLES

Table 1
118 Petten Street
Rochester, New York
Site No: C828130

Summary of Detected Volatile Organic Compounds in mg/kg or ppm
Soil Samples

Compound	Unrestricted Use SCO	Restricted Commercial SCO	Protection of Groundwater SCO	TP1-06-18-2015	TP2-06-19-2015	TP3-06-22-2015	TMW1-13-07-15(7-8)	TMW2-13-07-20-15(7-8)	TMW3-13-07-15(6-8)	GM-MW-16A-13-07-15(4-8)	TP4-13-07-15(2.5)
				4.5	3.5	5.0	7-8	7-8	6-8	4-8	2.5
				152526-01	152526-02	152535-01	152971-11	152971-12	152971-13	152971-14	152971-15
				6/18/2015	6/19/2015	6/22/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015	7/13/2015
Acetone	0.05	500	0.05	U J	0.0148 J	0.0259 J	0.0205 J	0.0209 J	**0.158** AC	U	U
Benzene	0.06	44	0.06	U	U	U	U	U	U	0.00453	U
2-Butanone	NS	NS	0.3	U	U	U	U	U	0.0451	U	U
Carbon Disulfide	NS	NS	2.7	U	U	U	U	0.00437	U	U	U
Cyclohexane	NS	NS	NS	11.7	U	0.0196 J	0.0371	U	U	0.141	U
Ethylbenzene	1	390	1	**1.66** AC	U	U	U	U	U	0.027	U
Isopropylbenzene	NS	NS	2.3	0.845	U	U	0.00366 J	U	U	0.0143	U
Xylenes (mixed)	0.26	500	1.6	**6.605** AC	U	U	0.01338 J	U	U	0.08251	U
Methylcyclohexane	NS	NS	NS	54.4	U	0.0125	0.0386	0.0303 J	U	0.2	0.449
Methylene Chloride	0.05	500	0.05	U	U	U	U	U	0.00597	U	U
trans-1,3-Dichloropropene	NS	NS	NS	U	U	U	U	U	U	0.00349 J	U
Toluene	0.7	500	0.7	U	U	U	U	U	U	0.00604	U
Total VOCs				75.21	0.0148	0.0580	0.11324	0.05557	0.20907	0.47887	0.449
Total TICs(1)				647.00	U	0.097	1	U	U	1.91	30.9
Total VOCs and TICs(1)				722.21	0.0148	0.155	1.11324	0.05557	0.20907	2.38887	31.349

Compound	Unrestricted Use SCO	Restricted Commercial SCO	Protection of Groundwater SCO	TMW5-14-07-15(2-4)	TMW5-14-07-15(10-12)	TMW6-14-07-15(4-6)	TMW7-14-07-15(4-6)	TMW8-14-07-15(3-4)	TMW9-14-07-15(4-6)	TMW10-14-07-15(6-8)
				2-4	10-12	4-6	4-6	3-4	4-6	6-8
				152977-01	152977-08	152977-09	152977-03	152977-04	152977-06	152977-07
				7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015
Acetone	0.05	500	0.05	**0.426** J AC	0.0173	0.0184	0.0207	**0.0925** AC	0.033	0.0134
Benzene	0.06	44	0.06	U	U	U	U	U	U	U
2-Butanone	NS	NS	0.3	U	U	U	U	0.0188	U	U
Carbon Disulfide	NS	NS	2.7	U	U	0.0288	0.00466	U	U	U
Cyclohexane	NS	NS	NS	U	U	U	U	U	0.0177	U
Ethylbenzene	1	390	1	0.113 J	U	U	U	U	U	U
Isopropylbenzene	NS	NS	2.3	0.165 J	U	U	U	U	U	U
Xylenes (mixed)	0.26	500	1.6	U	U	U	U	U	0.00348	U
Methylcyclohexane	NS	NS	NS	3.34 J	U	0.0058	0.00626	U	0.0804	U
Methylene Chloride	0.05	500	0.05	U	U	U	U	0.00684	U	0.00546
trans-1,3-Dichloropropene	NS	NS	NS	0.0798 J	U	U	U	U	0.00482	U
Toluene	0.7	500	0.7	U	U	U	U	U	U	U
Total VOCs				4.1238	0.0173	0.053	0.03162	0.11814	0.1394	0.01886
Total TICs(1)				67.6	U	0.0257	0.0805	U	1.05	U
Total VOCs and TICs(1)				71.7238	0.0173	0.0787	0.11212	0.11814	1.1894	0.01886

Note

U = Not Detected

NS = No Standard

A = Exceeds Unrestricted Use SCO

B = Exceeds Commercial Use SCO

C = Exceeds Protection of Groundwater SCO

Units in milligrams per kilogram (mg/kg) or parts per million (ppm)

Soil cleanup objectives (SCOs) are as referenced in 6 NYCRR Part 375-6, Remedial Program Cleanup Objectives, dated December 14, 2006, as supplemented by CP-51 dated October 21, 2010

J = Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than the method detection limit. The concentration given is an approximate valu

UJ = Not Detected at an estimated detection limit as qualified by the data validator

(1) Refer to the analytical laboratory report for individual TICs detected and associated flags.

VOC = Volatile Organic Compound

TIC = Tentatively Identified Compound

TMW3-13-07-15(6-8)	Sample ID
6-8	Sample Depth in feet below ground surface
152971-13	Laboratory Sample ID
7/13/2015	Sample Collection Date (mm/dd/yyyy)

Table 2
118 Petten Street
Rochester, New York
Site No: C828130

Summary of Detected Semi-Volatile Organic Compounds in mg/kg or ppm
Soil Samples

Compound	Unrestricted Use SCO	Restricted Commercial SCO	Protection of Groundwater SCO	TP1-06-18-2015		TP2-06-19-2015		TP3-06-22-2015		TMW1-13-07-15(7-8)		TMW2-13-07-15(7-8)		TMW3-13-07-15(6-8)		GM-MW-16A-13-07-15(4-8)		TP4-13-07-15(2.5)	
				152526-01		152526-02		152535-01		152971-11		152971-12		152971-13		152971-14		152971-15	
				4.5		3.5		5		7-8		7-8		6-8		4-8		2.5	
				6/18/2015		6/19/2015		6/22/2015		7/13/2015		7/13/2015		7/13/2015		7/13/2015		7/13/2015	
2-Methylnaphthalene	NS	NS	36.4	3.23		U		U		U		U		U		0.406		U	
Acenaphthene	20	500	98	0.853		U		U		0.406		0.199 J		U		0.560		U	
Acenaphthylene	100	500	107	0.309 J		U		U		0.174 J		U		U		0.232 J		0.237 J	
Anthracene	100	500	1000	1.68		U		U		0.792		U		U		1.11		0.54	
Benzo(a)anthracene	1	5.6	1	**1.99**	AC	U		0.457		**1.28**	AC	0.373		0.217 J		**1.58**	AC	**1.16**	AC
Benzo(a)pyrene	1	1	22	**2.13**	AB	U		0.451		**1.29**	AB	0.367		0.226 J		**1.48**	AB	**1.08**	AB
Benzo(b)fluoranthene	1	5.6	1.7	**2.51**	AC	U		0.531		**1.37**	A	0.451		0.26 J		**1.43**	A	**1.11**	A
Benzo(g,h,i)perylene	100	500	1000	1.32		U		0.296 J		0.852		0.266 J		U		0.798		0.594	
Benzo(k)fluoranthene	0.8	56	1.7	**1.45**	A	U		0.328 J		**1.06**	A	0.322 J		0.195 J		**1.18**	A	**0.897**	A
Bis(2-ethylhexyl)phthalate	NS	NS	435	U		U		U		0.19 J		0.202 J		0.19 J		0.219 J		U	
Carbazole	NS	NS	NS	0.681		U		U		0.263 J		U		U		0.353		U	
Chrysene	1	56	1	**1.89**	AC	U		0.523		**1.4**	AC	0.452		0.262 J		**1.66**	AC	**1.11**	AC
Dibenz(a,h)anthracene	0.33	0.56	1000	**0.487**	A	U		U		0.261 J		U		U		0.303 J		0.201 J	
Dibenzofuran	7	350	210	0.984		U		U		0.341		U		U		0.553		U	
Fluoranthene	100	500	1000	5.31		U		1.26		3.77		0.869		0.539		3.97		2.48	
Fluorene	30	500	386	1.72		U		U		0.557		U		U		0.905		0.265 J	
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	**2.14**	A	U		0.415		**0.942**	A	0.332 J		0.194 J		**1.01**	A	**0.715**	A
Naphthalene	12	500	12	2.87		U		U		U		U		U		0.545		U	
Phenanthrene	100	500	1000	5.89		U		0.761		2.9		0.261 J		0.355		3.56		1.19	
Pyrene	100	500	1000	4.57 M		U		0.966		2.99		0.76		0.430		3.16		2.14	
Total SVOCs				42.014		U		5.988		20.838		4.854		2.868		25.014		13.719	
Total TICs(1)				80.4		18.5		12.00		11.7		8.71		8.95		13.000		28.800	
Total SVOCs and TICs(1)				122.414		18.5		17.988		32.538		13.564		11.818		38.014		42.519	

Compound	Unrestricted Use SCO	Restricted Commercial SCO	Protection of GW SCO	TMW5-14-07-15(2-4)		TMW5-14-07-15(10-12)		TMW6-14-07-15(4-6)		TMW7-14-07-15(4-6)		TMW8-14-07-15(4-8)		TMW9-14-07-15(4-6)		TMW10-14-07-15(6-8)	
				152977-01		152977-08		152977-09		152977-03		152977-05		152977-06		152977-07	
				2-4		10-12		4-6		4-6		4-8		4-6		6-8	
				7/14/2015		7/14/2015		7/14/2015		7/14/2015		7/14/2015		7/14/2015		7/14/2015	
2-Methylnaphthalene	NS	NS	36.4	U		U		U		U		U		U		U	
Acenaphthene	20	500	98	U		U		U		U		U		U		U	
Acenaphthylene	100	500	107	U		U		U		U		U		U		U	
Anthracene	100	500	1000	U		U		U		U		U		U		U	
Benzo(a)anthracene	1	5.6	1	U		U		U		U		0.363		U		U	
Benzo(a)pyrene	1	1	22	U		U		U		U		0.388		U		U	
Benzo(b)fluoranthene	1	5.6	1.7	U		U		U		U		0.438		U		U	
Benzo(g,h,i)perylene	100	500	1000	U		U		U		U		0.272 J		U		U	
Benzo(k)fluoranthene	0.8	56	1.7	U		U		U		U		0.317 J		U		U	
Bis(2-ethylhexyl)phthalate	NS	NS	435	0.171 J		U		U		U		0.353		U		U	
Carbazole	NS	NS	NS	U		U		U		U		U		U		U	
Chrysene	1	56	1	U		U		U		U		0.463		U		U	
Dibenz(a,h)anthracene	0.33	0.56	1000	U		U		U		U		U		U		U	
Dibenzofuran	7	350	210	U		U		U		U		U		U		U	
Fluoranthene	100	500	1000	U		U		U		U		0.957		U		U	
Fluorene	30	500	386	U		U		U		U		U		U		U	
Indeno(1,2,3-cd)pyrene	0.5	5.6	8.2	U		U		U		U		0.288 J		U		U	
Naphthalene	12	500	12	U		U		U		U		U		U		U	
Phenanthrene	100	500	1000	U		U		U		U		0.56		U		U	
Pyrene	100	500	1000	U		U		U		U		0.754		U		U	
Total SVOCs				0.171		U		U		U		5.153		U		U	
Total TICs(1)				12.800		2.200		5.140		1.71		8.480		6.45		1.25	
Total SVOCs and TICs(1)				12.971		2.200		5.140		1.71		13.633		6.45		1.25	

Note
U = Not Detected
NS = No Standard
A = Exceeds Unrestricted Use SCO
B = Exceeds Commercial Use SCO
C = Exceeds Protection of Groundwater SCO
Units in milligrams per kilogram (mg/kg) or parts per million (ppm)
Soil cleanup objectives (SCOs) are as referenced in 6 NYCRR Part 375-6, Remedial Program Cleanup Objectives, dated December 14, 2006, as supplemented by CP-51 dated October 21, 2010.
J = Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than the method detection limit. The concentration given is an approximate value.
UJ = Not Detected at an estimated detection limit as qualified by the data validator.
M = Matrix spike recoveries outside QC limits. Matrix bias indicated.
(1) Refer to the analytical laboratory report for individual TICs detected and associated flags.
SVOC = Semi-Volatile Organic Compound

TMW3-13-07-15(6-8)	Sample ID
6-8	Sample Depth in feet below ground surface
152971-13	Laboratory Sample ID
7/13/2015	Sample Collection Date (mm/dd/yyyy)

Table 3
118 Petten Street
Rochester, New York
Site No: C828130

Summary of Detected Lead Concentrations
Soil Samples

Analyte	Unrestricted Use SCO	Restricted Commercial SCO	Protection of Groundwater SCO	TP1-06-18-2015			TP2-06-19-2015			TP3-06-22-2015			TMW1-13-07-15(7-8)			TMW3-13-07-15(6-8)		
				4.5			3.5			5			7-8			6-8		
				152526-01			152526-02			152535-01			152971-11			152971-13		
				6/18/2015			6/19/2015			6/22/2015			7/13/2015			7/13/2015		
Lead	63	1000	450	31.6			5.7			**71.4**		**A**	19.6	J		**104**	J	**A**

Analyte	Unrestricted Use SCO	Restricted Commercial SCO	Protection of Groundwater SCO	GM-MW-16A-13-07-15(4-8)			TP4-13-07-15(2.5)			TMW5-14-07-15(2-4)			TMW7-14-07-15(4-6)		
				4-8			2.5			2-4			4-6		
				152971-14			152971-15			152977-01			152977-03		
				7/13/2015			7/13/2015			7/14/2015			7/14/2015		
Lead	63	1000	450	15.6	J		45.1	J		**68.9**	J	**A**	7.2	J	

Note

A = Exceeds Unrestricted Use SCO

B = Exceeds Commercial Use SCO

C = Exceeds Protection of Groundwater SCO

Units in milligrams per kilogram (mg/kg) or parts per million (ppm)

Soil cleanup objectives (SCOs) are as referenced in 6 NYCRR Part 375-6, Remedial Program Cleanup Objectives, dated December 14, 2006, as supplemented by CP-51 dated October 21, 2010

J = Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than the method detection limit. The concentration given is an approximate value.

TMW3-13-07-15(6-8)	Sample ID
6-8	Sample Depth in feet below ground surface
152971-13	Laboratory Sample ID
7/13/2015	Sample Collection Date (mm/dd/yyyy)

Table 4
118 Petten Street
Rochester, New York
Site No: C828130

Summary of Detected Volatile Organic Compounds
Groundwater Samples

Compound	TOGS 1.1.1 Groundwater Standard or Guidance Value	TMW1-14-07-15	TMW2-14-07-15	TMW3-14-07-15	GM-MW-16A-14-07-15	TMW5-14-07-15	TMW6-14-07-15	TMW7-14-07-15	TMW8-14-07-15	TMW9-14-07-15	TMW10-14-07-15
		152971-02	152971-03	152971-04	152971-05	152971-06	152971-07	152971-08	152971-09	152971-10	152971-16
		7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015	7/14/2015
Acetone	50	U	U	U	9.01 J	11.6	U	7.97 J	U	U	U
Benzene	1	**2.1** X	U	U	**5.07** X	**23.1** X	U	**2.15** X	U	U	U
Cyclohexane	NS	34.5	U	U	18.3	73.2	U	U	U	U	U
Ethylbenzene	5	U	U	U	4.74	**48.1** X	U	U	U	U	U
Isopropylbenzene	5	2.86	U	U	1.32 J	**15.0** X	U	U	U	U	U
Xylenes (mixed)	5	3.58 J	U	U	**12.94** J X	**9.44** J X	U	1.12 J	U	U	U
Methylcyclohexane	NS	12.2	U	U	20.5	65.8	U	U	U	U	U
Toluene	5	1.75 J	U	U	2.84	**5.35** X	U	U	U	U	U
trans-1,3-Dichloropropene	0.4	U	U	U	U	**1.63** J X	U	U	U	U	U
Total VOCs		56.99	U	U	74.72	253.22	U	11.24	U	U	U
TICs[(1)]		272	U	U	246	1470	U	29.9	U	U	U
Total VOCs and TICs		328.99	U	U	320.72	1723.22	U	41.14	U	U	U

Notes:

U = Not Detected

J = Estimated value

X = Exceeds TOGS 1.1.1 Groundwater Standard or Guidance Value

All measurements in micrograms per liter or parts per billion (µg/l or ppb)

VOC = Volatile Organic Compound

Groundwater Standards or Guidance Values referenced in NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 dated June 1998 as amended by the NYSDEC's supplemental table dated April 2000.

