DELPHI AUTOMOTIVE SYSTEMS SITE
MONROE COUNTY
ROCHESTER, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 8-28-064
USEPA ID # NYD002215234

Prepared for:

GM Components Holdings, LLC.
1000 Lexington Avenue
Rochester, New York 14606

Prepared by:

Haley & Aldrich of New York
200 Town Centre Drive, Suite 2
Rochester, New York 14623
(585)-359-9000

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

September 2022

CERTIFICATION STATEMENT

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

STATE OF NEW YORK · EDMUND QUINN LEWIS · 087372 · LICENSED PROFESSIONAL ENGINEER

It is a violation of New York State Education Law Article 145 for any person, unless he or she is acting under the direction of a licensed Professional Engineer, to alter this item in any way.

Edmund Quinn Lewis P.E.

30 September 2022 DATE

087372 NYS PROFESSIONAL ENGINEER NO.

DELPHI AUTOMOTIVE SYSTEMS SITE No. 828064
MONROE COUNTY
ROCHESTER, NEW YORK

SITE MANAGEMENT PLAN

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List of Acronyms

ASP	Analytical Services Protocol
AWTA	Additional Waste Treatment Area
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
COCs	Chemicals of Concern
CP	Commissioner Policy
cVOCs	Chlorinated Volatile Organic Compounds
Delphi	Delphi Corporation
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
EPA	Environmental Protection Agency
EWP	Excavation Work Plan
EWTA	Eastside Wastewater Treatment Area
GAC	Granulated Activated Carbon
GMC	General Motors Corporation
GMCH	GM Components Holdings LLC
GRTS	Groundwater Recovery and Treatment System
Haley & Aldrich	Haley & Aldrich of New York
HASP	Health and Safety Plan
HDPE	High-density Polyethylene
HVAC	Heating, Ventilation and Air Conditioning
IC	Institutional Control
IRM	Interim Remedial Measures
LGAC	Liquid Granulated Activated Carbon
LNAPL	Light Non-Aqueous Phase Liquid
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
NYCRR	New York Codes, Rules and Regulations

O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OWS	Oil-water Separator
PID	Photoionization Detector
PLC	Programmable Logic Controller
POTW	Public Operated Treatment Works
PRR	Periodic Review Report
PVC	Polyvinyl Chloride
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMA	Soil Management Area
SMP	Site Management Plan
SOP	Standard Operating Procedures
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-slab Depressurization System
SVI	Soil Vapor Intrusion
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
VFD	Variable Frequency Drive
VOC	Volatile Organic Compound
WWTP	Waste Water Treatment Plant
Cr	Chromium
Cu	Copper
Hg	Mercury
Ni	Nickel
PCB	Polychlorinated Biphenyl Compound
Pb	Lead
TCE	Trichloroethene
Zn	Zinc
ft	feet
in. W.C.	inches of water column
lb	pound
ppm	parts per million
uM	Micron

EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification:	**Delphi Automotive Systems Site No. 828064** **1000 Lexington Avenue, Rochester, New York**
Institutional Controls:	1. The property may be used for Commercial or Industrial use.
	2. The IC restricts the use of the Site to Commercial/Industrial purposes and groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Monroe County DOH and requires the evaluation of the vapor intrusion pathway for all new construction of buildings.
	3. All ECs must be operated and maintained as specified in this SMP.
	4. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	5. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
	6. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	7. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	8. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.
	9. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
	10. Agriculture or vegetable gardens on the Site are prohibited.

Site Identification:	**Delphi Automotive Systems Site No. 828064** **1000 Lexington Avenue, Rochester, New York**
Engineering Controls:	1. Cover system
	2. Groundwater Migration Control
	3. LNAPL Recovery
	4. Sub-Slab Depressurization System

Inspections:	Frequency
1. Cover System	Annually
2. Groundwater Migration Control and Treatment Systems	Annually
3. LNAPL Recovery	Monthly
4. Sub-Slab Depressurization System	Quarterly
Monitoring:	
1. Groundwater Quality	Annually
2. Indoor Air Quality	Annually
3. LNAPL Recovery	Monthly
4. Sub-Slab Depressurization Performance Monitoring	Varying frequency based on component
5. Soil Vapor Intrusion Assessment (SVI)	As needed for new building construction
Maintenance:	
1. Groundwater Migration Control and Treatment Systems	As needed
2. LNAPL Recovery	As needed
3. Sub-Slab Depressurization System	As needed
Reporting:	
1. Sanitary Sewer Discharge to Monroe County POTW	Monthly to POTW only
2. Groundwater Quality	Annually

<table>
<tr><td>Site Identification:</td><td colspan="2">Delphi Automotive Systems Site No. 828064
1000 Lexington Avenue, Rochester, New York</td></tr>
<tr><td colspan="2">3. Indoor Air Quality</td><td>Annually</td></tr>
<tr><td colspan="2">4. SSDS Vapor Effluent</td><td>Annually</td></tr>
<tr><td colspan="2">5. Periodic Review Report</td><td>Annually</td></tr>
</table>

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Delphi Automotive Systems Site located in Rochester, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program Site No. 828064 which is administered by New York State Department of Environmental Conservation (NYSDEC).

GMCH entered into an Order on Consent in September 2020 with the NYSDEC to remediate the Site, although the remedial components had already been implemented as IRMs. A figure showing the site location and boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description and survey that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC and recorded with the Monroe County Clerk requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement,

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 (New York Codes, Rules and Regulations (NYCRR) Part 375 and the Order on Consent (Index # B8-0531-98-06; Site No. 828064) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in Appendix B of this SMP.

This SMP was prepared by Haley & Aldrich of New York (Haley & Aldrich), on behalf of GMCH, in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, 6NYCRR Part 375 and/or Environmental Conservation Law.

- 7-day advance notice of any field activity associated with implementation of the remedial program not including normal operations and maintenance activities discussed in this SMP.

- 15-day advance notice of any proposed significant ground-intrusive activity pursuant to the Excavation Work Plan (EWP) not including normal facility operations and maintenance activities discussed in this SMP. Significant ground-intrusive activities that will result in, changes to the existing cover system (for example: paving in lieu of soil cover).

- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Order on Consent and all approved work plans and reports, including this SMP

- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Name	Contact Information
Danielle Miles NYSDEC Project Manager	(585) 226-5349; danielle.miles@dec.ny.gov
David Pratt, P.E. NYSDEC Region 8 Remediation Engineer	(585) 226-5449; david.pratt@dec.ny.gov
John Maher GMCH Remediation Project Manager	(765) 860-8543; john.maher@gm.com
Natalie Hahn GMCH Site Contact	(585) 647-7254; natalie.hahn@gm.com

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located in Rochester, Monroe County, New York and is identified as Parcel # 090.79-1-1.002 on the Monroe County Tax Map on the Monroe County Tax Map (see Figure 1). The Site is an approximately 86.701-acre area and is bounded by Driving Park Avenue, to the north and east, American Packaging Corporation to the southeast, Lexington Avenue to the south, and Mt. Read Boulevard, to the west (see Figure 2 – Site Layout Map). The boundaries of the Site are more fully described in Appendix A – Environmental Easement / Survey. The owner of the site parcel at the time of issuance of this SMP is:

GM Component Holdings LLC (GMCH)
1000 Lexington Avenue
Rochester, New York 14606

2.2 Physical Setting

2.2.1 Land Use

The Site is located at 1000 Lexington Avenue in the City of Rochester, Monroe County, New York. A 1.8 million square ft manufacturing facility encompasses the majority of the Site. The Site also contains administrative and engineering offices as well as smaller buildings used for storage, utility, industrial-wastewater pretreatment and security activities that are related to the manufacturing operations. Paved roadways, service and shipping courtyards, and vehicle parking lots cover most of the remainder of the Site. Outdoor areas that are not paved occupy less than 5 percent of the Site area, are enclosed by a security fence and are either maintained as mowed lawns or covered with coarse stone cobbles and gravel.

The properties adjoining the Site and surrounding the Site primarily include commercial properties. The properties immediately south, west, and north of the Site include commercial properties; the properties immediately east of the Site include commercial properties with a mix of residential properties beyond the adjacent commercial properties.

2.2.2 Geology

The Site is underlain by variable unconsolidated fill and native soil materials (overburden) from 5 feet (ft) to approximately 25 ft in total thickness. The thickness of the overburden increases from the southern portion of the property to the north end near Driving Park Avenue. Bedrock beneath the overburden is the Upper Silurian aged Rochester Shale (dolomitic mudstone) which dips gently to the south at approximately 40 ft per mile. Deep bedrock wells on the northern side of the Site penetrate the Rochester Shale and intersect the underlying Irondequoit Limestone

2.2.3 Overburden

The overburden consists generally of fill (soil particles mixed with miscellaneous materials including construction and demolition debris), lacustrine sediments, glacial till, glaciolacustrine sediments, residual soil and organics and root fibers formed from weathered shale bedrock, and weathered bedrock. Additionally, occasional swamp deposits exist as soft, black clayey or loose sandy silt with organic matter and shell fragments, primarily present north of the manufacturing building within the footprint of a former canal wide-waters basin.

2.2.4 Bedrock

The Rochester Shale underlies the overburden across the Site and consists of a moderately-hard, fine grained, gray to brown-gray dolomitic mudstone. The shale contains horizontal bedding planes, occasional pits, vugs, fossils, and secondary gypsum mineralization in available openings and as fossil replacement mineralization. Beneath the Rochester Shale lies the Irondequoit Limestone, a hard, gray to green-gray, fossiliferous limestone, with horizontal bedding and occasional vugs. Figure 3 presents a cross-section of the site stratigraphy.