(1) Refer to the analytical laboratory report for individual TICs detected and associated flags.

TMW3-13-07-15	Sample ID
152971-13	Laboratory Sample ID
7/14/2015	Sample Collection Date (mm/dd/yyyy)

APPENDIX A

Health and Safety Plan

HEALTH AND SAFETY PLAN

BROWNFIELD CLEANUP PROGRAM
118 PETTEN STREET
ROCHESTER, NEW YORK
NYSDEC SITE No. C828130

Prepared For:	Genesee Marina, Inc. 118 Petten Street Rochester, New York
Prepared by:	Day Environmental, Inc. 1563 Lyell Avenue Rochester, New York 14606
Project No.:	5119R-16
Date:	May 2016

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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.

A Remedial Design Investigation (RDI) was conducted in 2015, which identified two closed-in-place, approximately 550-gallon, concrete-filled, underground storage tanks (USTs) located in the vicinity of Building #6, and an assumed former pump dispenser concrete pad to the east of the USTs. The RDI identified evidence of petroleum contamination in soil and groundwater in the area of the two concrete-filled USTs, in the location of the assumed former pump dispenser, and in the area of a pipe elbow located south of the assumed former pump dispenser. The majority of soil contamination was present within the saturated zone.

1.2 Planned Activities Covered by HASP

Planned activities covered by this HASP include:

- Planned remedial activities for the Site; including soil excavation and removal, in-situ bioremediation in open excavations, planned injections of ORC Advanced® (Note: Additional information related to health and safety issues/concerns associated with ORC Advanced® is included in Appendix A);
- Activities during redevelopment and on-going property maintenance under protocols set forth in a Site Management Plan (SMP);
- 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	Heather M. McLennan

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 are 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^3	0.1 mg/m^3	80 mg/m^3
Benzo (b) fluoranthene	0.2 mg/m^3	0.1 mg/m^3	80 mg/m^3
Benzo (k) fluoranthene	0.2 mg/m^3	NA	80 mg/m^3
Chrysene	0.2 mg/m^3	0.1 mg/m^3	80 mg/m^3
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^3	NA	NA
Phenol	5 ppm	5 ppm	250 ppm
Arsenic	0.1 mg/m^3	0.002 mg/m^3	5 mg/m^3
Barium	0.5 mg/m^3	0.5 mg/m^3	50 mg/m^3
Cadmium	0.005 mg/m^3	NA	9 mg/m^3
Chromium	0.5 mg/m^3	0.5 mg/m^3	250 mg/m^3
Cobalt Dust	0.1 mg/m^3	0.05 mg/m^3	20 mg/m^3
Copper Dust	1 mg/m^3	1 mg/m^3	100 mg/m^3
Lead	0.05 mg/m^3	0.05 mg/m^3	100 mg/m^3
Mercury	0.1 mg/m^3	0.05 mg/m^3	10 mg/m^3
Nickel	1 mg/m^3	0.015 mg/m^3	10 mg/m^3
Silver	0.01 mg/m^3	0.01 mg/m^3	10 mg/m^3
Zinc	5 mg/m^3	5 mg/m^3	500 mg/m^3

Dieldrin	0.25 mg/m^3	0.25 mg/m^3	50 mg/m^3
Aroclor 1254	0.5 mg/m^{3**}	0.00 mg/m^3	NA
CONSTITUENT	CONSTITUENT	NIOSH REL	NIOSH IDLH
4,4'-DDT	1 mg/m^3	0.5 mg/m^3	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) 3 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® 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.
- Individuals participating in on-site intrusive remedial activities associated with the RDWP will have current 29 CFR 1920.120 Hazardous Waste Operations and Emergency Response (HAZWOPER) training certifications (e.g., 8-hour HAZWOPER refresher) that will be made available upon request.
- 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^3).

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	Level D
	1-25 ppm in breathing zone, sustained 5 minutes	Level C
	26-250 ppm in breathing zone, sustained 5 minutes	Level B, Stop work, evaluate the use of engineering controls
	>250 ppm in breathing zone	Level A, Stop work, evaluate the use of engineering controls
Real Time Aerosol Monitor (RTAM) Particulate Meter	<150 micrograms per meter cubed (μg/m^3) over an integrated period not to exceed 15 minutes.	Continue working
	>150 μg/m^3	Cease work, implement dust suppression, change in way work performed, etc. If levels can not be brought below 150 μg/m^3, then upgrade PPE to Level C.

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 μg/m^3 (0.15 mg/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-l0) 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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
NYSDEC	
Charlotte B. Theobald	(585) 226-5354
Spills	(585) 226-2466
NYSDOH	
Justin Deming	(518) 402-7860
MCDPH	
Jeffrey Kosmala, P.E.	(585) 753-5470
GENESEE MARINA, INC.	
Steve Gibbs	(585) 663-8990
DAY ENVIRONMENTAL, INC.	
Jeff Danzinger	(585) 454-0210 x114
Ray Kampff	(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 values 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

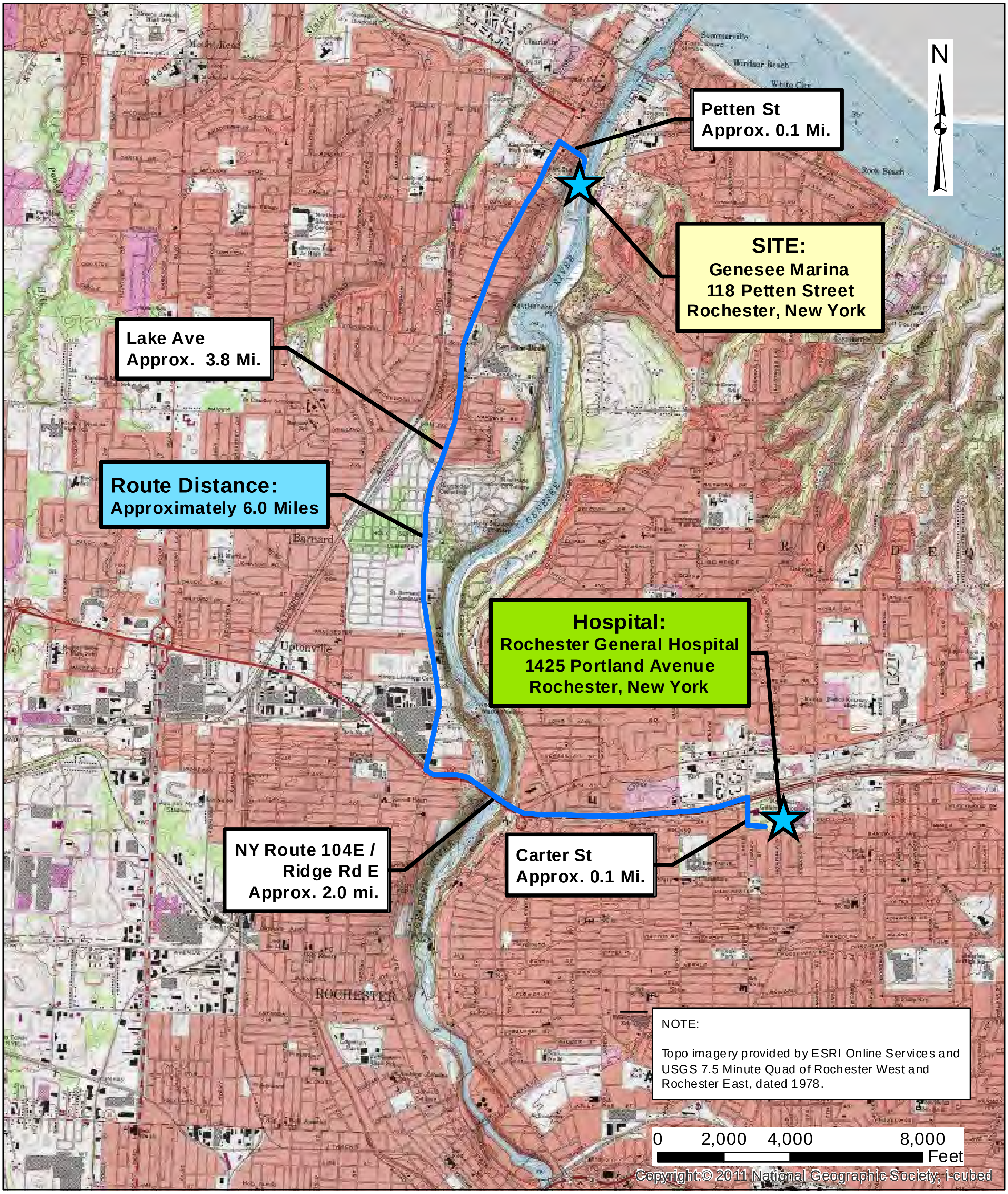
AST	Aboveground Storage Tank
BCP	Brownfield Cleanup Program
C&D	Construction and Demolition
CAMP	Community Air Monitoring Program
CPR	Cardio-Pulmonary Resuscitation
DAY	Day Environmental, Inc.
dBA	Decibels on the A-Weighted Scale
EMC	Environmental Management Council
EMS	Emergency Medical Service
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Heath
MCDPH	Monroe County Department of Public Health
mg/m^3	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
$\mu g/m^3$	Microgram Per Meter Cubed
UFPO	Underground Facilities Protection Organization
UST	Underground Storage Tank
VOC	Volatile Organic Compound

FIGURES

FIGURES

Document Path: E:\GIS\GIS Mapping\Genesee_Marina\4742R-12Genmar\HASP\4742R-12Genmar - Hospital Map.mxd

Last Date Saved: 29 Oct 2012



Petten St
Approx. 0.1 Mi.

SITE:
Genesee Marina
118 Petten Street
Rochester, New York

Lake Ave
Approx. 3.8 Mi.

Route Distance:
Approximately 6.0 Miles

Hospital:
Rochester General Hospital
1425 Portland Avenue
Rochester, New York

NY Route 104E /
Ridge Rd E
Approx. 2.0 mi.

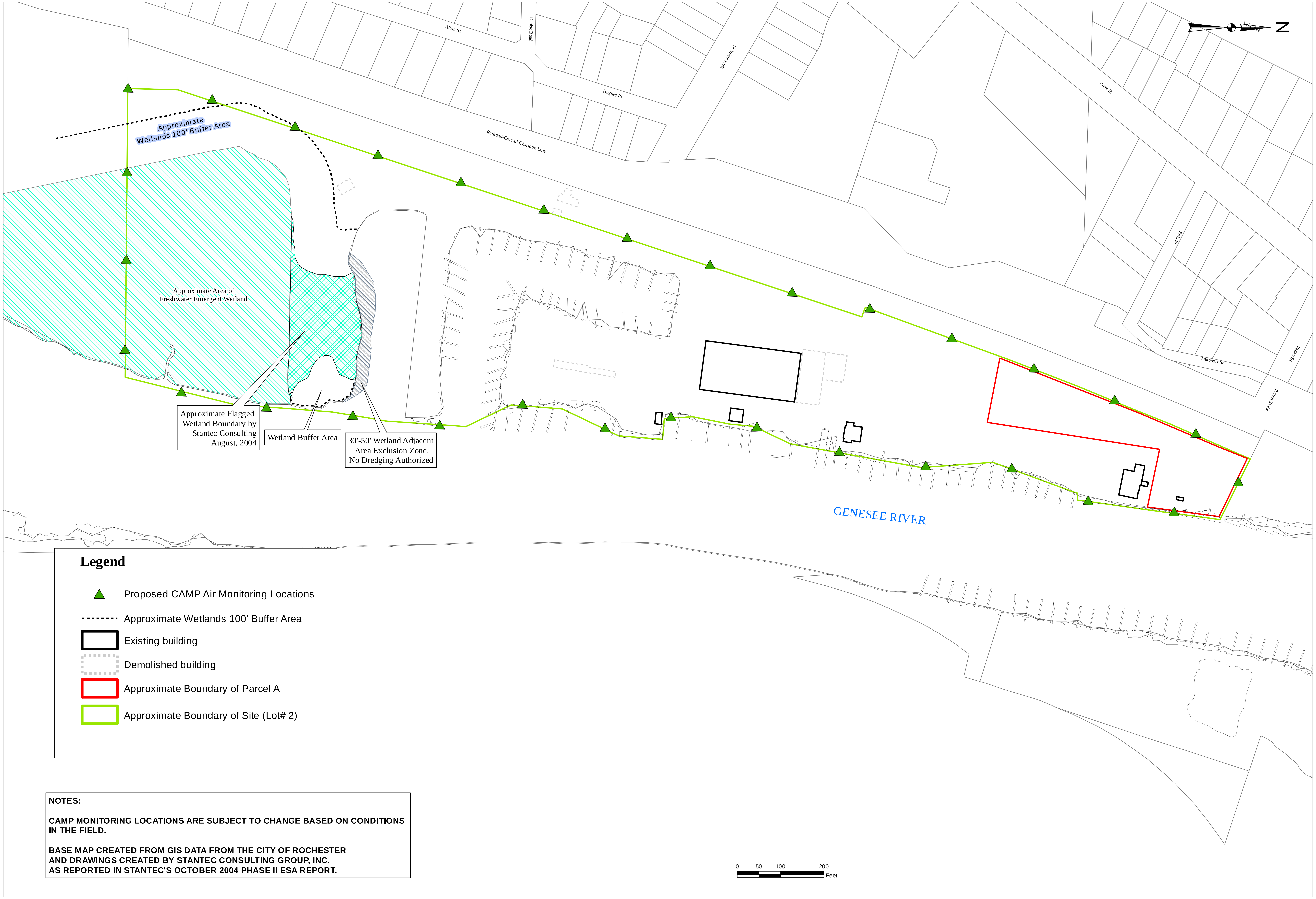
Carter St
Approx. 0.1 Mi.

NOTE:

Topo imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West and Rochester East, dated 1978.

Date 10-26-2012	day **DAY ENVIRONMENTAL, INC.** **Environmental Consultants** **Rochester, New York 14606** **New York, New York 10170**	Project Title GENESEE MARINA 118 PETTEN STREET ROCHESTER, NEW YORK (NYSDEC SITE NO. C828130) HEALTH AND SAFETY PLAN	Project No. 4742R-12 FIGURE 1
Drawn By CPS		Drawing Title Route to Emergency Services	
Scale AS NOTED			

Document Path: E:\GIS\GIS Mapping\Genesee_Marina\4742R-12Genmar\HASP\4741R-12genmar - Figure 2.mxd



Legend

- ▲ Proposed CAMP Air Monitoring Locations
- ······ Approximate Wetlands 100' Buffer Area
- ☐ Existing building
- ⬚ Demolished building
- 🟥 Approximate Boundary of Parcel A
- 🟩 Approximate Boundary of Site (Lot# 2)

NOTES:

CAMP MONITORING LOCATIONS ARE SUBJECT TO CHANGE BASED ON CONDITIONS IN THE FIELD.

BASE MAP CREATED FROM GIS DATA FROM THE CITY OF ROCHESTER AND DRAWINGS CREATED BY STANTEC CONSULTING GROUP, INC. AS REPORTED IN STANTEC'S OCTOBER 2004 PHASE II ESA REPORT.

DESIGNED BY: **DJG**	DATE **10-2012**
DRAWN BY: **CPS**	DATE **10-2012**
CHECHED BY: **RJM**	DATE **10-2012**
APPROVED BY: **DDD**	DATE **10-2012**
SCALE: **AS NOTED**	DATE **10-26-2012**

DAY ENVIRONMENTAL, INC.
DRAWING ALTERATION
THIS DOCUMENT MAY NOT BE ALTERED WITHOUT THE PERMISSION OF DAY ENVIRONMENTAL, INC.

	REVISIONS	DATE	BY
	Addition of Building #3 and Building #4	09/2011	CAH
	Change in designation of monitoring well GM-MW-36 to depict exceedance	09/2011	CAH

day
DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14606
NEW YORK, NEW YORK 10170

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

HEALTH AND SAFETY PLAN (NYSDEC SITE NO. C828130)

DRAWING TITLE:
CAMP AIR MONITORING LOCATIONS

PROJECT NO.:
4742R-12

FIGURE 2

APPENDIX A: ORC Advanced® Information

REGENESIS

Oxygen Release Compound (ORC®) Installation Instructions

(Direct-Injection Slurry Application)

SAFETY:

Pure ORC is shipped to you as a fine powder rated at -325 mesh (passes through a 44 micron screen). It is considered to be a mild oxidizer and as such should be handled with care while in the field. Field personnel should take precautions while applying the pure ORC. Typically, the operator should work upwind of the product as well as use appropriate safety equipment. These would include eye and respiratory protection, and gloves as deemed appropriate by exposure duration and field conditions.

Personnel operating the field equipment utilized during the installation process should have appropriate training, supervision and experience.

GENERAL GUIDELINES:

ORC may be installed in the contaminated saturated zone in the ground utilizing hand augered holes, Geoprobe® type hydraulic punch equipment, or hollow stem augers. This set of instructions is specific for Geoprobe equipment. Alternate instructions may be obtained from the Regenesis Technical Support Department.

For optimum results the ORC slurry installation should span the entire vertical contaminated saturated thickness, including the capillary fringe and “smear zone”.

Two general installation approaches are available. The first is to backfill only the probe hole with slurry. This is a simple approach, in that it is easy, straightforward, and the location of the ORC slurry is precisely known after installation. However, this method requires significantly more probe holes than the alternative, and may take more time for the completion of the remediation process. A separate set of instructions for this method utilizing Geoprobe equipment is available from Regenesis.

The second method is to inject the slurry through the probe holes into the contaminated saturated zone. This method requires fewer probe holes, is less disruptive to the site, and aids the spread of oxygen by spreading the ORC source material. However, it may be difficult to know the exact, final disposition of the ORC installed with this method. This is the method described in these instructions.

Note: It is important that the installation method and specific ORC slurry point location be established prior to field installation. It is also important that the ORC slurry volume and solids content for each drive point be predetermined. The Regenesis Technical Service Department is available to discuss these issues, and Helpful Hints at the end of these instructions offers relevant information. Regenesis also has available Technical Bulletins covering source treatments with ORC.

SPECIFIC INSTALLATION PROCEDURES

1. Identify the location of all underground structures, including utilities, tanks, distribution piping, sewers, drains, and landscape irrigation systems.
2. Identify surface and aerial impediments.
3. Adjust planned installation locations for all impediments and obstacles.
4. Pre-mark the installation grid point locations, noting any that have special depth requirements.
5. Set up the Geoprobe unit over each specific point, following manufacturer recommended procedures. Care should be taken to assure approximate vertical probe holes.
6. Penetrate surface pavement, if necessary, following standard Geoprobe procedures.
7. Drive the 1 1/2" (one-and-one-half inch) pre-probe (part #AT-148B) with the expendable tip (part #AT142B) to the desired maximum depth. Standard 1" (one inch) drive rods (part AT104B) should be used, after the pre-probe. (Hint: Pre-counted drive rods should be positioned prior to the installation driving procedure to assure the desired depth is reached.)
8. Disconnect the drive rods from the expendable tip, following standard Geoprobe procedures.
9. Mix the appropriate quantity of ORC slurry for the current drive point. (See separate "Directions for ORC® Slurry Mixing" and Helpful Hints). **Note: Do not mix more slurry than will be used within a 30 minute period.**
10. Set up and operate an appropriate slurry pump according to manufacturer's directions. Based on our experience, a Geoprobe model GS-1000 pump is recommended. Connect the pump to the probe grout pull cap (GS-1054) via a 1 inch diameter delivery hose. The hose is then attached to the 1" drive rod with its quick connector fitting. Upon confirmation of all connections add the ORC slurry to the pump hopper/tank.
11. Withdraw the pre-probe and drive stem 4' (four feet). (Also note Helpful Hints - Operations at end of instructions.)
12. Optional pretreatment step. (See Helpful Hints - Operations at end of instructions). Pump one to two gallons of tap water into the aquifer to enhance dispersion pathways from the probe hole.
13. Pump the predetermined quantity of ORC slurry for the depth interval being injected. Observe pump pressure levels for indications of slurry dispersion or refusal into the aquifer. (Increasing pressure indicates reduced acceptance of material by the aquifer).
14. Remove one 4' section of the 1" drive rod. The drive rod will contain slurry. This slurry should be returned to the ORC bucket for reuse.
15. Repeat steps 11, 13, and 14 until treatment of the entire affected thickness has been achieved. It is generally recommended that the procedure extend to the top of the capillary fringe/smear zone.
16. Install an appropriate seal, such as bentonite, above the ORC slurry through the entire vadose zone. This helps assure that the slurry stays in place and prevents contaminant migration from the surface. Depending on soil conditions and local regulations, a bentonite seal can be pumped through the slurry pump or added via chips or pellets after probe removal.
17. Remove and decontaminate the drive rods and pre-probe.

18. Finish the probe hole at surface as appropriate (concrete or asphalt cap, if necessary).
19. Move to the next probe point, repeating steps 5 through 18.

HELPFUL HINTS:

A. Physical characteristics

A1. Slurry

The ORC slurry is made using the dry ORC powder (rated at -325 mesh). It makes a smooth slurry, with a consistency that depends on the amount of water used.

A thick, but pumpable, slurry that approaches a paste can be made by using 65-67% solids. This material would normally be used for back-filling a bore or probe hole. It is especially useful where maximum density is desired such as where ground water is present in the hole or there are heaving sands.

Thinner slurries can be made by using more water. Typical solids for the thinner slurries content will range from 35% to 62%. Such slurries are useful for injecting through a probe or bore hole into the saturated aquifer.

As a rule, it is best to mix the first batch of slurry at the maximum solids content one would expect to use. It can then be thinned by adding additional water in small increments. By monitoring this process, the appropriate quantities of water for subsequent batches can be determined.

The slurry should be mixed at about the time it is expected to be used. It is best to not hold it for more than 30 minutes. Thinner slurries, especially, can experience a separation upon standing. All ORC slurries have a tendency to form cements when left standing. If a slurry begins to thicken too much, it should be mixed again and additional water added if necessary.

Care should be taken with slurry that may be left standing in a grout pump or hose. Problems can generally be avoided by periodically re-circulating the slurry through the pump and hose back into the pump's mixing or holding tank.

A2. Equipment

Most geotechnical grout pumping equipment has a holding tank with a capacity sufficient for injection.

When applying measured volumes of ORC slurry to probe holes, it is sometimes useful to know the volumes and content of the delivery system lines. The following information may be useful in this regard.

Geoprobe pump: At the end of a pump stroke virtually no deliverable slurry remains in the pump.

5/8" O.D. connecting hose (10 feet long):	0.2 gallons (26 fluid ounces).
Four foot (4') length of 1" drive rod:	.04 gallons (5 fluid ounces).
Three foot (3') length of 1 1/2" pre-probe:	.03 gallons (4 fluid ounces).

Cleaning and maintenance:

Pumping equipment and drive rods can be lightly cleaned by circulating clear water through them. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

B. Operating characteristics

B1. Operations - General

Judgment will be needed in the field when injecting ORC slurries. In general, it is relatively easy to inject ORC slurries into sandy soils, and this can usually be accomplished at very moderate pressures. Silts and clays require more pressure, and may accept less slurry.

Careful observation of pressure during slurry pumping is the best indication of the effectiveness of the slurry injection. To test the soil's ability to accept the slurry and to "precondition" the injection point for the slurry, it is sometimes useful to inject a small volume of plain water prior to the slurry. Normally, one-half (0.5) gallons to two (2) gallons would be appropriate.

During injection, increasing pressure and decreasing flow rate are signs of refusal by the soil matrix to accept the slurry. The site geologist should determine whether to increase pressure, and possibly fracture ("frac") the soil matrix to achieve ORC slurry installation in a tight site that has refused the slurry at lower pressures.

B2. Fill Volumes

Probe hole back-filling

Probe hole capacities:

Per 10' (Ten Foot) Length			
Theoretical		**Operating Volume**	
(Gallons/Fluid Ounces/Cubic Inches)		**(Gallons/Fluid Ounces)**	
Sand, Silts & Clay		**Sand**	**Silts & Clay**
1" Diameter	.41 gal/52 fl. oz./94.2 cu. in.	.61 gal/78 fl. oz.	.51 gal/65 fl. oz.
1 1/2" Diameter	.92 gal/117 fl. oz./212.0 cu. in.	1.38 gal/176 fl. oz.	1.15 gal/146 fl. oz.
2" Diameter	1.63 gal/209 fl. oz./376.8 cu. in.	2.44 gal/313 fl. oz.	2.04 gal/261 fl. oz.
2 1/4" Diameter	2.06 gal/264 fl. oz./476.9 cu. in	3.09 gal/396 fl. oz.	2.57 gal/330 fl. oz.

Note that the operating volumes include a 50% excess above the theoretical volume in sands and 25% in clays and silts. This is important to successful treatment. The additional material allows for a small degree of infiltration of the slurry into the surrounding soil and fractures, as well as hole diameter variability. It is important to assure that the entire contaminated saturated zone is treated (including the capillary fringe), since this is often the area of highest pollution concentration. Failure to treat this area due to improper installation can undermine an otherwise successful remediation effort.

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesis Technical Services at 949-366-8000.

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Oxygen Release Compound (ORC®) Installation Instructions

(Excavation Applications)

SAFETY:

Pure ORC is shipped to you as a fine powder, which is rated at -325 mesh (passes through a 44 micron screen). It is considered to be a mild oxidizer and as such should be handled with care while in the field. Field personnel should take precautions while applying the pure ORC. Typically, the operator should work up wind of the product as well as use appropriate safety equipment. These would include eye, respiratory protection and gloves as deemed appropriate by exposure duration and field conditions.

Although two options are discussed, application of ORC should never be applied by personnel within the tank excavation, unless proper shoring or sidewall cutback is in place.

GENERAL GUIDELINES:

ORC can be applied in a dry powder form or as a slurry. Field conditions dictate which form of ORC can be used most effectively.

Installation of ORC should be within the tank excavation floor and/or in an adequate backfill section thickness to account for the anticipated groundwater “smear zone”.

Maximum treatment effect is obtained when ORC is mixed as thoroughly as possible within the backfill material. The more dispersed the ORC slurry/powder within the excavation backfill, the more effective the treatment.

The quantity of ORC to be used is generally calculated prior to moving into the field for installation. Generally it is applied at a rate of between 0.1% and 1.0% by weight of the soil matrix. The following illustrates a dilute application rate calculation:

> Use a weight/weight percent of ORC/backfill material to ensure distribution of the ORC into the desired aquifer section. For example: a 0.15% weight of ORC to weight of backfill for the standard ORC weight (30 pounds) per container calculates as follows: 30 lb. ORC/0.15% = 20,000 lbs. of soil matrix. Thus, to achieve a 0.15% mixture of ORC in the backfill material, 30 lb. of pure ORC should be mixed into 10 tons (20,000 lbs. ÷2,000 lbs./ton) of backfill, or approximately 7 - 10 cubic yards of soil depending on field conditions. Professional judgment should be used to select the appropriate soil mass per cubic yard for designing each site treatment.

CHOOSING THE FORM OF INSTALLATION:

Pure ORC is shipped to you in a powder form. Weather conditions (especially wind) may have a direct effect on the application of ORC as a tank backfill amendment.

Application of the dry powder may be difficult in windy conditions. To counter the effects of wind (and the subsequent potential loss of ORC), Regenesis recommends that a water source or a spray tank be on-site to wet down the ORC and the backfill material as ORC is applied.

Application of ORC in a slurry format is a very effective method and eliminates the wind issue.

Four somewhat different installation conditions can be encountered in the field:

- ORC in a pea gravel back-fill. ("Type 1")
- ORC in a soil back-fill. ("Type 2")
- ORC mixed in native soil in the bottom of a tank pit. ("Type 3")
- ORC installed in soil under standing water in the bottom of a tank pit. ("Type 4")

A single tank pit excavation can include more than one of these conditions, depending on the site and extent of treatment. Instructions for each condition are discussed separately in the following sections. After the installation instructions are detailed instructions for mixing the slurry, if that is the option chosen.

INSTALLATION INSTRUCTIONS:

"Type 1," ORC in a Pea Gravel Back-fill

The easiest method for installing ORC in pea gravel back-fill is to mix the ORC in the material in a backhoe or skiploader bucket before placing it in the excavation.

- **Dry Powder method**

Into each scoop of back-fill material add the appropriate portion of ORC being installed. Generally, it is advisable to moisten the material in the bucket to reduce wind blown ORC loss. Excessive winds make this method not feasible.

After mixing the dry powder in the bucket, it is dumped into the bottom of the excavation. The backhoe bucket can be used for further mixing in the excavation.

- **Slurry method**

Mix a 63% solids slurry of ORC and water (see "Steps to make ORC slurry). This relatively thick slurry is used to help keep the ORC dispersed through the pea gravel, even when it contacts water in the bottom of the excavation during installation. It is generally desirable to avoid having the ORC run down through the pea gravel and collect in the bottom of the excavation. The thick slurry addresses this issue.

In each scoop of back-fill material, add the appropriate amount of ORC slurry. Pre-mix the materials in the backhoe bucket After mixing, dump the slurry and back-fill into the bottom of the excavation. The backhoe bucket can be used for further mixing in the excavation.

If the slurry method is being used, observe the physical behavior of the ORC in the fill material. If the ORC collects at the bottom of the back-fill material, increase the percent solids content by reducing the amount of water being used to make the slurry.

“Type 2,” ORC in a Soil Back-fill

Follow the instructions for the pea gravel back-fill method, except:

If the slurry method is being used, the solids content should be reduced. Typically a 50% solids is appropriate, although soil conditions sometimes dictate lower solids contents (see “Steps to make ORC slurry”).

“ Type 3,” ORC Mixed in Native Soil in the Bottom of the Tank Pit

When ORC is added to the bottom of a tank pit it may be done by backhoe or injection.
CAUTION: Personnel should never work within the tank excavation, unless proper shoring or sidewall cutback is in place.

- **Backhoe method**

A skilled backhoe operator can distribute the ORC around the bottom of the tank excavation and, using the bucket, mix it thoroughly. If there are no winds, it may be possible to:

1. Put the dry ORC powder in the backhoe bucket,
2. Lower it to the bottom of the pit,
3. Gently deposit the ORC evenly on the remaining soil,
4. Use the bucket to mix the powder into the soil,
5. To mitigate dusting, if necessary, spray water into the excavation during the process.

An alternative backhoe method is to use a 50% (or less) solids ORC slurry (see “Steps to make ORC slurry) in place of the dry powder. This eliminates the dusting problem, and in some cases enhances the even distribution of ORC into the soil. Observe the slurry mixing behavior in the bottom of the excavation, and adjust the water content of the slurry to optimize mixing, if necessary.

- **Injection method**

If available, a pump and root feeder may be used to inject an ORC slurry into the excavation floor. This may require a more dilute slurry mix, and care should be taken to assure that the solids do not settle out of the slurry prior to injection.

“ Type 4.” ORC installed in standing water in the bottom of a tank pit

Application of ORC into tank excavations with standing water requires the operator apply ORC in a slurry form. ORC powder application in this scenario is not advised because a portion of the ORC particle fraction is not likely to pass through the surface tension of the standing water. Caution: Personnel should never work within the tank excavation, unless proper shoring or sidewall cutback is in place.

- **Backhoe method**

A skilled backhoe operator can distribute the ORC slurry within the excavation, and mix it into the soil underlying the standing water with the bucket. Steps for installation:

1. Mix a high solids content ORC slurry (63% solids). See ("Steps to make ORC slurry").
2. Pour slurry into the backhoe bucket.
3. Lower the bucket to the standing water level in the excavation, and deposit the slurry as evenly as possible across the excavation floor. The dense slurry (63%solids is 1.6 grams per ml) will tend to make the majority of the slurry sink quickly to the bottom of the water layer.
4. Use the bucket to mix the slurry into the soil.
5. Water in the vicinity of the ORC slurry will often turn white and milky, since some of the ORC is dispersed within the standing water. This provides additional dispersion within the standing water and back-fill material as it is added to the excavation.