2.2.5 Hydrogeology

The Site is serviced by public water provided by the municipality. Groundwater is not used as a potable drinking water source. Four (4) hydrogeologic units are recognized at the Site and can be described as follows:

- Overburden Unit – saturated unconsolidated overburden deposits.
- Shallow Bedrock Unit – the overburden-bedrock interface down to the underlying upper 7 ft of bedrock.
- Intermediate Bedrock Unit - from approximately 10 to 25 ft below the top-of-bedrock surface.
- Deep Bedrock Unit - from approximately 30 to 65 ft below the top-of-bedrock surface.

Predominant groundwater flow in the overburden, shallow-bedrock, and intermediate-bedrock units tends toward the north to northeast. Since initiation of groundwater pumping from the migration-control trench system, the groundwater elevation data collected suggest that lateral flow in the shallow and intermediate-bedrock units in the area north of the migration-control trench along Driving Park Avenue is south toward the trench. The effective hydraulic conductivity at the Site is relatively varies between approximately 3.0×10^{-1} cm/s to less than 10^{-6} cm/s in the shallow and intermediate bedrock and from 6.2×10^{-4} to less than 10^{-8} in the deep bedrock (Haley & Aldrich, 2005). Example groundwater contour maps for the shallow and intermediate bedrock water bearing units are shown in Figures 4 and 5. Groundwater elevation data collected during the most recent monitoring event conducted in May 2021 are provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix C.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

General Motors Corporation (GMC) built the original manufacturing building at 1000 Lexington Avenue in the City of Rochester, Monroe County, New York and began manufacturing operations at the Site in 1938. Various GMC divisions operated the facility until ownership of the Site and its operation were sold to Delphi Corporation (Delphi) in 1999. In January of 2010, GM Components Holdings, LLC (GMCH) purchased the Site as a part of GMC's restructuring plan.

The Site contains an approximately 2,000,000 square ft manufacturing space with administrative and engineering offices as well as smaller buildings used for storage, utility, industrial-wastewater pretreatment and security activities. Paved roadways, service and shipping courtyards, and vehicle parking lots cover most of the remainder of the Site. Unpaved outdoor areas that occupy less than 5 percent of the site, are enclosed by a security fence and are either maintained with vegetative cover or with coarse stone cobbles and gravel.

Specific manufacturing processes at the site have included machining and forming of metal parts, metal tube manufacturing, metal plating, heat treating, die casting, solvent degreasing, injection molding of plastic parts, and the assembly of finished automotive parts and fuel systems. Fuel-systems flow-testing and calibration, engine output testing, and related product engineering and testing operations have also been conducted.

2.3.1 Remedial Investigation (RI) and Interim Remedial Measures (IRM)

An Order on Consent to conduct a Remedial Investigation/Feasibility Study (RI/FS) was executed by Delphi in January 2002. The Remedial Investigation (RI) was completed in 2005 and the Feasibility Study was completed in 2008. The final Record of Decision (ROD) was issued by the NYSDEC in March 2011. The findings of the RI and previous site investigations are presented in the following reports:

- *Remedial Investigation - Delphi Automotive Systems (Rochester Operations Facility) NYSDEC Registry Site #828064 - EPA ID No. NYD002215234, Haley & Aldrich of New York, November 2005.*

- *Feasibility Study - Delphi Automotive Systems (Rochester Operations Facility) NYSDEC Registry Site #828064 - EPA ID No. NYD002215234, Haley & Aldrich of New York, August 2008.*

Generally, the RI concluded that the following environmental conditions are present at the Site:

- Shallow and intermediate groundwater is impacted with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals at concentrations greater than NYSDEC cleanup standards. Impacted groundwater extends downgradient from the manufacturing building to the northern and slightly beyond the eastern site boundaries. The vertical extent of the impact is limited to the overburden water bearing unit and the top 25 ft of underlying bedrock water bearing units.
- Light non-aqueous phase liquid (LNAPL) is present on top of the overburden groundwater in areas beneath the manufacturing building and beyond the building footprint to the north and east. The LNAPL consists of machining oils used as lubricants during metal-machining operations, and simulated fuels and calibration fluids formerly used in engineering and product-testing operations. In some areas, the LNAPL contains chlorinated VOCs and polychlorinated biphenyl compounds (PCBs). In the eastern portion of the Site, LNAPL is present below the overburden groundwater level in the intermediate bedrock at 10 to 25 ft below the top-of-bedrock and extends slightly beyond the eastern property boundary.
- Soil and soil vapor are impacted by chlorinated VOCs beneath the manufacturing building areas at the locations of formerly operated solvent degreaser systems.
- Soil is impacted by metals including chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), mercury (Hg) and zinc (Zn), are present beneath the manufacturing building in former metal plating areas and in subsurface soils along the path of the former wastewater drainage ditch located in the northern portion of the Site.

The ROD issued by the NYSDEC in March 2011 required the following Remedial Actions at the Site:

1. Continued operation of the IRMs installed at the Site, with the following evaluation and enhancements:
   - § LNAPL recovery in the Building 22 and Tank Farm areas. Additional LNAPL recovery methods will be implemented to expand the area and volume of NAPL recovery, in a manner allowing for continued facility manufacturing operations in the areas affected by LNAPL.
   - § An effectiveness study will evaluate LNAPL in areas adjacent to the existing LNAPL collection points to determine if more aggressive collection techniques are required.
   - § The continued operation of the Groundwater Migration Control systems with the installation of additional recovery wells. The operation of the current groundwater migration control systems in concert with the recovery of LNAPL interior to the Site to reduce the mass flux of dissolved phase contaminants. At a minimum, expansion of the groundwater migration control system will require the installation of at least two (2) bedrock groundwater recovery wells north of the Eastern Parking Lot.
   - § Continue to maintain a positive pressure in Site buildings to address vapor intrusion in areas of contamination in the subsurface and evaluation of the effectiveness and extent of the mitigation provided by this approach by conducting periodic indoor air quality testing throughout the building.
2. Maintenance of a cover system consisting of the existing structures such as buildings, pavement, sidewalks or a soil cover in areas where the upper one foot of exposed surface soil exceed the applicable soil cleanup objectives (SCOs). Where the soil acts as the cover system, it will be a minimum of one foot of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375- 6.7(d) for commercial use or protection of groundwater, whichever is lower. The soil cover will be placed over a demarcation layer, where appropriate, with the upper six inches of the soil of sufficient quality to

maintain a vegetation layer and to prevent human exposure to remaining contaminated soil/fill at the site.

3. Execution and recording of an institutional control in the form of an Environmental Easement to restrict land use and prevent future exposure to any contamination remaining at the site following completion of remedial activities.
4. Development and implementation of this Site Management Plan, in order to enhance the long-term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) IC/ECs, (2) monitoring, (3) operation and maintenance and (4) reporting.

An IRM is conducted when a source of contamination or exposure pathway can be effectively addressed before issuance of the ROD. To expedite remediation of the site conditions, Delphi implemented four (4) IRMs at the Site consisting of the Blasted Bedrock Trench Groundwater Migration Control System (1992), Tank Farm LNAPL Recovery System (1989), Building 22 Area LNAPL Recovery System (1995), and a Soil Vapor Extraction (SVE) System (1996). The post-installation operation and performance of the active IRMs are provided within the Feasibility Study Report, Delphi Automotive Systems Site, 1000 Lexington Avenue, Rochester, New York, Registry Site No. 8-28-064 (Haley & Aldrich of New York, 2008) and summarized here as part of this SMP:

2.3.2 Groundwater Migration Control and Treatment

A groundwater migration-control, collection, and treatment system designed to capture contaminated groundwater north of the manufacturing plant was constructed and placed in operation in 1992. The system controls off-site migration of impacted groundwater along the northern Site boundary. The system consists of a 1200-ft-long blasted bedrock trench located beneath the facility's North Parking Lot. The migration-control trench was created using engineered-blasting techniques to enhance the permeability of the shallow and intermediate bedrock water bearing units. Two wells (GR-1 and GR-2) are installed in the blasted bedrock trench to recover groundwater which is conveyed to the Additional Waste Treatment Area (AWTA) building (Building 14) located north of Building 22 for discharge to the sanitary sewer in compliance with the facility's sewer use permit. The average rate of groundwater extraction by the migration-control system is approximately 20 gallons per minute (gpm).

2.3.3 Tank Farm Area LNAPL Recovery

The Tank Farm Area LNAPL recovery system was installed in 1989 outside the northeast corner of the manufacturing building in the tank farm area to collect LNAPL consisting of a mixture of Stoddard Solvent, other gasoline-like test fuels, and machining oils detected on the overburden groundwater in this area of the Site. The system includes three (3) large-diameter recovery wells (RW-101, RW-2, and RW-3) installed along a 400-ft-long gravel-backfilled trench. Initial LNAPL-recovery operations used passive skimming of LNAPL from the top of the water table. In November 1994, the passive skimmer system was replaced with a total-fluids pumping system.

Recovered LNAPL and groundwater are transferred via RW-2 to the Eastside Waste Treatment Area (EWTA) building where the LNAPL is recovered and placed in drums for off-site disposal. Recovered groundwater is further treated using an air stripper system and granulated activated carbon (GAC) prior to discharge to the sanitary sewer in compliance with the facility's sewer use permit. A copy of the facility's current Monroe County Pure Waters Sewer Use permit is provided in Appendix D.

2.3.4 Building 22 Area LNAPL-Recovery

A LNAPL recovery system initiated operating at RW-4 near Building 22 in 1995. In 1999, total-fluids pumping of LNAPL and groundwater was implemented at Well Z, located east of Building 22, and from the foundation-drain system for the AWTA building (Building 14) located north of Building 22. The LNAPL and groundwater collected is routed through an oil-water separator (OWS) located inside the AWTA building. Collected LNAPL is placed in drums and shipped off-site for disposal, and the separated groundwater is transferred through a filter bag system and a GAC vessel prior to discharge to the sanitary sewer for additional treatment at the local POTW under the facility's sewer use permit.