- **Injection method**

If available, a pump and root feeder may be used to inject an ORC slurry into the soil in an excavation. This may require a more dilute slurry mix, and care should be taken to assure that the solids do not settle out of the slurry prior to injection.

MIXING ORC SLURRY:

ORC powder is shipped to you in pre-measured batches. Each batch is contained in a plastic bag which is shipped in a 5-gallon bucket.

Remove the pre-measured ORC bag from the 5-gallon bucket and open
Measure and pour the appropriate amount of water from the following table into the 5 gallon bucket

Slurry Solids Content (%)	Pounds of ORC	Gallons of Water
63%	30 lbs.	2.1 gal. (2 gal. + 2 cups)
50%	30 lbs.	3.6 gal. (3 gal + 2 1/2 qts.)

Add the entire ORC pre-measured bag to the water (30 pounds). If the slurry solids contents of less than 50% are desired, the quantity of ORC per batch mixed in the bucket must be reduced. For example, a bucket containing four gallons of water would require 22.4 pounds of ORC to make a 40% solids slurry, and 16.6 pounds of ORC to make a 33% slurry.

Use an appropriate mixing device to thoroughly mix ORC and water. Regenesis recommends use of a 0.5 Horsepower (minimum) hand held drill with a “jiffy mixer” or stucco mixer. A common paint paddle can be used to scrape the bottom and sides of the container to ensure thorough mixing. Standard environmental slurry mixers may also be used.

After mixing, small amounts of water can be added to adjust the consistency of the slurry.

When slurries are used, the early batches should be observed in the process of mixing with the soil. Each site can vary, due to soil type and moisture content. Based on professional judgment, additional water can be added to subsequent slurry batches.

ORC slurry should be used ASAP; if the ORC slurry has been standing more than 15 minutes, it should be remixed immediately before using. Do not let stand more than 30 minutes without stirring. Otherwise, the slurry will begin to harden into a weak cement.

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesis Technical Services at 949-366-8000.

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SAFETY DATA SHEET

1. Identification

Product identifier	**Oxygen Release Compound Advanced (ORC Advanced®)**
Other means of identification	None.
Recommended use	Soil and Groundwater Remediation.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name	Regenesis
Address	1011 Calle Sombra San Clemente, CA 92673
Telephone	949-366-8000
E-mail	CustomerService@regenesis.com
Emergency phone number	CHEMTREC® at 1-800-424-9300 (International)

2. Hazard(s) identification

Physical hazards	Oxidizing solids	Category 2
Health hazards	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 1
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	May intensify fire; oxidizer. Causes skin irritation. Causes serious eye damage.

Precautionary statement

Prevention	Keep away from heat. Keep/Store away from clothing/combustible materials. Take any precaution to avoid mixing with combustibles. Wash thoroughly after handling. Wear protective gloves/eye protection/face protection.
Response	If on skin: Wash with plenty of water. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.
Storage	Store away from incompatible materials.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Calcium hydroxide oxide	682334-66-3	≥85
Calcium hydroxide	1305-62-0	≤15
Dipotassium Phosphate	7758-11-4	<5

Monopotassium Phosphate	7778-77-0	<5

Composition comments	All concentrations are in percent by weight unless otherwise indicated.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	IF ON CLOTHING: rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
Eye contact	Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Ingestion	Never give anything by mouth to a victim who is unconscious or is having convulsions. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Dusts may irritate the respiratory tract, skin and eyes. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	Take off all contaminated clothing immediately. Contact with combustible material may cause fire. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Water spray, fog (flooding amounts). Foam. Dry chemical powder. Carbon dioxide (CO_2).
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	Greatly increases the burning rate of combustible materials. Containers may explode when heated. During fire, gases hazardous to health may be formed. Combustion products may include: metal oxides.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers.
Specific methods	Cool containers exposed to flames with water until well after the fire is out.
General fire hazards	May intensify fire; oxidizer. Contact with combustible material may cause fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep away from clothing and other combustible materials. Wear appropriate protective equipment and clothing during clean-up. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Collect dust using a vacuum cleaner equipped with HEPA filter. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Ventilate the contaminated area. Stop the flow of material, if this is without risk. Absorb in vermiculite, dry sand or earth and place into containers. Large Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Shovel the material into waste container. Minimize dust generation and accumulation. Avoid the generation of dusts during clean-up. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. Place all material into loosely covered plastic containers for later disposal. For waste disposal, see section 13 of the SDS. Wear appropriate protective equipment and clothing during clean-up.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Keep away from heat. Provide appropriate exhaust ventilation at places where dust is formed. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Avoid contact with water and moisture. Do not get this material in contact with eyes. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Keep away from heat. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Do not store near combustible materials. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Calcium hydroxide (CAS 1305-62-0)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. ACGIH Threshold Limit Values

Components	Type	Value
Calcium hydroxide (CAS 1305-62-0)	TWA	5 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Calcium hydroxide (CAS 1305-62-0)	TWA	5 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. If engineering measures are not sufficient to maintain concentrations of dust particulates below the Occupational Exposure Limit (OEL), suitable respiratory protection must be worn. If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Use dust-tight, unvented chemical safety goggles when there is potential for eye contact.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Frequent change is advisable. Recommended gloves include rubber, neoprene, nitrile or viton.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Recommended use: Wear respirator with dust filter.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Keep from contact with clothing and other combustible materials. Remove and wash contaminated clothing promptly. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Powder.
Color	White to pale yellow.

Odor	Odorless.
Odor threshold	Not available.
pH	12.5 (3% suspension/water)
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Oxidizer.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Slightly soluble
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	527 °F (275 °C)
Viscosity	Not available.
Other information	
Bulk density	0.5 - 0.9 g/ml
Explosive limit	Non-explosive.

10. Stability and reactivity

Reactivity	Greatly increases the burning rate of combustible materials.
Chemical stability	Decomposes on heating. Product may be unstable at temperatures above: 275°C/527°F.
Possibility of hazardous reactions	Reacts slowly with water.
Conditions to avoid	Heat. Moisture. Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials.
Incompatible materials	Acids. Bases. Salts of heavy metals. Reducing agents. Combustible material.
Hazardous decomposition products	Oxygen. Hydrogen peroxide (H2O2). Steam. Heat.

11. Toxicological information

Information on likely routes of exposure	
Inhalation	Dust may irritate respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye damage.
Ingestion	Ingestion may cause irritation and malaise.
Symptoms related to the physical, chemical and toxicological characteristics	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Dusts may irritate the respiratory tract, skin and eyes. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity

Components	Species	Test Results
Calcium hydroxide (CAS 1305-62-0)		
Acute		
Oral		
LD50	Rat	7340 mg/kg

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Due to the physical form of the product it is not expected to be an aspiration hazard.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Calcium hydroxide (CAS 1305-62-0)			
Aquatic			
Fish	LC50	Zambezi barbel (Clarias gariepinus)	33.8844 mg/l, 96 hours

Persistence and degradability Decomposes in the presence of water. The product contains inorganic compounds which are not biodegradable.

Bioaccumulative potential The product does not contain any substances expected to be bioaccumulating.

Mobility in soil This substance has very low solubility in water and low mobility in the environment.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1479
UN proper shipping name	Oxidizing solid, n.o.s. (Calcium hydroxide oxide)
Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Label(s)	5.1
Packing group	II
Environmental hazards	
Marine pollutant	No
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	62, IB8, IP2, IP4, T3, TP33
Packaging exceptions	152
Packaging non bulk	212
Packaging bulk	240

IATA

UN number	UN1479
UN proper shipping name	Oxidizing solid, n.o.s. (Calcium hydroxide oxide)
Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Packing group	II
Environmental hazards	No
ERG Code	5L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1479
UN proper shipping name	OXIDIZING SOLID, N.O.S. (Calcium hydroxide oxide)
Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No
EmS	F-A, S-Q
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

15. Regulatory information

US federal regulations	This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - Yes

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Calcium hydroxide (CAS 1305-62-0)

US. New Jersey Worker and Community Right-to-Know Act

Calcium hydroxide (CAS 1305-62-0)
Calcium hydroxide oxide (CAS 682334-66-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Calcium hydroxide (CAS 1305-62-0)

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

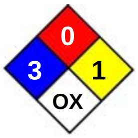
Country(s) or region	**Inventory name**	**On inventory (yes/no)***
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	02-April-2015
Revision date	30-July-2015
Version #	02
Further information	HMIS® is a registered trade and service mark of the American Coatings Association (ACA).
HMIS® ratings	Health: 3 Flammability: 0 Physical hazard: 2

NFPA ratings



Disclaimer	Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user’s responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

REGENESIS
Technology-Based Solutions for the Environment

SAFETY DATA SHEET

1. Identification

Product identifier	**Oxygen Release Compound Advanced (ORC Advanced®)**
Other means of identification	None.
Recommended use	Soil and Groundwater Remediation.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name	Regenesis
Address	1011 Calle Sombra San Clemente, CA 92673
Telephone	949-366-8000
E-mail	CustomerService@regenesis.com
Emergency phone number	CHEMTREC® at 1-800-424-9300 (International)

2. Hazard(s) identification

Physical hazards	Oxidizing solids	Category 2
Health hazards	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	May intensify fire; oxidizer. Causes skin irritation. Causes serious eye damage.
Precautionary statement	
Prevention	Keep away from heat. Keep/Store away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Wash thoroughly after handling. Wear protective gloves/eye protection/face protection.
Response	If on skin: Wash with plenty of water. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.
Storage	Store away from incompatible materials.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Calcium hydroxide oxide	682334-66-3	≥85
Calcium hydroxide	1305-62-0	≤15
Dipotassium Phosphate	7758-11-4	<5
Monopotassium Phosphate	7778-77-0	<5

Composition comments	All concentrations are in percent by weight unless otherwise indicated.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	IF ON CLOTHING: rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
Eye contact	Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Ingestion	Never give anything by mouth to a victim who is unconscious or is having convulsions. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Dusts may irritate the respiratory tract, skin and eyes. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	Take off all contaminated clothing immediately. Contact with combustible material may cause fire. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Water spray, fog (flooding amounts). Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	Greatly increases the burning rate of combustible materials. Containers may explode when heated. During fire, gases hazardous to health may be formed. Combustion products may include: metal oxides.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers.
Specific methods	Cool containers exposed to flames with water until well after the fire is out.
General fire hazards	May intensify fire; oxidizer. Contact with combustible material may cause fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep away from clothing and other combustible materials. Wear appropriate protective equipment and clothing during clean-up. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Collect dust using a vacuum cleaner equipped with HEPA filter. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Ventilate the contaminated area. Stop the flow of material, if this is without risk. Absorb in vermiculite, dry sand or earth and place into containers. Large Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Shovel the material into waste container. Minimize dust generation and accumulation. Avoid the generation of dusts during clean-up. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. Place all material into loosely covered plastic containers for later disposal. For waste disposal, see section 13 of the SDS. Wear appropriate protective equipment and clothing during clean-up.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Keep away from heat. Provide appropriate exhaust ventilation at places where dust is formed. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Avoid contact with water and moisture. Do not get this material in contact with eyes. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Keep away from heat. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Do not store near combustible materials. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Calcium hydroxide (CAS 1305-62-0)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. ACGIH Threshold Limit Values

Components	Type	Value
Calcium hydroxide (CAS 1305-62-0)	TWA	5 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Calcium hydroxide (CAS 1305-62-0)	TWA	5 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. If engineering measures are not sufficient to maintain concentrations of dust particulates below the Occupational Exposure Limit (OEL), suitable respiratory protection must be worn. If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Use dust-tight, unvented chemical safety goggles when there is potential for eye contact.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Frequent change is advisable. Recommended gloves include rubber, neoprene, nitrile or viton.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Recommended use: Wear respirator with dust filter.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Keep from contact with clothing and other combustible materials. Remove and wash contaminated clothing promptly. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Powder.
Color	White to pale yellow.

Odor	Odorless.
Odor threshold	Not available.
pH	12.5 (3% suspension/water)
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Oxidizer.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Slightly soluble
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	527 °F (275 °C)
Viscosity	Not available.
Other information	
Bulk density	0.5 - 0.9 g/ml
Explosive limit	Non-explosive.

10. Stability and reactivity

Reactivity	Greatly increases the burning rate of combustible materials.
Chemical stability	Decomposes on heating. Product may be unstable at temperatures above: 275°C/527°F.
Possibility of hazardous reactions	Reacts slowly with water.
Conditions to avoid	Heat. Moisture. Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials.
Incompatible materials	Acids. Bases. Salts of heavy metals. Reducing agents. Combustible material.
Hazardous decomposition products	Oxygen. Hydrogen peroxide (H_2O_2). Steam. Heat.

11. Toxicological information

Information on likely routes of exposure	
Inhalation	Dust may irritate respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye damage.
Ingestion	Ingestion may cause irritation and malaise.
Symptoms related to the physical, chemical and toxicological characteristics	Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Dusts may irritate the respiratory tract, skin and eyes. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity

Components	Species	Test Results
Calcium hydroxide (CAS 1305-62-0)		
Acute		
Oral		
LD50	Rat	7340 mg/kg

Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye damage.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Due to the physical form of the product it is not expected to be an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Calcium hydroxide (CAS 1305-62-0)			
Aquatic			
Fish	LC50	Zambezi barbel (Clarias gariepinus)	33.8844 mg/l, 96 hours

Persistence and degradability	Decomposes in the presence of water. The product contains inorganic compounds which are not biodegradable.
Bioaccumulative potential	The product does not contain any substances expected to be bioaccumulating.
Mobility in soil	This substance has very low solubility in water and low mobility in the environment.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1479
UN proper shipping name	Oxidizing solid, n.o.s. (Calcium hydroxide oxide)

Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Label(s)	5.1
Packing group	II
Environmental hazards	
Marine pollutant	No
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	62, IB8, IP2, IP4, T3, TP33
Packaging exceptions	152
Packaging non bulk	212
Packaging bulk	240
IATA	
UN number	UN1479
UN proper shipping name	Oxidizing solid, n.o.s. (Calcium hydroxide oxide)
Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Packing group	II
Environmental hazards	No
ERG Code	5L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
IMDG	
UN number	UN1479
UN proper shipping name	OXIDIZING SOLID, N.O.S. (Calcium hydroxide oxide)
Transport hazard class(es)	
Class	5.1
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No
EmS	F-A, S-Q
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - Yes

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Calcium hydroxide (CAS 1305-62-0)

US. New Jersey Worker and Community Right-to-Know Act

Calcium hydroxide (CAS 1305-62-0)
Calcium hydroxide oxide (CAS 682334-66-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Calcium hydroxide (CAS 1305-62-0)

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	02-April-2015
Revision date	-
Version #	01
Further information	HMIS® is a registered trade and service mark of the American Coatings Association (ACA).
HMIS® ratings	Health: 3 Flammability: 0 Physical hazard: 2

NFPA ratings

Disclaimer	Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

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 Design Work Plan (RDWP) 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®-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 and alconox-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 RDWP-Derived Wastes

RDWP-derived wastes will be characterized and disposed upon completion of the RDWP 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 RDWP-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 Target Compound List (TCL) and CP-51 list VOCs including Tentatively Identified Compounds (TICs) using USEPA Method 8260 for soil/fill, groundwater, and QA/QC samples.
- NYSDEC TCL and CP-51 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 wok.

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 RDWP. 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.