2.3.5 Former Stoddard Tank Farm Soil Removal

An IRM addressing soil contamination in the former Stoddard Tank Farm area was completed in 2006 and 2007. The IRM included:

- The removal of the stoddard solvent storage tanks and ancillary piping,
- Removal of a portion of the impacted tank basin soils,
- Backfill of the excavation with clean structural fill; and
- Re-construction of a new concrete containment structure over the excavation area.

Metzger Removal, Inc. of North Tonawanda, New York performed the soil removal, and off-site transportation and disposal at the Modern Disposal Landfill in Model City, New York. Contaminated soil was removed to a depth of 6 ft to accommodate the re-configuration of the new tank farm.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Record of Decision (ROD) dated March 2011 are as follows:

2.4.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

2.4.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

2.4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

2.5.1 Soil

Following the implementation of the remedial actions at the Site, the remaining soils below the soil cover system in some areas at the Site exceed NYSDEC Unrestricted Use SCOs for volatile and semi-volatile organic compounds (VOCs and SVOCs), metals and PCBs.

Table 3 summarizes the results of the soil samples collected during the RI that exceed the Industrial and Commercial Use SCOs at the Site after completion of remedial action and Figure 6 presents the locations where these soils remain in place.

2.5.2 Groundwater

Table 4 presents the analysis results of the groundwater samples that exceeded the standards, criteria and guidelines (SCGs) after completion of the RI. Remaining contamination in groundwater can be summarized as follows:

Overburden and Shallow-Bedrock Groundwater

- Overburden and shallow bedrock groundwater are impacted with LNAPL, consisting of lubricating oils used in fabrication and/or lighter-molecular weight test-fluid products (e.g. Stoddard Solvent) used in product-testing.
- PCB compounds have been detected in the LNAPL recovered by the Building 22 LNAPL recovery system consisting primarily of Stoddard Solvent. No known source for the PCBs has been identified.
- Overburden and shallow bedrock groundwater beneath the manufacturing building at the location of former solvent degreaser systems is impacted with chlorinated volatile organic compounds (cVOCs) such as trichloroethene (TCE) and its breakdown products (e.g. cis-1, 2-dichloroethene). In the shallow-bedrock groundwater, the cVOC impacts extend downgradient from the former degreaser areas towards the groundwater migration control trench installed beneath the North Parking lot.

Intermediate-Bedrock Groundwater

- Dissolved cVOC impacted groundwater is present in intermediate bedrock groundwater below the manufacturing building and extends to the north and east.
- LNAPL is present within the intermediate-bedrock groundwater bearing unit under the east side of the manufacturing building and extending slightly beyond the eastern Site boundary. The LNAPL is a mixture of petroleum products, including low-molecular weight calibration fluids commingled with a higher molecular-weight machining-oil and VOC. PCB compounds have also been detected in the LNAPL present in the intermediate bedrock well located at the southeast portion of the East Parking Lot.

Figures 7 and 8 present the extent of LNAPL detected in the monitoring wells at a thickness of greater than 0.10 foot installed during the RI and the current conditions in the overburden and shallow bedrock (Figure 7) well locations and intermediate bedrock well locations (Figure 8).

2.5.3 Soil Vapor

Soil-vapor intrusion (SVI) assessment sampling was performed in May 2005 as part of the RI. Sub-slab soil vapor and indoor air samples were collected concurrently at six (6) locations in the manufacturing building in areas where soil, soil vapor, and/or groundwater impacts from VOCs and/or petroleum test fluids had been identified. The indoor air and sub-slab vapor samples were collected using calibrated 8-hour flow controllers and 6.0-liter passivated stainless-steel canisters.

The potential for impacted soil vapor intrusion was further evaluated through the completion of a soil vapor intrusion (SVI) investigation conducted in May 2014. The sampling program was conducted to determine the potential for contaminated soil-vapor to adversely impact the indoor air quality and identify appropriate corrective actions. The results of the investigation were documented in the report submitted to the Department entitled, *Soil Vapor Intrusion Investigation Results – May 2014, Delphi Automotive Systems Site No. 828064*, (Haley & Aldrich, October 2014). The report identified areas beneath the manufacturing building where the concentrations of VOCs exceeded the soil vapor screening values for evaluating soil-vapor intrusion provided by the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006 (NYSDOH, 2006).

In January 2015, a sub-slab depressurization pilot test was conducted at two (2) locations within Building 1 (Phase 1) and May 2015 (Phase 2) to assist in the design of a SSD system and included the following elements:

- The installation of a suction pit below the concrete floor.
- The installation of extraction piping to a temporary/portable vacuum blower system with discharge of the extracted vapor to the outdoor atmosphere through flexible hosing.
- The installation of vacuum monitoring points (VMPs) through the concrete floor at a range of distances from the suction pit.
- Operation of the temporary/portable vacuum blower system with periodic monitoring of the sub-slab vacuum to determine the radius of vacuum influence measured at the VMPs.

The results of the pilot testing activities and the final design details for the SSDS were submitted to the Department in a report titled *Sub-Slab Depressurization Pilot Test Results, Delphi Automotive Systems Site No. 828064* dated 29 February 2016 (Haley & Aldrich of New York, 2016). The report was revised on 27 February 2017 based on comments received on 15 December 2016 and is provided as Appendix M. The installation of additional suction points with dedicated suction fans was completed in 2017.

A total of six (6) suction pits have been installed throughout the manufacturing floor within Building 1 and have been operating since 2017. Periodic measurements of suction pit vacuum levels are obtained from vacuum gauges installed at eye-level on the extraction piping from each suction pit and sub-slab vacuum readings from vacuum monitoring points (VMP) installed through the floor slab are collected to confirm system operation and the radius of vacuum influence.

In February 2021, additional indoor air and sub-slab vapor samples were collected throughout the facility to evaluate the performance of the SSDS system to mitigate the potential of soil vapor intrusion to impact the indoor air quality. The sampling program was conducted in accordance with the with the Indoor Air Quality (IAQ) Monitoring Plan provided as Appendix A in the *Revised Remedial Work Plan, Delphi Automotive Systems Site,* dated 6 July 2020 (Haley & Aldrich, 2020). The IAQ monitoring plan included the procedures for the collection and laboratory analysis of sub-slab soil-vapor, and indoor air quality samples. To evaluate the background ambient air (AA) quality at the time of the sampling event, an additional sample was collected at an up-wind location outside the facility concurrently with the study area samples. Each IA, SV and outdoor AA sample was collected using a pre-cleaned 6-liter passivated SUMMA® canister equipped with a pre-calibrated flow controller to enable the sample collection over a period of approximately 8 hours.

Table 5 provides the description of the sampling locations and summarizes the results of all samples of soil vapor, indoor air and outdoor air samples collected before and after the installation of the SSDS systems with comparison to the current NYSDOH Ambient Air Guideline Values.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix E) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the Record of Decision (ROD) to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Site to Commercial/Industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. These ICs include:

- The property may only be used for: commercial or industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the Monroe County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated; and
- Vegetable gardens and farming on the site are prohibited.
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

3.3 Engineering Controls (ECs)

3.3.1 Cover System

Exposure to remaining contamination at the site is prevented by a cover system present at the site. This cover system is comprised of a minimum of 12 inches of clean soil in unpaved areas, asphalt pavement, concrete-covered sidewalks, and concrete building slabs.

The EWP provided in Appendix E outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the site and provided in Appendices F and G.

3.3.2 Groundwater Recovery and Treatment Systems (GRTS)

Groundwater recovery systems consisting of a shallow overburden groundwater recovery trench (1989) and a blasted bedrock groundwater migration control trench (1992) were installed north of the manufacturing building to collect impacted groundwater from the shallow and intermediate bedrock groundwater bearing units downgradient from the manufacturing buildings at the Site. Details regarding the installation of these systems prior to the issuance of the ROD are contained in the Revised Remedial Work Plan (RWP), Delphi Automotive Systems Site, 1000 Lexington Avenue, Rochester New York, NYSDEC Site No. 828064 (Haley & Aldrich of New York 2020).

Enhancements to the existing groundwater recovery systems completed since the issuance of the ROD in 2011 included the installation of the groundwater recovery wells (GR-3 and GR-4) in 2012 and the construction of the Eastside Waste Treatment Area (EWTA) Groundwater Recovery and Treatment System (GRTS) in 2014.

3.3.2 LNAPL Recovery Systems

LNAPL recovery systems were installed in the former Tank Farm area (located east of the manufacturing building) and in the area of Building 22 (located northeast of the manufacturing building). Details regarding the installation of these systems prior to the issuance of the ROD are contained in the Revised RWP, Delphi Automotive Systems Site, 1000 Lexington Avenue, Rochester New York, NYSDEC Site No. 828064 (Haley & Aldrich of New York 2020).

Three (3) additional automated LNAPL recovery systems have been installed as part of the remedial action to enhance the LNAPL collection remedy and are located in the former UST A area east of Building 1, in the Building 2 CWTA Courtyard and within existing monitoring well R-309 located in Building 1.

Additional manual LNAPL recovery has been implemented in the areas where LNAPL has been detected within the existing groundwater monitoring well network to expand the area and volume of LNAPL recovery. Details regarding the installation and performance of the automated LNAPL recovery systems are provided in the Final Engineering Report (FER).

3.3.3 Sub-slab Depressurization System (SSDS)

An SSDS has been installed within Building 1 to mitigate the potential for impacted soil vapor intrusion into the building. The SSDS was constructed with six (6) sub-slab suction pits connected via schedule 40 polyvinyl chloride (PVC) piping to dedicated extraction fans to provide sub-slab depressurization of the Building 1 manufacturing area. Operational monitoring of the SSDS blower units is conducted utilizing vacuum gauges installed on the suction piping at each suction pit location viewable from the facility floor level. Dedicated suction fans are located on the roof of the building with the blower discharge piping routed to exhaust points at least seven feet above roof surface and at least 25 ft from any roof or sidewall openings, or heating ventilation and air conditioning (HVAC) intakes. The suction fans are designed to re-start automatically after power interruption (if any) and are monitored to confirm vacuum is applied to each suction pit located behind the facility floor.

Procedures for operating and maintaining the GRTSs, LNAPL collection remedy, and the Cover System and SSDS Engineering Controls are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings for the automated LNAPL remedy reviewed by the certifying professional engineer and drawings for the previously installed GRTS and SSDS IRMs are included in Appendix H – Operations and Maintenance Manual.

3.3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the RAOs identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. As discussed below, the NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection (if any) and recovery wells as per the NYSDEC CP-43 policy. The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the Site.

3.3.4.1 - Composite Cover

The composite cover system consisting of asphalt and concrete hard space and surface soils is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP until such time that the subsurface soils have been removed or sampling has determined that the subsurface soils no longer exceed regulatory criteria. Any determination on reduction or removal of the cover system shall only be made with written approval by NYSDEC and NYSDOH. Figure 11 presents the composite surface soil cover system at the Site.

3.3.4.2 – SSDS

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that indoor air and sub-slab soil vapor monitoring data indicates that the SSDS may no longer be required to mitigate the potential for impacted soil vapor intrusion into the indoor air space, a proposal to discontinue the operation of the SSDS will be submitted to the NYSDEC and NYSDOH.

3.3.4.3 – GRTS and LNAPL

The GRTS will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that LNAPL thickness and groundwater quality monitoring data indicates that the GRTS system may no longer be required, a proposal to discontinue the system operations, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the operation of an GRTS system include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or a measured LNAPL thickness of less than 0.1 foot for a period of six (6) months, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that the GRTS system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

3.3.4.4 – Monitoring Wells associated with Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC with consultation with NYSDOH, until residual groundwater concentrations are found to be consistently below ambient water quality standards, the site SCGs, or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicates that monitoring for natural attenuation may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan (QAPP) provided in Appendix I.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and,
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections will be performed when the ground surface is visible by a QEP or NYS PE at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix J – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and,
- Confirm that site records are up to date.

As part of the Site-wide inspections, inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date; and
- Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day or as reasonably possible. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

Monitoring of the remedial systems including the automated LNAPL recovery pumps, the GRTS and the SSDS will be performed by qualified personnel under the direct oversight by a QEP or NYS PE on a routine basis, as identified in Table 6 Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of each remedial system will be conducted in accordance with the frequency requirements presented in Table 6. Unscheduled inspections and/or sampling may take place when a suspected potential operating issue occurs with the remedial system or an emergency occurs that is deemed likely to affect the operation of the system. The remedial system components to be monitored include the components identified in Table 6 below.

Table 6 – Remedial Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Monitoring Schedule
LNAPL Recovery Well #1	Gallons recovered	Monthly
LNAPL Recovery Well #2		
LNAPL Recovery Well #3		
EWTA OWS #1 LNAPL Recovery Drum		
EWTA OWS #2 LNAPL Recovery Drum		
Manual LNAPL Recovery Drums		

Table 6 (cont.) – Remedial Monitoring Requirements and Schedule

Remedial System Component		Typical Operating Range	Monitoring Schedule
GR-1 Recovery Well Pump	Flow Rate	10 – 20 (GPM)	Monthly
GR-2 Recovery Well Pump		5 -10	
GR-3 Recovery Well Pump		0.2 - 1.0	
GR-4 Recovery Well Pump		2.0 - 5.0	
RW-2 Recovery Well Pump		2.0 – 5.0	

Remedial System Component	Monitoring Parameter	Typical Operating Range	Monitoring Schedule
Suction Point #1	Vacuum Level	27-32 inches of water column (in. W.C.)	Monthly
Suction Point #2		35-45 in. W.C.	
Suction Point #3		38-42 in. W.C.	
Suction Point #4		40-44 in. W.C.	
Suction Point #5		15-20 in. W.C.	
Suction Point #6		35-45 in. W.C.	

During routine operations and monitoring of the LNAPL pump systems, if there is no measurable LNAPL observed in the recovery drum for a recovery well location over a three (3) month period, the following measures will be taken:

- Temporarily discontinue LNAPL pump operation for a period of three (3) months and during this period measure LNAPL thickness in the recovery well on a monthly basis. If LNAPL thickness returns to recoverable levels, typically greater than 0.1ft, restart pump operations,
- If LNAPL thickness is less than 0.1 ft consider either relocating an existing pump system or installing a new system in an existing monitoring well with measured LNAPL thicknesses that would allow for recovery with an automated pump system.

The activities associated with the potential relocation or installation of an LNAPL pump system will be summarized in the annual PRR.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix J - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required.

4.3.1 Remedial System Sampling

Samples shall be collected from the groundwater recovery systems on a routine basis. Sampling locations and required analytical parameters and schedule are provided in Table 7 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 7 – Remedial System Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**				**Schedule**
	VOCs (EPA[1] Method 624)	Total Oil & Grease (EPA Method 1664)	Total PCBs (EPA Method 8082)	VOC (EPA Method TO-14)	
EWTA Discharge	X	X	X		Monthly
EWTA Air Stripper and SSDS Vapor-Phase Effluent				X	Annually
AWTA Discharge	X	X	X		Monthly

[1] Environmental Protection Agency

Detailed sample collection and analytical procedures and protocols are provided in Appendix I – Quality Assurance Project Plan and Appendix K – Field Sampling Plan. All wastes generated by the remedial systems will be properly disposed at off-site disposal facilities according to local, state, and federal laws and regulations.

4.4 Remediation Media Monitoring and Sampling

Groundwater and indoor air quality samples shall be collected on a routine basis to evaluate the performance of the remedial systems installed at the Site. Sampling locations and required analytical parameters and schedule are provided in Table 8 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 8 – Remedial System Sampling Requirements and Schedule

Sampling Locations	**Analytical Parameters**		**Schedule**
	VOCs (8260C)	VOCs (TO -15)	
Monitoring Wells	X		Annual
Indoor Air Quality Sampling		X	Annual

Indoor air sample locations are presented on Figure 9. Detailed sample collection and analytical procedures and protocols are provided in Appendix I – Quality Assurance Project Plan and Appendix K – Field Sampling Plan.

4.4.2 Groundwater Sampling

Groundwater monitoring will be performed annually to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC. A network of monitoring wells has been installed to monitor both up-gradient and down-gradient groundwater conditions at the site. The network of on-site and off-site wells has been selected to evaluate the following remedial objectives:

1. Monitor changes in observed LNAPL thickness within the existing monitoring wells to evaluate remedial performance and effectiveness,
2. Monitor groundwater levels to determine the performance of the migration control systems to mitigate off-site impacts,
3. Collect samples from the overburden and shallow and intermediate bedrock monitoring wells for the evaluation of the natural attenuation of the chemicals of concern (COCs),

4. Collect samples from the deep bedrock wells on Site to monitor for the potential of vertical migration of COCs; and,
5. Collect samples from monitoring wells located along and beyond the eastern property boundary to evaluate the potential for off-site migration of impacted groundwater.

As part of the groundwater monitoring, four (4) upgradient wells; SR-101/R-101 and SR-301/R-301, ten (10) on-site wells SR-107/R-107, SR-108/R-108, SR-9/R-109, PZ-113, PZ-115 and SR-2/R-2 and five (5) downgradient wells; SR-303, R303, R-306, R-401 and R-403 will be sampled to evaluate the effectiveness of the remedial system. Monitoring well construction logs are included in Appendix C of this document. Monitoring well locations are shown on Figure 10. Results of the groundwater monitoring conducted at the Site since the implementation of the enhanced GRTS with comparison to baseline conditions are provided in Table 9.

If biofouling or silt accumulation occur in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "Commissioner Policy (CP)-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC. Deliverables for the groundwater monitoring program are specified in Section 7.0 - Reporting Requirements.

4.4.3 Soil Vapor Intrusion Sampling

Soil vapor intrusion sampling will be performed periodically during the heating season as defined by the NYSDOH to assess the performance of the remedy. Modification to the frequency or sampling requirements may be required by the NYSDEC. This SMP will be modified to reflect changes in sampling plans requested by the NYSDEC. The network of on-site soil vapor intrusion sample locations have been selected based on the following criteria:

- Proximity to a known source of soil or groundwater impacts;
- Occupied manufacturing space;
- Historical results of previous soil vapor intrusion (SVI) sampling; and
- Location of SSDS suction points

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements. Figure 9 presents the on-site soil vapor intrusion sampling locations for monitoring the indoor air quality at the Site.

4.4.4 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix J - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as Appendix K of this document.

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the groundwater migration control, LNAPL recovery and SSDSs;
- Will be updated periodically to reflect changes in site conditions or the manner in which the remedial systems are operated and maintained.

Further detail regarding the Operation and Maintenance of the remedial systems are provided in Appendix H - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is maintained at the Site within the EWTA building. This Operation and Maintenance Manual is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial Systems and Engineering Controls Performance Criteria

The typical operating ranges and monitoring parameters for the remedial systems and engineering controls are as listed in Table 6 located in Section 4.3. As reviewed in Section 2.3 recovered groundwater processed through the AWTA or EWTA GRTSs is discharged to the sanitary sewer in compliance with the facility's sewer use permit. A copy of the facility's current Monroe County Pure Waters Sewer Use permit is provided in Appendix D.