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

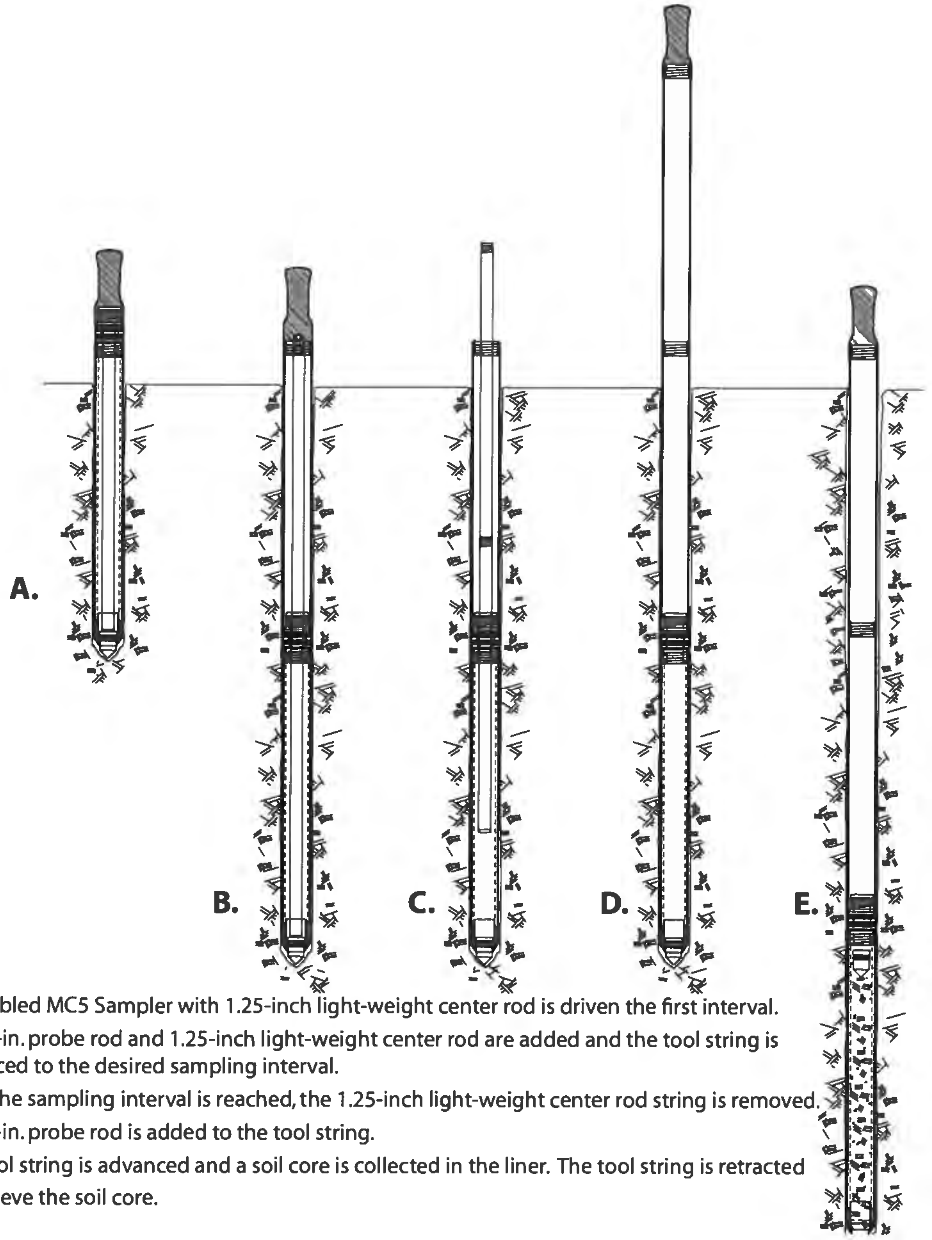
Geoprobe MacroCore Soil Sampling SOP

GEOPROBE® MACRO-CORE® MC5
1.25-INCH LIGHT-WEIGHT CENTER ROD SOIL SAMPLING SYSTEM

STANDARD OPERATING PROCEDURE

Technical Bulletin No. MK3139

PREPARED: January, 2011



A. Assembled MC5 Sampler with 1.25-inch light-weight center rod is driven the first interval.
B. A 2.25-in. probe rod and 1.25-inch light-weight center rod are added and the tool string is advanced to the desired sampling interval.
C. Once the sampling interval is reached, the 1.25-inch light-weight center rod string is removed.
D. A 2.25-in. probe rod is added to the tool string.
E. The tool string is advanced and a soil core is collected in the liner. The tool string is retracted to retrieve the soil core.

OPERATION OF THE MACRO-CORE® MC5 SOIL SAMPLING SYSTEM

Geoprobe Systems®

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

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.

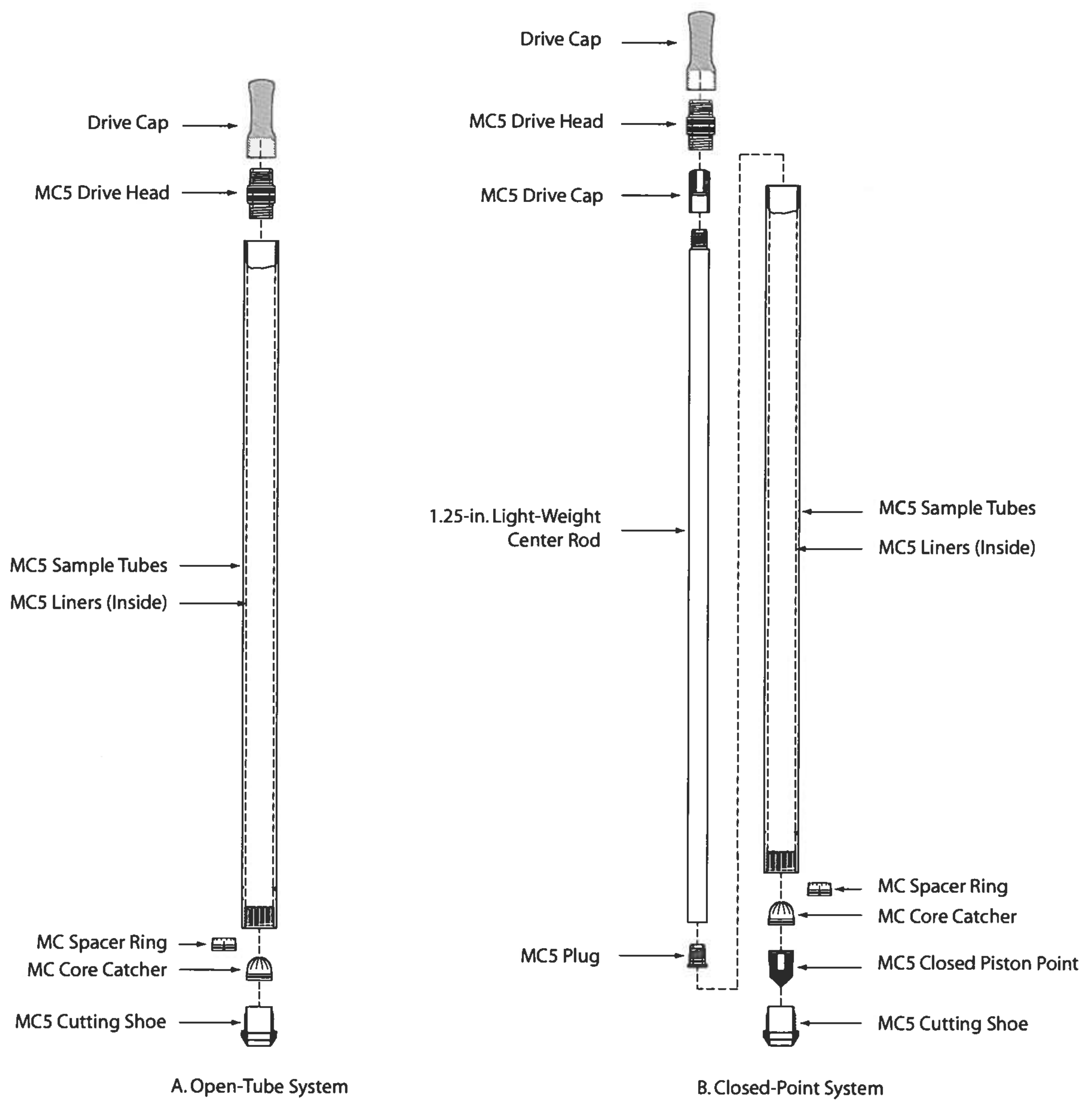


Figure 2.1
Macro-Core® MC5 Soil Sampler Configurations

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.

MC5 Sampler Parts	**Part Number**
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

Center Rods (1.25 in.) and Center Rod Accessories	**Part Number**
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

	Part Numbers for Specific Probe Rod OD	
Probe Rods and Probe Rod Accessories	**2.25-in. OD**	**2.125-in. OD**
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

MC5 Liners, Accessories, and Miscellaneous Tools	**Part Number**
MC Liners, 60 in. (66 liners)	10074
MC Liners, 48 in. (66 liners)	AT927K
MC Liners, 1m. (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	

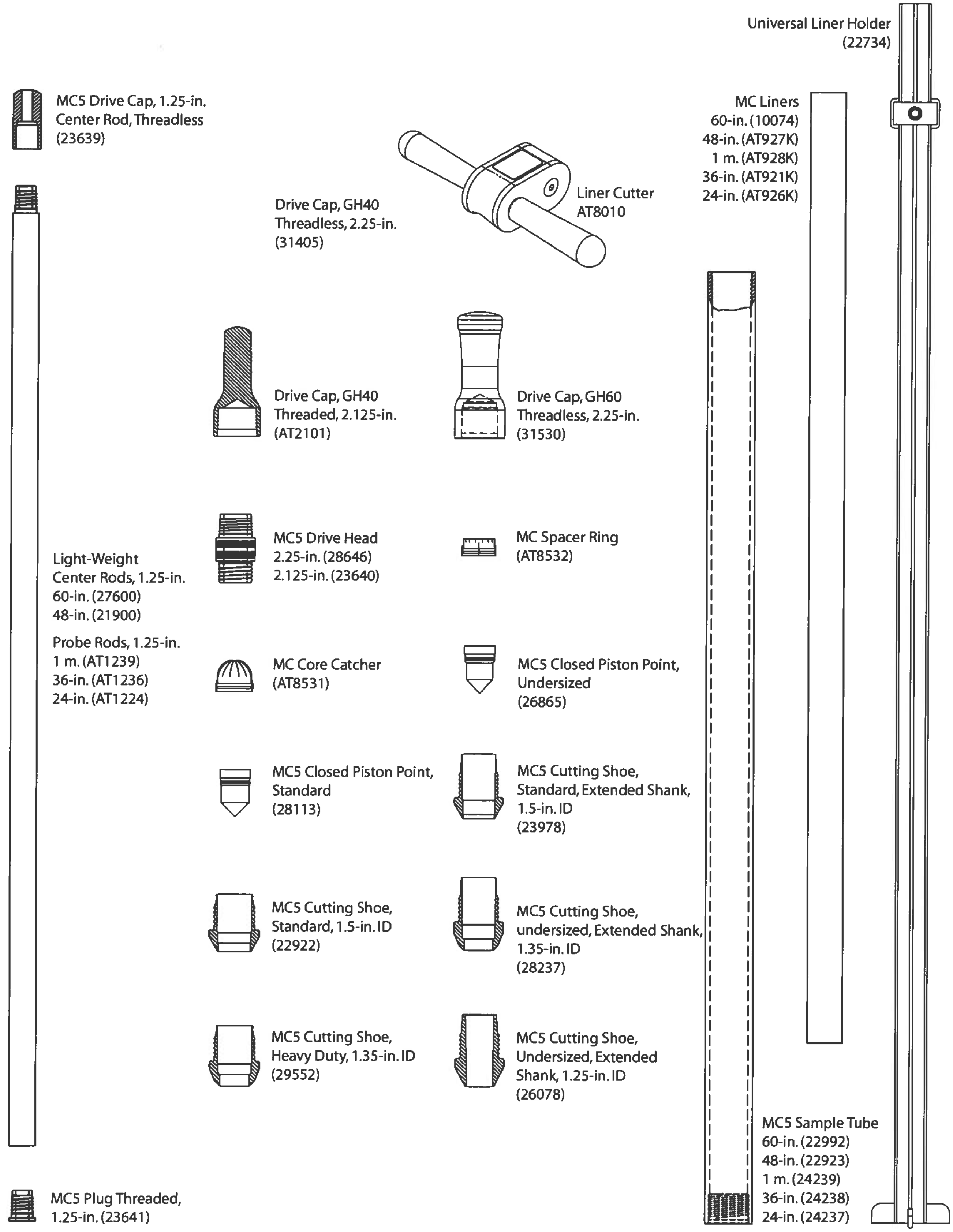


Figure 3.1
Macro-Core® MC5 Soil Sampler Parts

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).

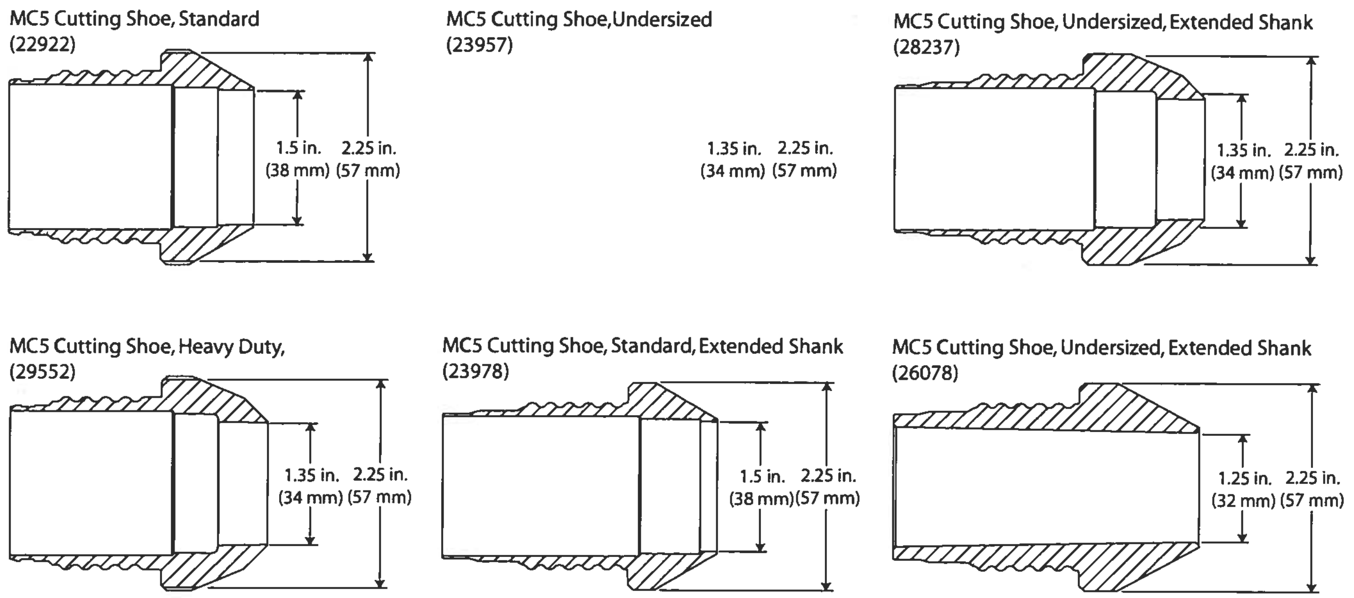
Cutting Shoes

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.