5.3 Operation and Maintenance of Groundwater Migration Control Systems

The following sections provide a description of the operations and maintenance of groundwater migration and control systems installed along the eastern property boundary including the blasted bedrock trench (GR-1 and GR-2) and the groundwater recovery wells

(RW-2, GR-3 and GR-4). Cut-sheets and as-built drawings for the groundwater migration control systems are provided in Appendix H- Operations and Maintenance Manual.

5.3.1 Routine System Operations and Maintenance

Groundwater / Non-Aqueous Phase Liquid (NAPL) Separation

Groundwater recovered from the bedrock groundwater recovery wells, RW-2 and GR-4 may contain LNAPL. To address this mixed waste stream, an oil/water separator (OWS) has been installed to separate LNAPL from each aqueous influent stream for proper handling and off-site disposal. Routine maintenance conducted on the OWS includes the periodic cleaning of the system components.

Equalization Tank (EWTA Only)

After the LNAPL is removed from the influent streams from the overburden soil trench (RW-2) and bedrock recovery wells (GR-3 and GR-4), the aqueous effluent of the OWS are combined in an equalization tank. The equalization tank is constructed of high-density polyethylene (HDPE) and vented to the outside of the EWTA building. Routine maintenance of the equalization tank includes periodic mechanical cleaning to remove insoluble precipitates such as iron hydroxide and biological growth.

Filtration

The effluent from the OWS (AWTA) and equalization tank (EWTA) are treated for suspended solids using bag filter systems. The bag filter systems are operated in parallel (with 2 sets of filter assemblies processing groundwater simultaneously). Differential pressure sensors are installed across the bag filter housings and monitored to identify when the bag filters require replacement. Scheduling of filter change-outs is dependent upon the rate of groundwater recovery, the subsequent volume of groundwater treatment, and particulate fouling.

Air Stripper System (EWTA only)

An air stripper is installed within the EWTA to remove the volatile organic compounds (VOC) from the aqueous effluent of the filter systems. The air stripper system includes a blower that introduces a counter current flow of ambient air to the aqueous influent pumped from the equalization tank through the filter bag system. The blower air flow passes through the aqueous influent to transfer the VOCs to the vapor phase for discharge to the atmosphere via a stack installed through the side of the EWTA building. Routine maintenance of this system includes the mechanical cleaning of the air stripper trays and sump pump components.

Granulated Activated Carbon (GAC) Treatment

Prior to discharge to the sewer systems, the treated effluent is pumped through a 2000-pound (lb) liquid granulated activated carbon (LGAC) vessel to adsorb residual VOC not removed from the air stripper system (EWTA only) and the residual PCBs not removed by the particulate filters (AWTA). Pressure sensors are installed at the influent to the GAC vessels and monitored to identify when the GAC system needs maintenance. Maintenance activities include periodic backwashing to remove particulate fouling and replacement.
Schedule for GAC back washing and/or replacement is dependent upon the rate of groundwater recovery and treatment.

Treated Water Discharge

The treated groundwater is discharged to the sanitary sewer via connections located at the eastside of the Plant via underground piping. Sample ports and totalizing flow meters are installed at the discharge points for compliance sampling consistent with the current Monroe County Pure Water Sewer Use permit and total discharge flow measurements. Routine maintenance of this system includes periodic cleaning of the sample port.

Sub-Slab Depressurization Systems

Impacted soil vapor intrusion is controlled through the application of vacuum to the sub-slab where COC impacted soil and groundwater remain in place. The SSDS includes sampling ports and vacuum monitoring devices installed within the vapor transfer piping. Routine maintenance of the SSDS include inspection of seals, sample ports and/or replacement of suction fans and vacuum gauges as needed.

The schedule of routine maintenance for the remedial systems is provided in the O&M Manual contained in Appendix H.

5.3.2 System Monitoring Devices and Alarms

The remedial systems installed at the Site have visual observation devices/ instrumentation (e.g. pressure gauges and flow meters) to allow operations personnel to assess when the system is not operating properly. In the event that these observations are made indicating that the remedial system is not operating within normal parameters, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the remedial system will be restarted. Operational problems will be noted in the Periodic Review Report for that reporting period.

In addition to these instrumentation devices, the EWTA GRTS uses a PLC interfaced with a personal computer to log process data and enables fully automated operation of the treatment system.

The PLC enabled controls include:

- Flow or level control of the GR-3 and GR-4 well pumps;
- Pump control for all system pumps (e.g., oil-water separator discharge pumps, air stripper feed pump, discharge pump);
- Air Stripper on/off control;
- Monitoring and logging of system variables, including pressures, flow rates and tank levels; and
- Annunciating alarms if system parameters are outside of the normal operating range.

In the event of critical alarm such as equipment or instrument failure, pipe breaks, pipe or filter blockage, the PLC shuts down the system and sends text message alerts to the system operators via the system computer interfaced with a modem. The system operator can view the current system conditions via the computer interface and re-start the system remotely.

5.3.3 Fire Safety

GMCH Rochester Operations Plant Safety and Security staff will conduct an annual facility walk with the local fire chief and/or fire suppression team. The site walk will allow for the addition of the facility to any local preplanning efforts. The NYSDEC project manager will be provided with the local fire chief's/fire suppression team's recommendations as soon as they become available. Following review, the NYSDEC project manager may direct the remedial party to implement the recommendations and/or revise the SMP.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or ECs to severe storms/weather events and associated flooding.

Groundwater Recovery and Treatment Systems

The groundwater and recovery systems installed at the Site have been placed in areas that are not anticipated to be affected by climate change. All recovery wells have been installed within sub-grade vaults that are sealed from the environment, transfer piping is installed below grade and the treatment systems have been installed within structures designed to withstand typical weather conditions for the area. If excessive weather conditions are observed in the vicinity, inspection of the systems will be conducted and reported as part of the Periodic Review Reports.

Sub-Slab Depressurization Systems (SSDS)

The SSDS have been installed within impacted areas of Building 1 at the Site. The suction pits and transfer piping are installed within the building interior and will not be affected by climactic conditions. However, the suction fans are installed on the rooftop of the building. The suction fan supports have been designed to withstand typical wind conditions for the area. If excessive wind loads are observed in the vicinity, inspection of the systems will be conducted and reported as part of the Periodic Review Reports.

Soil Cover Systems

The soil cover system at the Site includes landscaped areas, paved parking and roadways, and associated hardscape (i.e. concrete sidewalks and curbing). There are no mature trees on Site and few installed features that breach the cover system. Inspections of the integrity of the soil cover systems will be completed and the findings included as part of the Periodic Review Report.

LNAPL Recovery Systems

The LNAPL recovery systems installed at the exterior portions of the Site have been placed in areas that are not anticipated to be affected by climate change. All LNAPL recovery wells have been installed in a manner that are sealed from the environment, transfer piping and the collection systems have been installed within structures designed to withstand typical weather conditions for the area. If excessive weather conditions are observed in the vicinity, inspection of the systems will be conducted and reported as part of the Periodic Review Reports.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

Groundwater Recovery Wells

The groundwater recovery wells, GR-1, GR-2, GR-3 and GR-4 have been equipped with variable frequency drives (VFD) to maintain a constant groundwater level within the recovery well and optimize the energy required to operate the pump system. The VFD adjusts the operating speed of the pump to match the flow of groundwater removed from the well dependent upon the seasonal static groundwater level. The use of VFDs enables the adjustment of the amount of groundwater flow to the treatment systems based on seasonal conditions and reduces the amount of waste generated and the energy used to maintain hydraulic control. The amount of recovered groundwater and the effectiveness of the groundwater migration control system will be presented in the Periodic Review Reports with potential recommendations for further optimization of the system.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of consumables. Spent materials will be sent for recycling, and/or regeneration as appropriate.

6.2.3 Building Operations

Structures including buildings will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished during one Site visit to confirm remedy protectiveness while reducing the expenditure of energy or resources.

6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix J – Site Management Forms, information on energy usage, solid and hazardous waste generation, transportation and shipping, and land use and ecosystems will be recorded to document consistent implementation of green remediation during site management and to identify opportunities for remedy optimization and cost reduction in operations and maintenance.

6.3 Remedial System Optimization

A RSO study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded by a Qualified Environmental Professional (QEP) or NYS PE on the appropriate site management forms provided in Appendix J. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 9 and summarized in the Periodic Review Report.

Table 9 - Routine Inspection and Reporting Schedule

Task/Report	**Reporting Frequency***
Inspection Report	Monthly
Periodic Review Report	Annually, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-

custody documentation, etc.);

- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, groundwater quality monitoring data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A PRR will be submitted to the Department beginning sixteen (16) months after the Satisfactory Completion Letter is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report.

The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Identification of any wastes generated during the reporting period, with waste characterization data, manifest and disposal documentation.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part

of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan RAWP), ROD or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.
  - The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;

- Trends in equipment failure;
- A summary of the performance, effluent and/or effectiveness monitoring; and
- Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, Professional Engineer licensed to practice in New York State will prepare, stamp and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

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

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site*

remedial program [and generally accepted engineering practices]; and

- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] [I have been authorized and designated by all site owners/remedial parties to sign this certification] for the site."