MC5 Cutting Shoe, Standard (22922)

MC5 Cutting Shoe, Undersized (23957)

MC5 Cutting Shoe, Undersized, Extended Shank (28237)

MC5 Cutting Shoe, Heavy Duty, (29552)

MC5 Cutting Shoe, Standard, Extended Shank (23978)

MC5 Cutting Shoe, Undersized, Extended Shank (26078)

Figure 3.2
Cutting Shoe Options for Macro-Core® MC5 Soil Sampler

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 contaminates 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

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

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

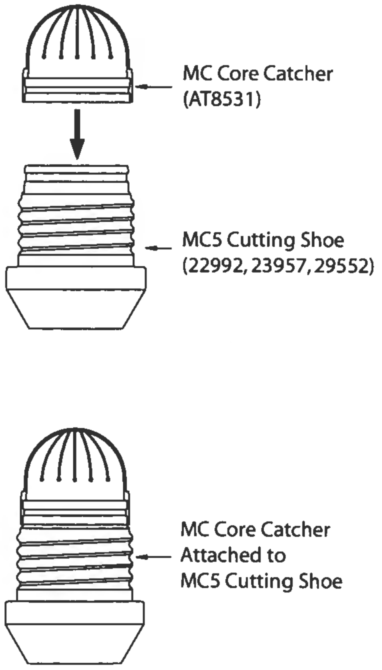


Figure 4.2
Core Catcher Attachment

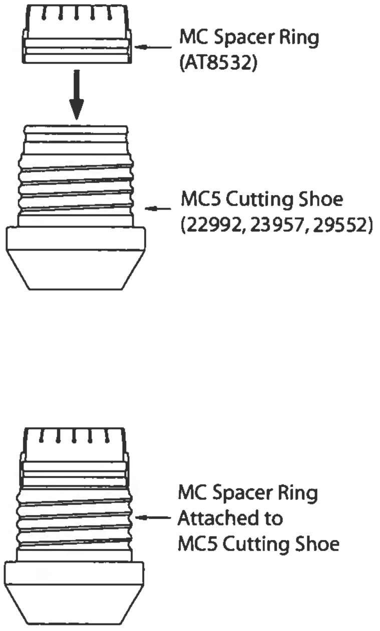


Figure 4.3
Spacer Ring Attachment

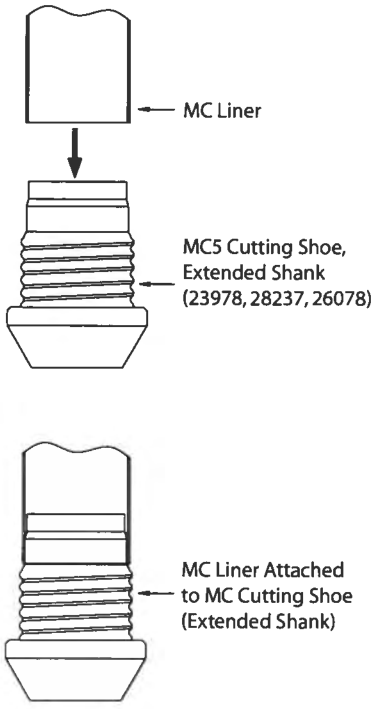


Figure 4.4
Liner Attachment on Extended Shank

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

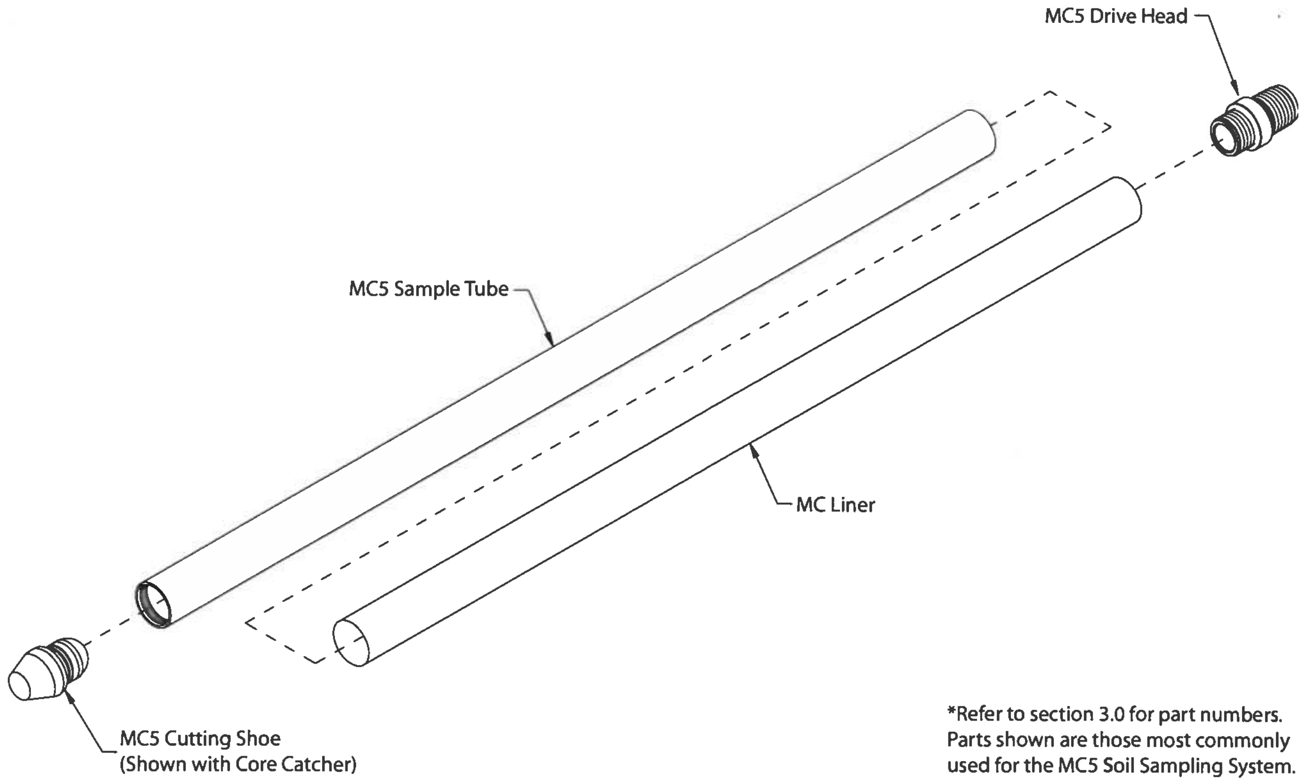
The cutting shoes with extended shanks (23978, 28237, 26078) do not use core catchers or spacer rings. MC5 Liners should securely slide onto the end of these cutting shoes (Fig. 4.4). The extended shank cutting shoes should only be used when sampling cohesive soils. When sampling loose soils, especially 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



*Refer to section 3.0 for part numbers. Parts shown are those most commonly used for the MC5 Soil Sampling System.

Figure 4.5
MC5 Open-Tube Sampler Assembly

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)

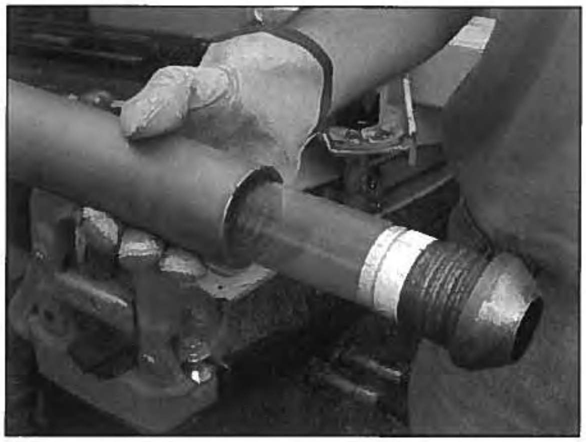


Figure 4.8. Slide whole assembly into either end of the sample tube.

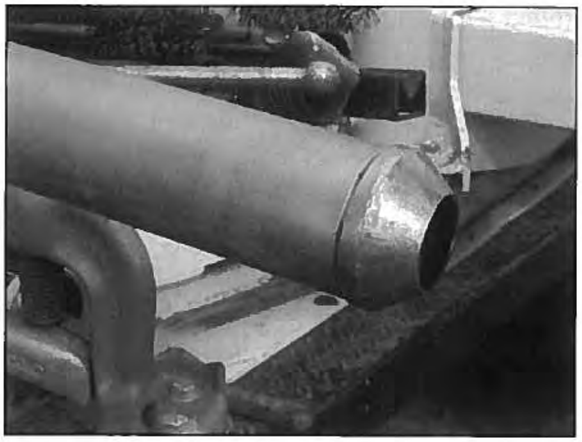


Figure 4.9. Thread the cutting shoe onto the sample tube.

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 shoud 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.

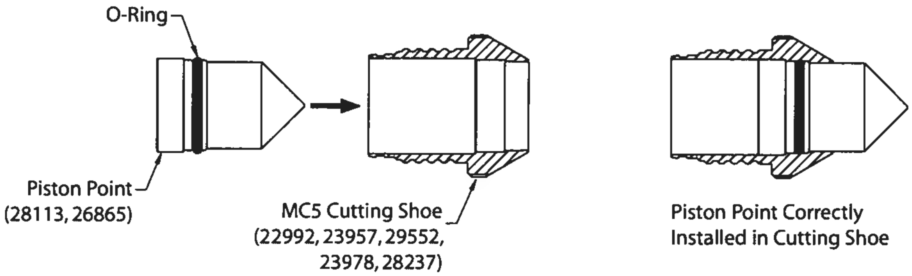


Figure 4.12
Installation of MC5 Closed Piston Point Assembly in MC5 Cutting Shoe

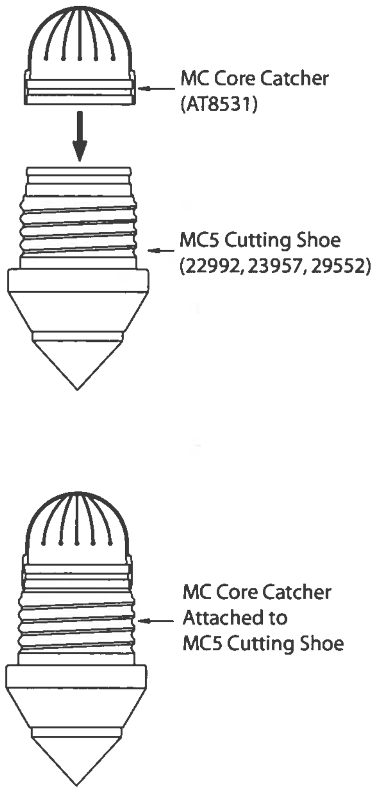


Figure 4.13
Core Catcher Attachment
With Point Assembly

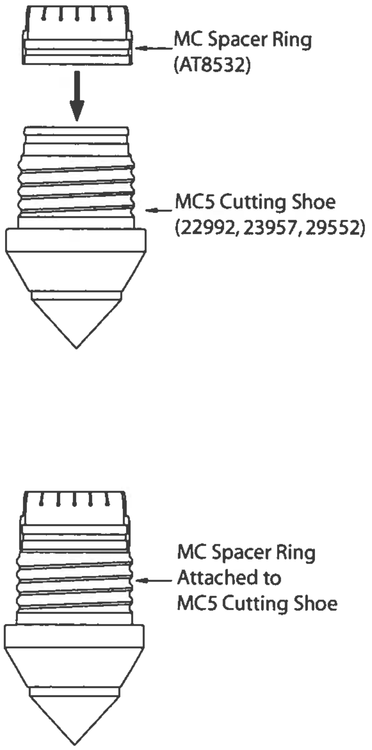


Figure 4.14
Spacer Ring Attachment
With Point Assembly

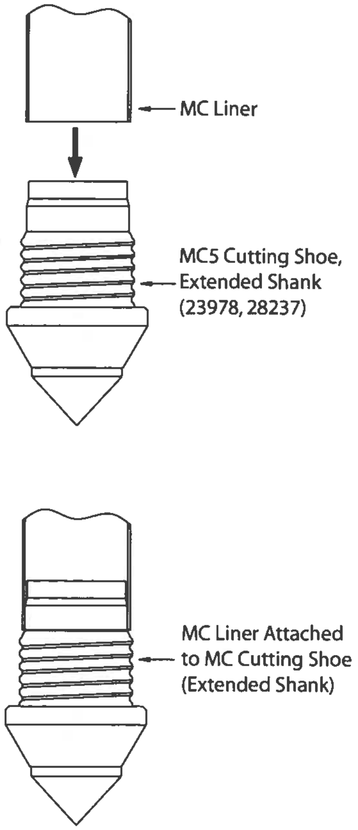


Figure 4.15
Liner Attachment on Extended
Shank With Point Assembly

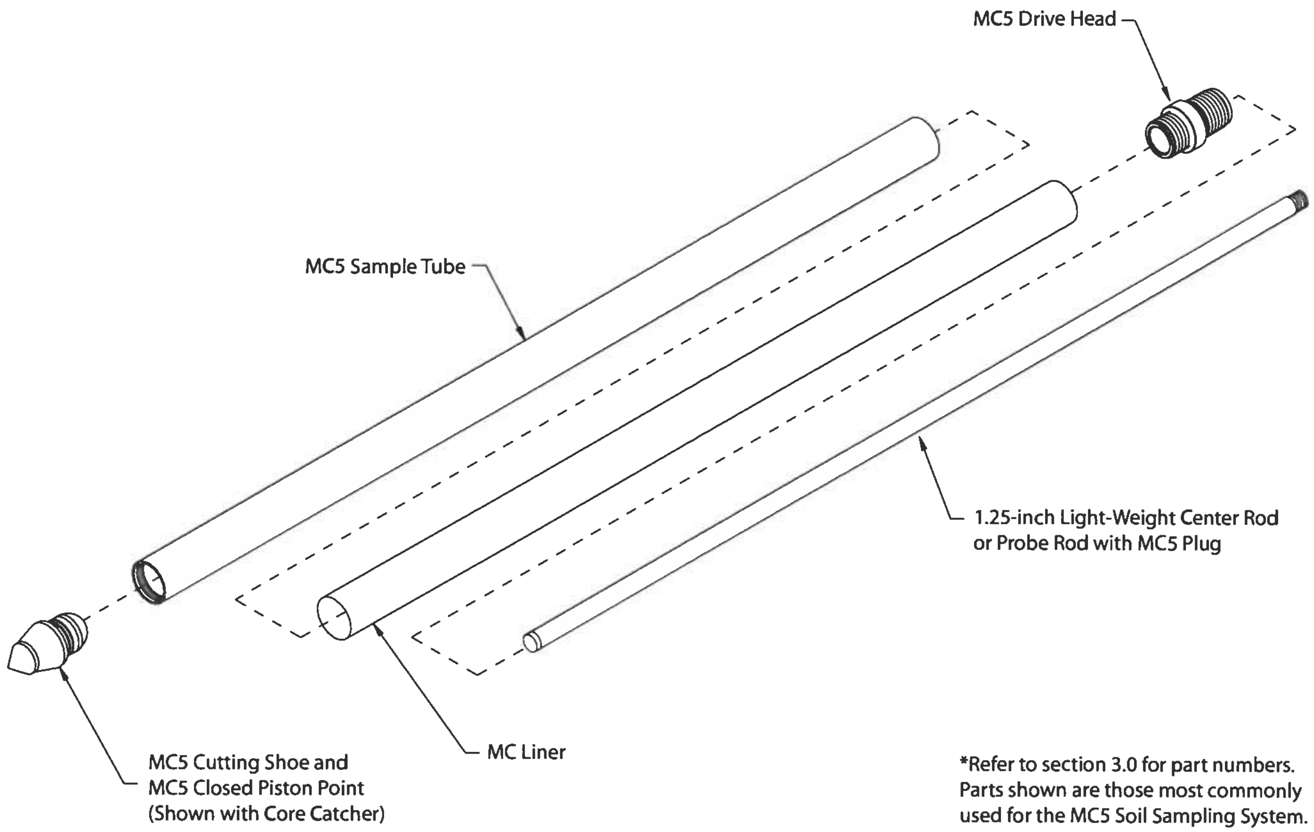
Refer to Figure 4.16 for MC5 Closed-Point Sampler Assembly

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



*Refer to section 3.0 for part numbers.
Parts shown are those most commonly
used for the MC5 Soil Sampling System.

Figure 4.16
MC5 Closed-Point Sampler Assembly

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

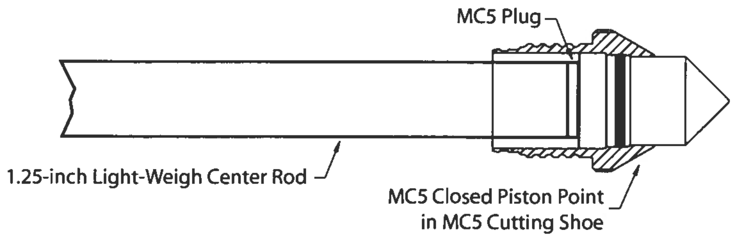


Figure 4.17
MC5 Closed-Point Center Rod Assembly

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.

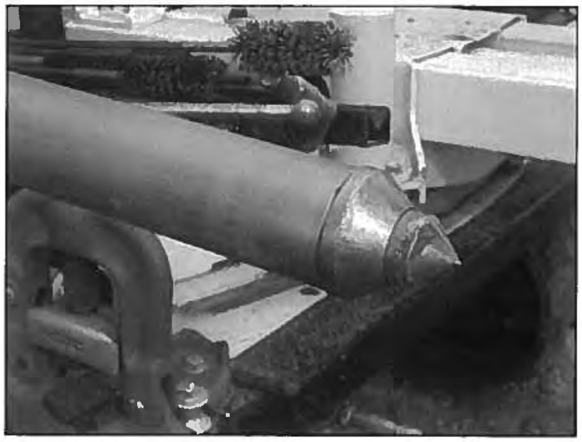


Figure 4.21. Thread the cutting shoe and point onto the sample tube.