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The Periodic Review Report may need to be submitted in hard-copy format, as requested by the NYSDEC project manager. The signed certification will be included in the Periodic Review Report.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC/EC, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix L. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

1. 6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

2. NYSDEC DER-10 – Technical Guidance for Site Investigation and Remediation December 2010.

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

4. NYSDEC, Record of Decision, Delphi Automotive Systems Site No. 828064, March 2011.

5. Remedial Investigation (RI) Report, Delphi Automotive Systems (Rochester Operations Facility) NYSDEC Registry Site No. 828064, Haley & Aldrich of New York, November 2005.

6. Feasibility Study Report, Delphi Automotive Systems Site, 1000 Lexington Avenue, Rochester, New York, Registry Site No. 828064, Haley & Aldrich of New York, July 2008.

7. Groundwater Recovery Wells Installation Report, Delphi Automotive Systems Site No. 828064, Haley & Aldrich of New York, March 2012.

8. Groundwater Recovery and Treatment System Design Drawings, Delphi Automotive Systems Site #828064, Haley & Aldrich of New York, July 2013.

9. Soil Vapor Intrusion Investigation Results – May 2014, Delphi Automotive Systems Site No. 828064, Haley & Aldrich of New York, October 2014.

10. Revised Sub-Slab Depressurization Pilot Test Results, Delphi Automotive Systems Site No. 828064, Haley & Aldrich of New York, February 2017.

11. Revised Remedial Work Plan Delphi Automotive Site, 1000 Lexington Avenue, Rochester New York, NYSDEC Site No. 828064, Haley & Aldrich of New York, July 2020.

TABLE 2
SUMMARY OF GROUNDWATER LEVEL MEASUREMENTS
DELPHI AUTOMOTIVE SYSTEMS SITE No. 828064
May 2021

Well Identification	Dates	RISER TYPE	Measuring Point	NORTHING	EASTING	Ground Elevation (ft)	Difference b/w Ground El. And TOR El. (ft)	Top of Riser Elevation NGVD EL. (ft)	Depth to Water (ft)	GW Elevation (ft)	Measured Depth to Bottom (ft)
OW-323	5/26-27/2021	2-inch PVC	TOR	1160175.146	1396443.969	510.65	-0.20	510.45	4.1	506.35	14.19
OW-7	5/26/21-5/27/2021	2-inch Steel	TOR	1161684.048	1395770.833	499.04	2.63	501.67	12.34	489.33	15.2
PZ-1	5/26/21-5/27/2021	4-inch PVC	outer casing	1160386.615	1396585.379	509.02	1.00	510.02	7.42	502.60	11.36
PZ-113	5/26/21-5/27/2021	2-inch PVC	TOR	1160577.27	1396610.118	507.17	2.20	509.37	11.45	497.92	16.3
PZ-114	5/26/21-5/27/2021	2-inch PVC	TOR	1160471.863	1396511.824	508.48	2.51	510.99	8.55	502.44	14.03
PZ-115	5/26/21-5/27/2021	2-inch PVC	TOR	1160380.344	1396797.914	506.29	2.39	508.68	12.22	496.46	21.01
PZ-118	5/26/21-5/27/2021	2-inch PVC	TOR	1160365.431	1396377.465	511.22	2.29	513.51	7.2	506.31	15.23
PZ-121	5/26/21-5/27/2021	2-inch PVC	TOR	1160429.359	1396562.643	507.70	2.87	510.57	7.63	502.94	15.11
PZ-123	5/26/21-5/27/2021	2-inch PVC	TOR	1160578.229	1396359.074	511.03	2.93	513.96	10.57	503.39	16.52
PZ-124	5/26/21-5/27/2021	2-inch PVC	TOR	1160397.918	1396458.92	508.59	3.50	512.09	6.04	506.05	12.78
PZ-125	5/26/21-5/27/2021	2-inch PVC	TOR	1160532.616	1396480.479	509.00	2.90	511.9	8.02	503.88	15.46
PZ-126	5/26/21-5/27/2021	2-inch PVC	TOR	1160322.403	1396524.558	508.52	2.83	511.35	6.07	505.28	11.93
PZ-132	5/26/21-5/27/2021	2-inch PVC	TOR	1160808.342	1396134.508	512.35	2.57	514.92	11.51	503.41	17.9
PZ-139	5/26/21-5/27/2021	2-inch PVC	TOR	1161000.233	1396217.958	507.37	2.49	509.86	26.83	483.03	31.85
PZ-140	5/26/21-5/27/2021	2-inch PVC	TOR	1162012.304	1395294.457	496.46	2.25	498.71	14.98	483.73	29.57
PZ-141	5/26/21-5/27/2021	2-inch PVC	TOR	1162213.528	1395105.44	493.81	2.94	496.75	12.79	483.96	22.45
RW-3	5/26/21-5/27/2021	8-inch PVC Riser/Casing	TOR	1160442.938	1396563.073	507.95	3.11	511.06	6.05	505.01	14.3
RW-101	5/26/21-5/27/2021	24-inch Steel	outer casing	1160728.464	1396295.104	512.23	2.00	514.23	10.21	504.02	14.5
R-101	5/26/21-5/27/2021	4-inch Steel	TOR	1160327.754	1394852.811	511.39	2.34	513.73	18.55	495.18	35.21
R-102	5/26/21-5/27/2021	4-inch Steel	TOR	1160778.454	1395303.408	512.39	2.38	514.77	31.74	483.03	35.11
R-103	5/26/21-5/27/2021	4-inch Steel	TOR	1161325.149	1395783.925	510.66	2.57	513.23	30.04	483.19	45.98
R-105-R	5/26/21-5/27/2021	4-inch Steel	TOR	1161687.972	1395458.465	506.98	2.40	509.38	26.07	483.31	47.4
R-107	5/26/21-5/27/2021	4-inch Steel	TOR	1161690.216	1395763.053	499.08	2.5	501.58	19.28	482.30	37.15
R-108	5/26/21-5/27/2021	4-inch Steel	TOR	1161090.685	1396313.371	500.51	2.28	502.79	20.84	481.95	37.05
R-109	5/26/21-5/27/2021	4-inch Steel	TOR	1161959.751	1395509.371	497.15	2.13	499.28	16.07	483.21	39.16
R-110	5/26/21-5/27/2021	4-inch Steel	TOR	1161858.054	1395157.713	498.72	2.63	501.35	17.01	484.34	42.39
R-131	5/26/21-5/27/2021	4-inch Steel	TOR	1160829.496	1395788.844	512.82	1.84	514.66	31.04	483.62	49.74
R-132	5/26/21-5/27/2021	4-inch Steel	TOR	1160799.647	1396134.968	512.44	2.47	514.91	32.29	482.62	47.83
R-2	5/26/21-5/27/2021	4-inch Steel	TOR	1159891.021	1396855.313	512.89	2.88	515.77	29.52	486.25	37.1
R-235	5/26/21-5/27/2021	4-inch Steel	TOR	1159833.773	1396416.863	516.45	2.22	518.67	31.07	487.60	35.59
R-236	5/26/21-5/27/2021	4-inch Steel	TOR	1160209.962	1396272.728	512.32	1.66	513.98	25.05	488.93	34.58
R-237	5/26/21-5/27/2021	4-inch Steel	TOR	1160130.092	1396402.648	511.06	2.14	513.2	24.96	488.24	36.52
R-238	5/26/21-5/27/2021	4-inch Steel	TOR	1160158.028	1396680.077	510.46	-0.18	510.28	22.73	487.55	28.88
R-239	5/26/21-5/27/2021	4-inch Steel	TOR	1160881.718	1396488.885	503.10	1.4	504.5	22.45	482.05	38.93
R-240	5/26/21-5/27/2021	2-inch Steel	TOR	1161234.712	1395929.603	507.24	2.62	509.86	21.28	488.58	49.85
R-241	5/26/21-5/27/2021	4-inch Steel	TOR	1160307.356	1396821.409	509.1	2.70	511.8	27.41	484.39	37.79
R-3	5/26/21-5/27/2021	4-inch Steel	TOR	1159918.196	1394931.562	518.92	2.5	521.42	18.11	503.31	37.79
R-301	5/26/21-5/27/2021	4-inch Steel	TOR	1161953.965	1394800.274	497.38	2.51	499.89	11.09	488.80	31.49
R-303	5/26/21-5/27/2021	4-inch Steel	TOR	1161706.503	1395891.642	494.27	-0.2	494.07	6.13	487.94	42.13
R-305	5/26/21-5/27/2021	4-inch Steel	TOR	1160300.417	1397152.542	504.9	2.5	507.4	23.28	484.12	34.24
R-306	5/26/21-5/27/2021	4-inch Steel	TOR/C	1159934.976	1397050.967	513.6	2.5	516.1	29.69	486.41	31.49
R-308	5/26/21-5/27/2021	2-inch PVC	TOR	1159801.324	1395912.749	518.43	3	521.43	28.2	493.23	36.89
R-309	5/26/21-5/27/2021	4-inch Steel	TOR	1160076.464	1396094.386	516.85	-0.2	516.65	29.97	486.68	38.3
R-401	5/26/21-5/27/2021	4-inch Steel	TOR	1160506.717	1397209.754	504.56	-0.6	503.96	19.61	484.35	32.86
R-403	5/26/21-5/27/2021	4-inch Steel	TOR	1160781.416	1396915.916	500.4	-0.4	500	22.44	477.56	31.17
GR-3	5/26/21-5/27/2021	4-inch PVC	TOR	1160572.445	1396575.186	508.3	-0.6	507.7	34.12	473.58	36.93
GR-4	5/26/21-5/27/2021	4-inch PVC	TOR	1160382.592	1396763.809	507.6	-0.5	507.1	32.29	474.81	37.94