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.

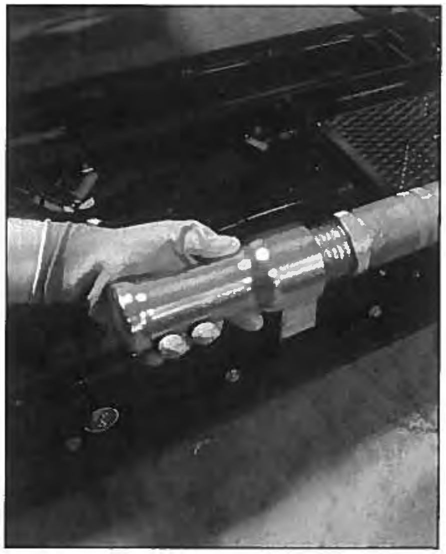
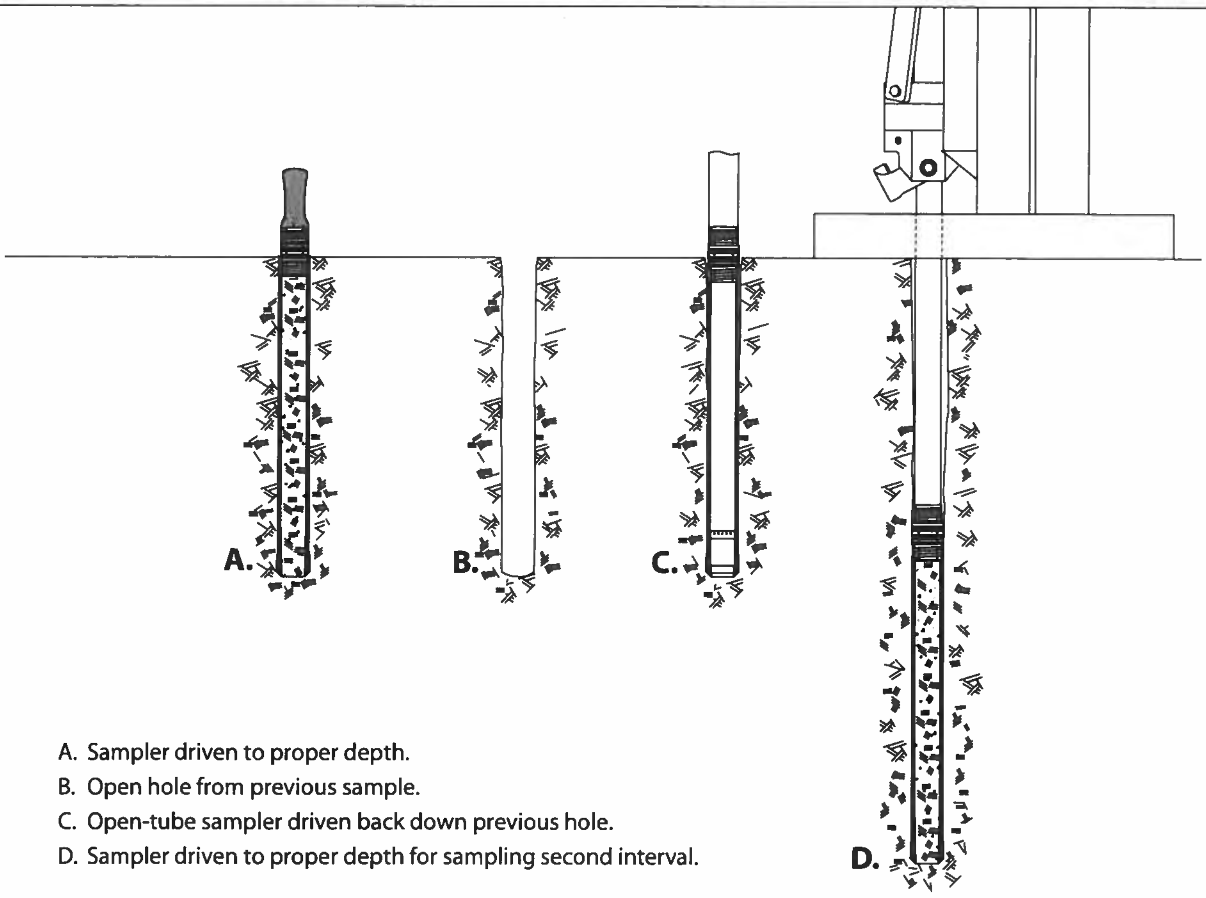


Figure 4.24. Place drive cap onto sampler drive head.

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.



A. Sampler driven to proper depth.
B. Open hole from previous sample.
C. Open-tube sampler driven back down previous hole.
D. Sampler driven to proper depth for sampling second interval.

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).

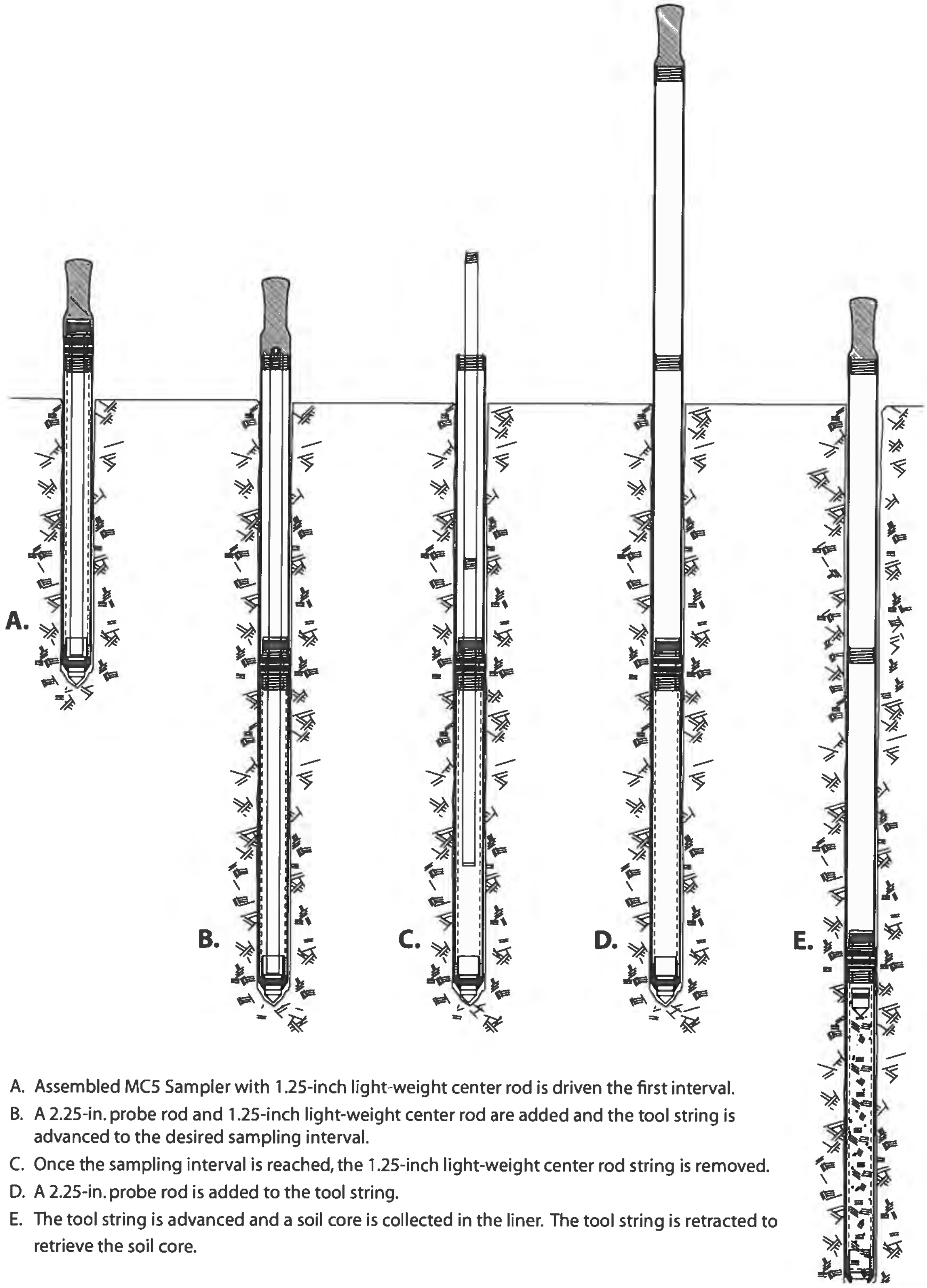
8. Advance the tool string to collect the soil core in the liner (Fig. 4.28E).

   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.



A. Assembled MC5 Sampler with 1.25-inch light-weight center rod is driven the first interval.
B. A 2.25-in. probe rod and 1.25-inch light-weight center rod are added and the tool string is advanced to the desired sampling interval.
C. Once the sampling interval is reached, the 1.25-inch light-weight center rod string is removed.
D. A 2.25-in. probe rod is added to the tool string.
E. The tool string is advanced and a soil core is collected in the liner. The tool string is retracted to retrieve the soil core.

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.

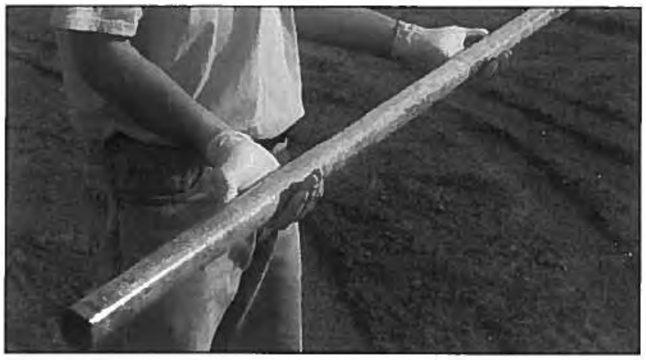


Figure 4.31. MC5 Liner filled with soil core.

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.

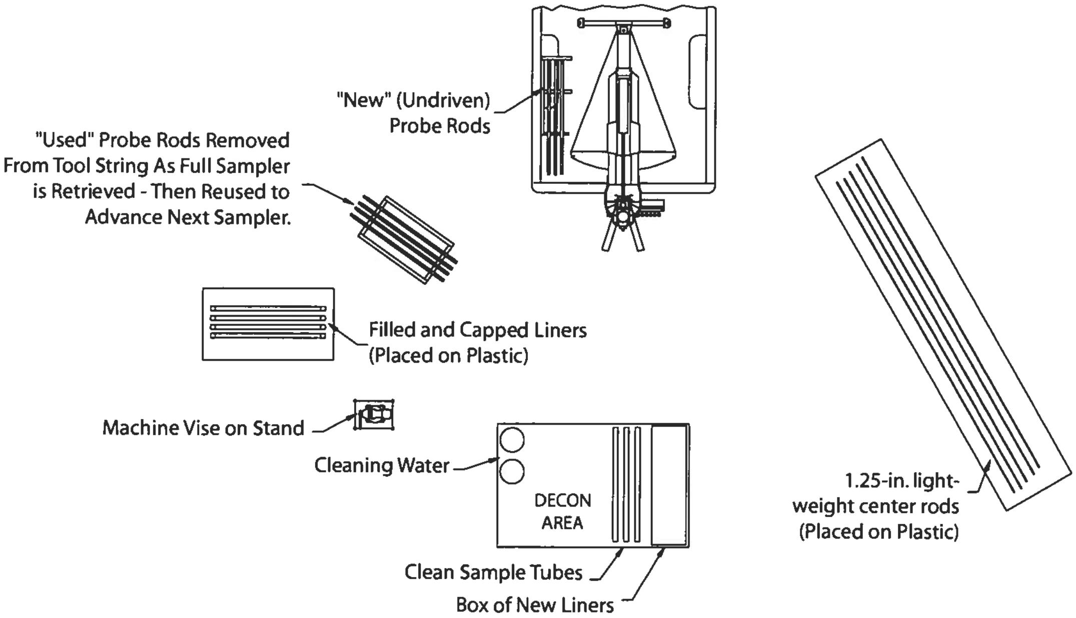


Figure 4.36
Equipment Layout Example to Maximize Sampling Productivity

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

Geoprobe® Tools and Equipment	Part Number
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

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:______________

Signed:____________________ Date:__________ Title:______________

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Revision Record

Rev. No.	Date	Responsible Person	Change
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. 3.1Added 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.

Rev. No.	Date	Responsible Person	Change
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

Location	Personnel
Technical Director's Office	Technical Director
QA Office	QA Officer
Environmental Laboratory	Technical Staff

Table of Contents

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:

Duty	***Assigned to:***
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:

Duty	***Assigned to:***
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 inabilities 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 it 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:

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

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

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.

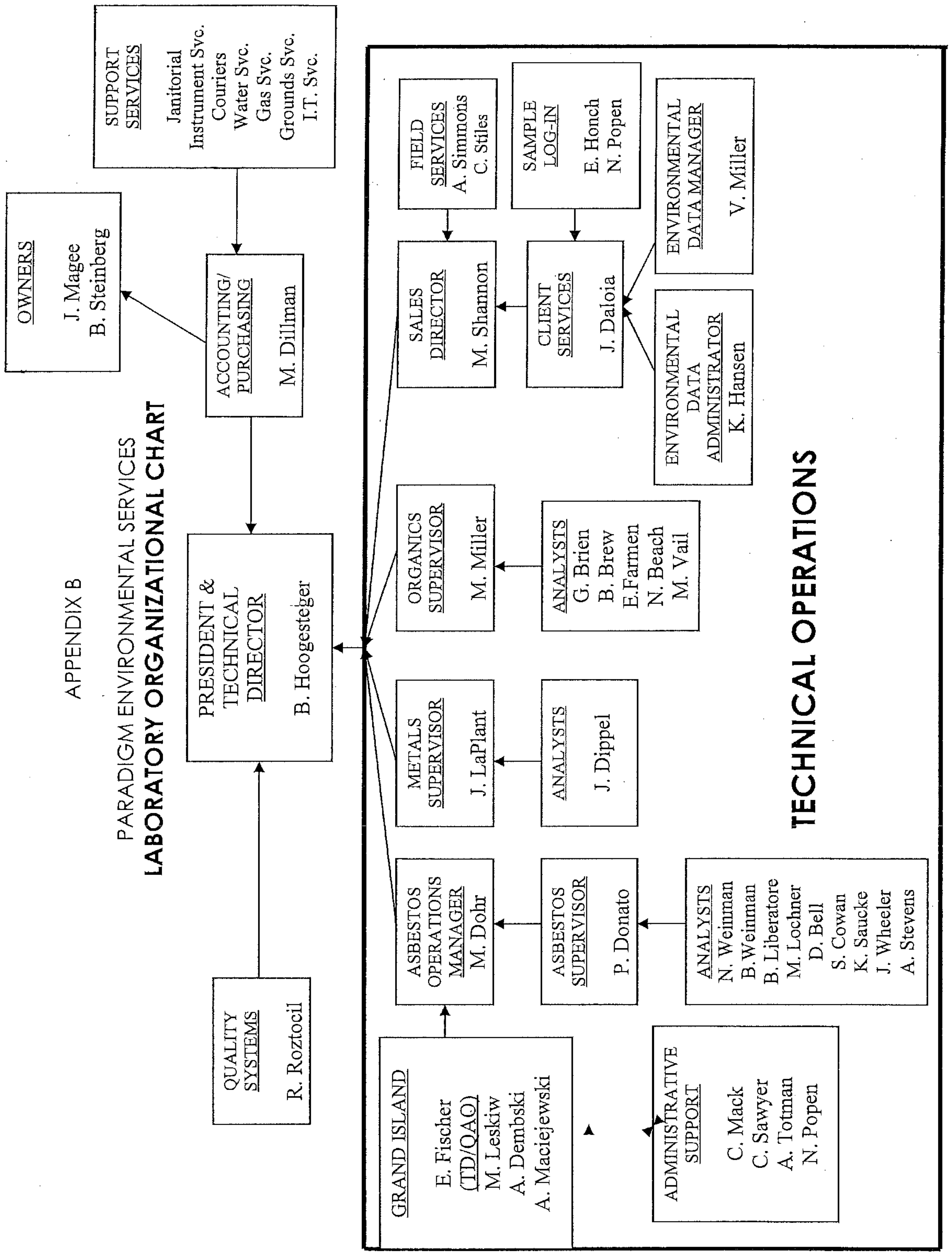
6. To oppose and refrain from incompetent and fraudulent inspection, sampling, analysis, testing, consultation, development and research work.