TABLE 2
SUMMARY OF GROUNDWATER LEVEL MEASUREMENTS
DELPHI AUTOMOTIVE SYSTEMS SITE No. 828064
May 2021

Well Identification	Dates	RISER TYPE	Measuring Point	NORTHING	EASTING	Ground Elevation (ft)	Difference b/w Ground El. And TOR El. (ft)	Top of Riser Elevation NGVD EL. (ft)	Depth to Water (ft)	GW Elevation (ft)	Measured Depth to Bottom (ft)
SR-101	5/26/21-5/27/2021	2-inch Steel	TOR	1160339.523	1394853.101	511.02	2.35	513.37	8.41	504.96	15.8
SR-102	5/26/21-5/27/2021	2-inch Steel	TOR	1160784.573	1395303.539	512.27	2.48	514.75	19.65	495.10	30.54
SR-103	5/26/21-5/27/2021	2-inch Steel	TOR	1161337.81	1395772.137	510.72	2.95	513.67	29.14	484.53	34.21
SR-105	5/26/21-5/27/2021	2-inch Steel	TOR	1161579.991	1395452.686	510.77	2.75	513.52	26.93	486.59	31.25
SR-107	5/26/21-5/27/2021	2-inch Steel	TOR	1161697.554	1395756.2	499.72	2.37	502.09	16.99	485.10	21.66
SR-110	5/26/21-5/27/2021	2-inch Steel	TOR	1161852.23	1395152.265	498.46	2.40	500.86	13.24	487.62	23.03
SR-131	5/26/21-5/27/2021	2-inch Steel	TOR	1160837.911	1395788.485	512.70	2.02	514.72	19.21	495.51	30.1
SR-132	5/26/21-5/27/2021	2-inch Steel	TOR	1160830.771	1396133.862	512.62	1.75	514.37	16.88	497.49	30
SR-2	5/26/21-5/27/2021	2-inch PVC	TOR	1159898.318	1396862.783	514.4	1.93	516.33	8.83	507.50	20.31
SR-235	5/26/21-5/27/2021	2-inch Steel	TOR	1159833.556	1396400.535	516.53	2.25	518.78	11.26	507.52	11.7
SR-236	5/26/21-5/27/2021	2-inch Steel	TOR	1160189.233	1396273.776	512.69	1.94	514.63	8.44	506.19	18.12
SR-301	5/26/21-5/27/2021	2-inch Steel	TOR	1161925.119	1394800.224	499.59	0.75	500.34	12.52	487.82	25.05
SR-303	5/26/21-5/27/2021	2-inch PVC	TOR	1161720.987	1395872.78	493.98	-0.20	493.78	9	484.78	15.79
SR-308	5/26/21-5/27/2021	2-inch Steel	TOR	1159797.119	1395833.084	517.34	2.80	520.14	12.84	507.30	20.19
SR-309	5/26/21-5/27/2021	2-inch Steel	TOR	1160137.395	1396093.415	516.85	-0.03	516.82	14.83	501.99	20.9
SR-310	5/26/21-5/27/2021	2-inch Steel	TOR	1160224.272	1396140.499	516.85	-0.20	516.65	14.51	502.14	19.39
SR-311	5/26/21-5/27/2021	2-inch Steel	TOR	1160463.977	1396079.838	516.85	-0.20	516.65	9.48	507.17	21.68
SR-312	5/26/21-5/27/2021	2-inch Steel	TOR	1160350.521	1395941.831	516.85	-0.20	516.65	19.97	496.68	21.42
SR-313	5/26/21-5/27/2021	2-inch Steel	TOR	1160340.041	1395840.53	516.85	-0.20	516.65	19.35	497.30	19.81
SR-326	5/26/21-5/27/2021	2-inch Steel	TOR	1160602.431	1395927.202	516.85	-0.30	516.55	20.34	496.21	27.13
SR-503	5/26/21-5/27/2021	2-inch Steel	TOR	1160121.775	1396031.466	516.85	-0.30	516.55	13.57	502.98	20.83
SR-8	5/26/21-5/27/2021	2-inch Steel	TOR	1161098.069	1396320.345	501.8	2.50	504.30	Dry	Dry	19.01
SR-9	5/26/21-5/27/2021	2-inch Steel	TOR	1161952.549	1395518.508	499.2	2.62	501.82	17.28	484.54	18.12
DR-103	5/26/21-5/27/2021	4-inch Steel	TOR	1161367.24	1395744.446	510.7	2.68	513.38	23.15	490.23	89.19
DR-105	5/26/21-5/27/2021	4-inch Steel	TOR	1161584.436	1395443.164	510.98	2.93	513.91	19.36	494.55	86.59
DR-108	5/26/21-5/27/2021	4-inch Steel	TOR	1161105.469	1396318.005	500.5	2.33	502.83	90.59	412.24	90.87
DR-109	5/26/21-5/27/2021	4-inch Steel	TOR	1161916.344	1395545.149	498.1	1.50	499.60	60.29	439.31	70.8
DR-132	5/26/21-5/27/2021	4-inch Steel	TOR	1160837.645	1396133.688	512.00	2.09	514.09	31.89	482.20	76.08
DR-315	5/26/21-5/27/2021	4-inch Steel	TOR	1160777.948	1395686.467	514.08	1.70	515.78	26.64	489.14	67.9

Notes:

Overburden Monitoring Wells
Intermediate Bedrock Monitoring Wells
Shallow Bedrock Monitoring Wells
Deep Bedrock Groundwater Wells

TOR - Top of Riser
(ft) - feet

TABLE 3

SUMMARY OF SOIL SAMPLE ANALYSIS RESULTS - REMAINING CONTAMINATION

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064

1000 LEXINGTON AVENUE

ROCHESTER, NEW YORK

SAMPLE LOCATION, MATRIX AND DEPTH	Commercial SCOs	Industrial SCOs	C-101 3.7 - 4 ft.	C-105 8.5 - 8.7 ft.	C-107 12.6 - 12.9 ft.	C-115 10.5 - 12 ft.	C-116 13 - 14 ft.	SSB-4 4 - 8 ft.	SSB-4 16 - 20 ft.	SSB-5 5 - 7 ft.	SSB-5 9 - 13 ft.	SSB-5 13 - 15 ft.	SSB-5A 4 - 8 ft.	SSB-5A 8 - 12 ft.	SSB-5C 6 - 8 ft.	SSB-5C 10 - 12 ft.	SR-310 0.7 - 2 ft.	PB-33 6 - 8 ft.
PCBS (PPM)																		
AROCLOR 1242	1	25	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.439 UJ	0.0222 U	**2.46**	**1.21**	**0.906**	NA	NA	NA	NA	0.1 U	0.0206 U
AROCLOR 1248	1	25	**2.3**	**3.3**	**7.9**	**30**	**9.2**	**5.28 J**	**0.285**	0.198 U	0.201 U	0.206 U	NA	NA	NA	NA	0.1 U	0.0206 U
AROCLOR 1254	1	25	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.439 UJ	0.0222 U	**0.952**	**0.51**	**1.16**	NA	NA	NA	NA	0.1 U	0.0206 U
SVOCS (PPM)																		
BENZO(A)PYRENE	1	1.1	NA	NA	NA	NA	NA	**0.81**	**0.577**	**0.774 J**	**0.527 J**	**0.179 J**	NA	NA	NA	NA	**1**	0.0332 U
VOCS (PPM)																		
1,2,4-TRIMETHYLBENZENE	190	380	NA	NA	NA	NA	NA	**0.0771**	**0.47 D**	**12**	**0.225**	**0.684**	**52.8 DJ**	78.8 DJ	**53.6 D**	**6.99**	0.2 U	**1.09 J**
1,3,5-TRIMETHYLBENZENE	190	380	NA	NA	NA	NA	NA	**0.0225**	0.0118 U	**4.08**	**0.0733**	**0.761**	**22.9 J**	**44 J**	**43.1**	**0.344 J**	0.2 U	**0.369 J**
TRICHLOROETHENE	200	400	NA	NA	NA	NA	NA	**0.0176**	0.0118 U	1.29 U	**0.0117 J**	0.11 U	1.27 UJ	2.32 UJ	2.66 U	1.45 U	**949.8**	**2.99**
METALS (PPM)																		
ARSENIC	16	16	NA	NA	NA	NA	NA	**8.97 J**	**7.59 J**	1.3 U	**3**	**2.2 J**	NA	NA	NA	NA	**2.6**	**3.2**
CADMIUM	9.3	60	NA	NA	NA	NA	NA	0.856 U	0.384 U	**4.2**	**0.69 J**	**0.37 J**	**39**	**26.8**	**8.2 J**	**1.3 J**	0.5 U	**0.23 J**
CHROMIUM	400	800	NA	NA	NA	NA	NA	**21 J**	**11.4 J**	**85.5**	**33.7**	**9.7**	**5700**	**112**	**562 J**	**43.9 J**	**4.9**	**12.1**
COPPER	270	10000	NA	NA	NA	NA	NA	**333 J**	**46.9 J**	**3650**	**550**	**11.6**	**21400**	**587**	**14000**	**32.1**	**12.8**	**14.2**
LEAD	1000	3900	NA	NA	NA	NA	NA	**158 J**	**12.9 J**	**355 J**	**70.9 J**	**11.6 J**	**1280**	**75.1**	**1210 J**	**19.6 J**	**45.9**	**8550 J**
MERCURY	2.8	5.7	NA	NA	NA	NA	NA	11.4 R	**0.398 J**	0.054 UJ	**0.076 J**	0.058 UJ	**9820 J**	**99.7 J**	**161 J**	**5.4 J**	0.05 U	0.053 UJ
ZINC	10000	10000	NA	NA	NA	NA	NA	**636 J**	**93.8 J**	10800 R	1010 R	38 R	**10300**	**420**	**29800 J**	**79.5 J**	**40.6**	**27.6**