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 B

PARADIGM ENVIRONMENTAL SERVICES

LABORATORY ORGANIZATIONAL CHART

APPENDIX C, TABLE 1

Paradigm Environmental Services, Inc.
CONTAINERS, PRESERVATION, & HOLDING TIMES
NON-AQUEOUS

**** Do not freeze samples***

PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
% Water, GC	10 g/40 ml	voa vial (unpres)	<=6°C	14 days
% Water, Karl Fischer	10 g/40 ml	voa vial (unpres)	<=6°C	28 days
Ammonia	5 g	glass jar	<=6°C	28 days
B, Mo, Sn, Ti, Si	5 g	glass jar	<=6°C	6 months
Bomb/IC Cl, Br, I, F	5 g	glass jar, no headspace	None	28 days
BTU	40 ml	voa vial (unpres)	<=6°C	28 days
Chloride	5 g	glass jar	<=6°C	28 days
Chromium, Hexavalent	5 g	p, g	<=6°C	30 days
Cyanide, Total	3 g	glass jar	<=6°C	14 days
Flashpoint 1010	30 g	glass jar	<=6°C	N/A
Fluoride	5 g	glass jar	<=6°C	28 days
Formaldehyde	5 g	glass jar	<=6°C	14 days
Glycols, APC	2 oz.	glass jar	<=6°C	7 days
Glycols, GC	2 oz.	glass jar	<=6°C	14 days
Ignitability 1030	50 g	p, g	room temp	N/A
Nitrate	5 g	glass jar	<=6°C	48 hours
Nitrite	5 g	glass jar	<=6°C	48 hours
Oil & Grease	25 g	glass jar	<=6°C	28 days
Ortho-phosphate	100 g	glass jar	<=6°C	48 hours
Paint Filter Test	100 g	p, g	<=6°C	N/A
pH	5 g	p,g	<=6°C	15 min after addition of water
Phenolics, Total	5 g	glass jar	<=6°C	28 days
Phosphorus, Total	3 g	glass jar	<=6°C	28 days
Radon (air)	N/A	cassette	N/A	7 days
Reactivity	20 g	glass jar	<=6°C	7 days
Solids (various)	50 g	glass jar	<=6°C	7 days
Specific Gravity	50 ml	N/A	N/A	N/A
Sulfate	5 g	glass jar	<=6°C	28 days

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

Appendix C, Table 2.

Paradigm Environmental Services, Inc.
CONTAINERS, PRESERVATION, & HOLDING TIMES
NON-AQUEOUS

**** Do not freeze samples***

PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
METALS				
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
ORGANICS				
8260 TCL, Stars, TCL + Stars; BTEX; MTBE; 8015 GRO	40 g	glass jar*	<=6ºC	14 days
TCLP Voa	10 g	glass jar*	<=6ºC	14 days
PCBs	5 g	glass, plastic	<=6ºC	1 year/ 1 year
PCBs (OIL)	2 g	glass, plastic	<=6ºC	1 year/ 1 year
8270 ABN, Stars; Pest; Herb; 8015 DRO; 310.13 PHC/TPH	35 g	glass jar	<=6ºC	14 days/40 days
TCLP Svoa	25 g	glass jar	<=6ºC	14 days/40 days
* no headspace				

Appendix C, Table 3.

Paradigm Environmental Services, Inc.
CONTAINERS, PRESERVATION, & HOLDING TIMES
AQUEOUS

**** Do not freeze samples***

PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
% water GC	40 ml	voa vial (unpres)	<=6°C	14 days
% water Karl Fisher	40 ml	voa vial (unpres)	<=6°C	28 days
Acidity	100 ml	p,g, no headspace	<=6°C	14 days
Alkalinity, Total	100 ml	p,g,no headspace	<=6°C	14 days
Ammonia as N	25 ml	p,g	<=6°C, H_2SO_4 pH <2	28 days
B, Mo, Au, Sn, Ti, Si	50 ml	p,g	<=6°C, HNO_3 pH <2	6 months
BOD5, BOD28	500 ml	p,g	<=6°C	48 hours
Bromide	25 ml	p,g	None	28 days
BTU	40 ml	voa vial (unpres)	<=6°C	28 days
CBOD5	500 ml	p,g	<=6°C	48 hours
Chloride	100 ml	p,g	None	28 days
Chlorine Demand	1000 ml	p,g	<=6°C	7 days
Chromium, Hexavalent	100 ml	p,g	<=6°C	24 hours
COD	25 ml	p,g	<=6°C, H_2SO_4 pH <2	28 days
Color, PCU	100 ml	p,g	<=6°C	48 hours
Conductivity	50 ml	p, g	<=6°C	28 days
Cyanide-Total & Amen.	100 ml	p,g	<=6°C, NaOH, .6g ascorbic acid pH >12	14 days
DOC	4 oz jar	p, g	<=6°C, pres after filtering w/ H_3PO_4	28 days
Eh	4 oz jar	p,g	None	ASAP - field parameter
Flashpoint 1010	30 ml	glass	<=6°C	N/A
Fluoride	125 ml	p,g	None	28 days
Formaldehyde	100 ml	p,g	<=6°C	14 days
Glycols, APC	2 oz jar	glass	<=6°C	7 days
Glycols, GC	2 oz jar	glass	<=6°C	7 days
Hardness	100 ml	p,g	<=6°C, HNO_3 pH <2	6 months
MBAS (surfactants)	250 ml	p,g	<=6°C	48 hours
Nitrate	25 ml	p,g	<=6°C	48 hours

Nitrate-Nitrite	100 ml	p, g	<=6°C, H_2SO_4 pH <2	28 days
Nitrite	75 ml	p,g	<=6°C	48 hours
Oil & Grease/Silica gel	1000 ml	glass	<=6°C, H_2SO_4 pH <2	28 days
Orthophosphate	100 ml	p,g	<=6°C, filter within 15 min	48 hours
pH	10 ml	p,g	<=6°C	Analyze within 15 min
Phenolics, Total	500 ml	glass	<=6°C, H_2SO_4 pH <2	28 days
Phosphorus, Total	50 ml	p,g	<=6°C, H_2SO_4 pH <2	28 days
Reactivity	500 ml	glass	<=6°C	7 days
Residual Chlorine	20 ml	p, g	<=6°C	ASAP - field parameter
Settleable Solids	1000 ml	p, g	<=6°C	48 hours
Silica	50 ml	p	<=6°C	28 days
Solids, Dissolved (TDS)	100 ml	p,g	<=6°C	7 days
Solids, Suspended (TSS)	200 ml	p,g	<=6°C	7 days
Specific Gravity	50 ml	N/A	N/A	N/A
Sulfate	25 ml	p,g	<=6°C	28 days
Sulfide	25 ml	p,g	<=6°C, NaOH + zinc acetate pH >9	7 days
Temperature	field test	p,g	None	15 minutes
TKN	100 ml	p,g	<=6°C, H_2SO_4 pH <2	28 days
TOC	25 ml	p,g	<=6°C, H_3PO_4 pH <2	28 days
TOX	250 ml	glass	<=6°C, H_2SO_4 pH <2	28 days
Turbidity	50 ml	p,g	<=6°C	48 hours

Appendix C, Table 4.

Paradigm Environmental Services, Inc.
CONTAINERS, PRESERVATION, & HOLDING TIMES
AQUEOUS

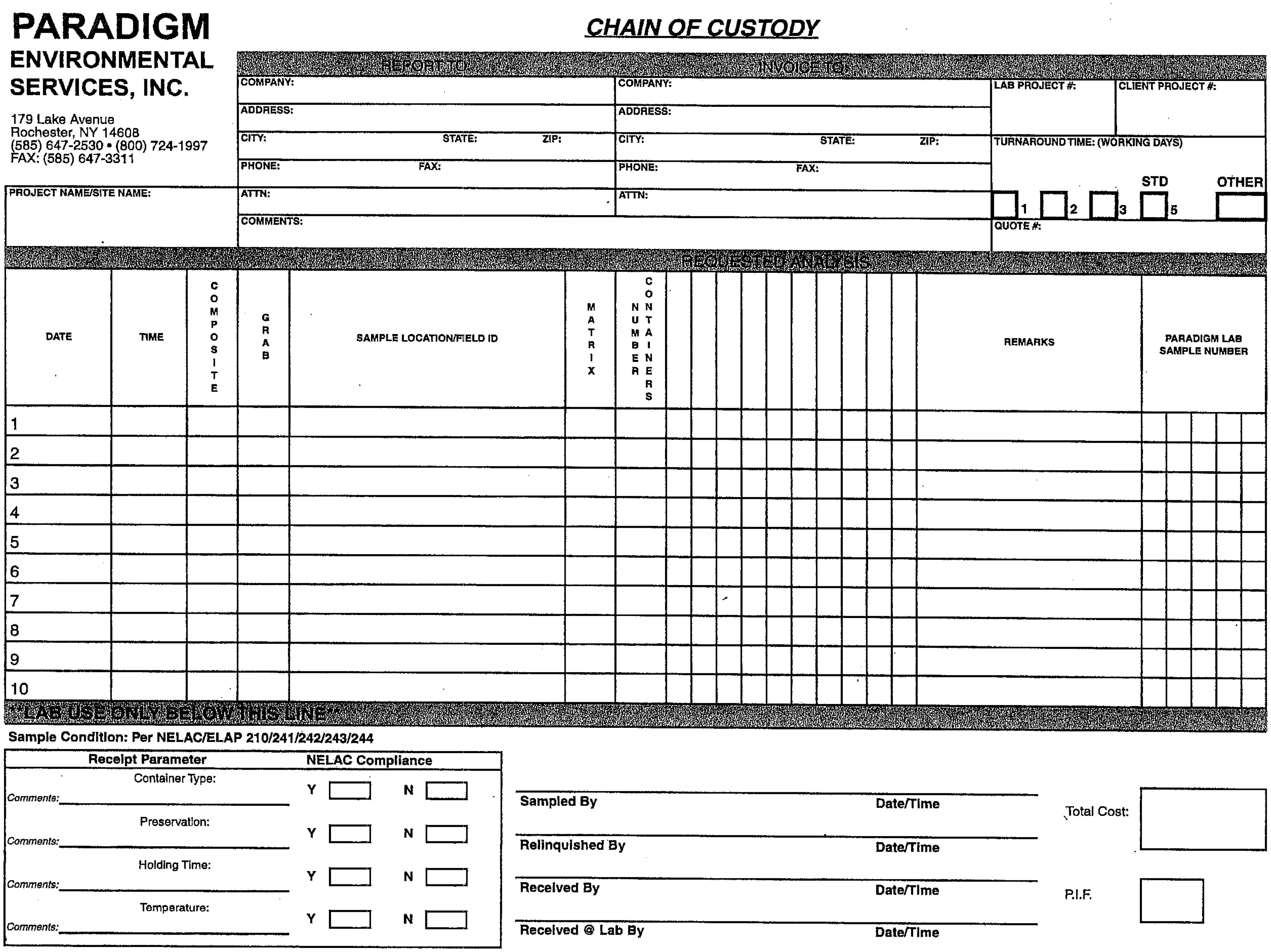
*** Do not freeze samples***				
PARAMETER	QUANTITY	CONTAINER	PRESERVATION	HOLDING TIME
METALS				
Flame/ICP Metals	200 ml	p,g	HNO_3 pH <2	6 months
Mercury	100 ml	p,g	HNO_3 pH <2	28 days
ORGANICS				
8260 TCL, Stars, TCL + Stars; 624; 601/602; BTEX; MTBE; TICS	2x40 ml	VOA vial	<=6°C, HCl pH <2	14 days
* 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 $Na_2S_2O_3$ if Cl present; adjust pH with 5% NaOH or H_2SO_4 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 $Na_2S_2O_3$ if Cl present	7 days/ 40 days
608 PCB	1 Liter	glass	<=6°C, 0.5 ml 10% soln $Na_2S_2O_3$ 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

BACTERIOLOGY				
Coliform, Total (DW)	100 ml	Coli Bottle	<=6ºC, 0.008% $Na_2S_2O_3$	30 hours
Coliform, Total (WW)	100 ml	Coli Bottle	<=6ºC, 0.008% Na2S2O3	8 hours
Fecal Coli (NPW)	100 ml	Coli Bottle	<=6ºC, 0.008% Na2S2O3	6 hours
Standard Plate Count (DW)	100 ml	Coli Bottle	<=6ºC, 0.008% $Na_2S_2O_3$	8 hours
Standard Plate Count (WW)	100 ml	Coli Bottle	<=6ºC, 0.008% $Na_2S_2O_3$	8 hours

Appendix C, Table 5.
Container Codes

Container	Size	Code
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 ($Na_2S_2O_3$)		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



PARADIGM
ENVIRONMENTAL SERVICES, INC.

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

CHAIN OF CUSTODY

REPORT TO:	INVOICE TO:	
COMPANY:	COMPANY:	LAB PROJECT #: CLIENT PROJECT #:
ADDRESS:	ADDRESS:	
CITY: STATE: ZIP:	CITY: STATE: ZIP:	TURNAROUND TIME: (WORKING DAYS)
PHONE: FAX:	PHONE: FAX:	STD OTHER
ATTN:	ATTN:	☐ 1 ☐ 2 ☐ 3 ☐ 5 ☐
COMMENTS:		QUOTE #:

PROJECT NAME/SITE NAME:

REQUESTED ANALYSIS

DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	NUMBER CONTAINERS											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: *Comments:*	Y ☐	N ☐
Preservation: *Comments:*	Y ☐	N ☐
Holding Time: *Comments:*	Y ☐	N ☐
Temperature: *Comments:*	Y ☐	N ☐

Sampled By **Date/Time**

Relinquished By **Date/Time**

Received By **Date/Time**

Received @ Lab By **Date/Time**

Total Cost: ☐

P.I.F. ☐

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 procured.

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 conditious 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

Category	***Method***	***Accrediting Body*** *Primary AB		
Potable Water:				
• Total Coliform	Colilert	NY*		
Non-Potable Water				
• 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-ClG	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 Caharcterization 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

day
DAY ENVIRONMENTAL, INC.

ENVIRONMENTAL CONSULTANTS
AN AFFILIATE OF DAY ENGINEERING, P.C.

TEST PIT TP-

Page of

Project #:
Project Address:
Date:
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-

1563 LYELL AVENUE
ROCHESTER, NEW YORK 14606
(585) 454-0210
FAX (585) 454-0825

www.dayenvironmental.com

420 LEXINGTON AVENUE, SUITE 300
NEW YORK, NEW YORK 10170
(212) 986-8645
FAX (212) 986-8657

Test Boring TMW-

Page 1 of 2

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):

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-

Test Boring TMW-

Page 2 of 2

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):

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-

day
DAY ENVIRONMENTAL, INC.

ENVIRONMENTAL CONSULTANTS
AN AFFILIATE OF DAY ENGINEERING, P.C.

TEMPORARY MONITORING WELL CONSTRUCTION DIAGRAM

Project #: ____________
Project Address: ____________

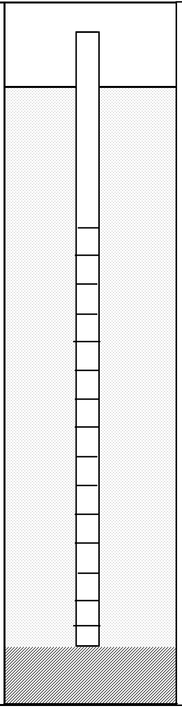
DAY Representative: ____________
Drilling Contractor: ____________

MONITORING WELL TMW-

Ground Elevation: ________ Datum: ________
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

MONITORING WELL TMW-

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_2O PER WELL CASING [GAL]: _____________ **CASING DIA.:** _________

CALCULATIONS:

CASING DIA. (FT)	WELL CONSTANT(GAL/FT)	CALCULATIONS
¾” (0.0625)	0.023	VOL. OF H_2O IN CASING = DEPTH OF WATER COLUMN X WELL CONSTANT
1” (0.0833)	0.041	
1¼” (0.1041)	0.063	
2” (0.1667)	0.1632	
3” (0.250)	0.380	
4” (0.3333)	0.6528	
4½” (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