SAMPLE LOCATION, MATRIX AND DEPTH	Commercial SCOs	Industrial SCOs	SR-231 6 - 8 ft.	PA-12 0 - 1 ft.	PA-13 0-1.0 ft	SR-313 1-2 ft	SR-313 12-13.1 ft	PB-6 0.9 - 4.0 ft	PB-6 14 - 16 ft	PB-17 12-16 ft.	PB-34 0.8 - 4.8 ft	STB-37 14 - 16 ft.	STB-39 0.9 - 4.9 ft.	STB-40 8.8 - 10.8 ft.	PB-21 4-6 ft.	DR-132 0.5 - 2 ft.	SMHB-1 0 - 4 ft.	SMHB-2 8 - 10 ft.
PCBS (PPM)																		
AROCLOR 1242	1	25	NA	NA	NA	**7.28**	0.54 U	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.1 U	**1.2**	NA	0.1 U	0.0203 U	0.0233 U
AROCLOR 1248	1	25	NA	NA	NA	0.1 U	0.54 U	**7.2**	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.0203 U	0.0233 U
AROCLOR 1254	1	25	NA	NA	NA	**2.69**	0.54 U	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	NA	**1.6**	0.0203 U	0.0233 U
SVOCS (PPM)																		
BENZO(A)PYRENE	1	1.1	NA	NA	NA	0.339 U	0.169 U	0.2 U	**1.8**	0.2 U	NA	**0.3**	0.2 U	**0.4**	NA	1.2 U	**3.36 J**	**1.96 J**
VOCS (PPM)																		
1,2,4-TRIMETHYLBENZENE	190	380	NA	NA	NA	1.31 U	**0.0525**	0.2 U	**6.5**	**0.6**	NA	**934**	**10**	**8.7**	NA	0.2 U	0.0105 UJ	0.00438 J
1,3,5-TRIMETHYLBENZENE	190	380	NA	NA	NA	1.31 U	**0.0158 J**	0.2 U	**1.3**	**0.2**	NA	**346**	**4.6**	**2.6**	NA	0.2 U	0.0105 UJ	0.0118 U
TRICHLOROETHENE	200	400	**420**	NA	NA	**20.5**	**0.593**	0.2 U	0.2 U	0.2 U	NA	2.3 U	0.2 U	0.2 U	NA	**7.9**	**0.00352 J**	0.0117 U
METALS (PPM)																		
ARSENIC	16	16	NA	NA	NA	**2.9**	**3.6**	**1.4**	**2.2**	**1.5**	NA	**2.1**	**2.3**	**3.7**	**20.6 J**	**7.4**	**56 J**	3.6
CADMIUM	9.3	60	NA	NA	NA	**0.14 J**	**0.31 J**	0.5 U	0.6 U	0.6 U	1.1 U	0.6 U	0.6 U	0.6 U	**1.2**	**3.5**	0.575 U	0.23 J
CHROMIUM	400	800	NA	**1150**	**472**	**5.7**	**11.3**	**82.4**	**9.1**	**6.9**	**123**	**7.7**	**468**	**8**	**6.8**	**11.6**	11.2 J	7.7 J
COPPER	270	10000	NA	NA	NA	**17.2**	**18.4**	**46**	**2.5**	**1926.1**	**120**	**9.5**	**26.8**	**7.9**	**17.2**	**24.3**	29.1 J	12.6 J
LEAD	1000	3900	NA	NA	NA	**7050 J**	**8620 J**	**12**	3.7 U	**59.4**	**34.2**	**30.9**	3.3 U	**10.2**	**34.1 J**	**20.8**	28.6 J	20.2 J
MERCURY	2.8	5.7	NA	NA	NA	0.046 UJ	0.051 UJ	**0.11**	0.06 U	0.06 U	**0.3**	**0.3**	0.1 U	0.1 U	0.052 U	**0.3**	0.108 U	0.096 J
ZINC	10000	10000	NA	**1200**	**5880**	**25.7**	**35.4**	**203.7**	**28.8**	**52.6**	**13098**	**21.2**	**20.1**	**19.9**	**66.4 J**	**59.3**	124 J	33.7 J

NOTES:

1. **Bold** - Concentration greater than reporting limit.
2. SCOs- Soil Cleanup Objectives
3. RED - Concentration greater than Commercial SCOs.
4. Highlighted RED - Concentratioon greater than Industrial SCOs.
5. U - Parameter Not Detected.
6. ft. - Sample Depth below ground surface in feet.
7. J - Estimated Concentration.
8. UJ - Estiamted Reporting Limit.
9. NA - Parameter Not Analyzed for this sample location.
10. PPM - parts per million or millgrams/ kilogram dry weight
11. PCBs - Polychlorinated Biphenyl compounds.
12. VOCs - Volatile organic Compomounds
13. SVOCs - Semi Volatile Organic Compounds

Table 4: – Groundwater Quality Summary
Delphi Automotive Systems Site No. 828064
1000 Lexington Ave. Rochester, New York

March 2022

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)	SCGs (ppb)	Frequency Exceeding SCGs
Metals	Antimony	ND - **186**	3	12 of 168
	Arsenic	ND - **470**	25	28 of 168
	Beryllium	ND - **30**	3	15 of 168
	Cadmium	ND - **50**	5	20 of 321
	Chromium	ND - **21,000**	50	72 of 365
	Copper	ND - **7,690**	200	25 of 366
	Cyanide	ND - **239**	200	1 of 83
	Iron	50 - **112,000**	300	12 of 16
	Lead	ND - **2,200**	25	122 of 366
	Manganese	ND - **4,510**	300	9 of 32
	Mercury	ND - **390**	1	27 of 362
	Nickel	ND - **5450**	100	62 of 366
	Selenium	ND - **400**	10	18 of 168
	Thallium	ND - **400**	0.5	20 of 168
	Zinc	ND - **51,600**	2,000	5 of 366
MNA Water Quality Parameters	Chloride	156,000 - **9,880,000**	250,000	15 of 16
	Nitrogen, Ammonia	60 - **8,530**	2,000	3 of 16
	Phosphorus	ND - **120**	20	6 of 16
	Sulfate	39,000 - **4,600,000**	250,000	5 of 16
	Sulfide	ND - **8,200**	50	12 of 16
Semi-Volatile Organic Compounds (SVOCs)	Acenaphthene	ND - **37**	20	1 of 151
	Anthracene	ND - **84**	50	1 of 151
	Benzo(a)anthracene	ND - **7**	0.002	4 of 151
	Benzo(a)pyrene	ND - **5**	Detected	4 of 151
	Benzo(b)fluoranthene	ND - **7**	0.002	4 of 151
	Benzo(k)fluoranthene	ND - **7**	0.002	4 of 151
	Bis(2-ethylhexyl)phthalate	ND -**3,300**	5	38 of 147
	Chrysene	ND - **19**	0.002	5 of 151
	Fluoranthene	ND - **97**	50	1 of 151
	Fluorene	ND - **260**	50	1 of 151
	Indeno(1,2,3-cd)pyrene	ND - **8**	0.002	3 of 151
	Naphthalene	ND - **240**	10	16 of 151
	n-Nitrosodiphenylamine	ND - **74**	50	1 of 147
	Pentachlorophenol	ND - **93**	1	2 of 147
	Phenanthrene	ND - **780**	50	6 of 151
	Phenol	ND - **26**	1	11 of 147

Table 4: – Groundwater Quality Summary
Delphi Automotive Systems Site No. 828064
1000 Lexington Ave. Rochester, New York

March 2022

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)	SCGs (ppb)	Frequency Exceeding SCGs
Volatile Organic Compounds (VOCs)	1,2-Dichloroethene (cis- and/or trans-)	**ND - 240,000**	5	7 of 43
	1,2-Dichloroethene, cis-	**ND - 180,000**	5	129 of 318
	1,2-Dichloroethene, trans-	**ND - 310**	5	40 of 317
	1,2-Dichloropropane	**ND - 10**	5	1 of 390
	1,3-Dichlorobenzene	**ND - 10**	3	1 of 54
	1,4-Dichlorobenzene	**ND - 10**	3	1 of 54
	Acetone	**ND - 310**	50	6 of 377
	Benzene	**ND - 1,400**	1	37 of 383
	Bromomethane	**ND - 10**	5	1 of 390
	Carbon tetrachloride	**ND - 10**	5	1 of 390
	Chlorobenzene	**ND - 10**	5	1 of 390
	Chloroethane	**ND - 80**	5	2 of 390
	Chloroform	**ND - 31**	7	6 of 390
	Dichlorodifluoromethane	**ND - 10**	5	1 of 54
	Ethylbenzene	**ND - 170**	5	13 of 387
	Isopropylbenzene	**ND - 170**	5	9 of 53
	Methylene Chloride	**ND - 10**	5	1 of 390
	n-Butylbenzene	**ND - 80**	5	21 of 311
	sec-Butylbenzene	**ND - 50**	5	15 of 310
	Styrene	**ND - 10**	5	1 of 390
	tert-Butylbenzene	**ND - 28**	5	4 of 315
	Tetrachloroethene	**ND - 15,000**	5	20 of 391
	Toluene	**ND - 180**	5	12 of 385
	Trans-1,3-Dichloropropene	**ND - 10**	0.4	3 of 390
	Trichloroethene	**ND - 27,000**	5	48 of 384
	Trichlorofluoromethane	**ND - 10**	5	1 of 54
	Vinyl Chloride	**ND - 35,000**	2	134 of 369
	Xylenes, Total	**ND - 270**	5	28 of 376

Notes and Abbreviations:

1. ppb: parts per billion which is equivalent to micrograms per liter in groundwater.
2. New York State (NYS) Ambient Water Quality Standards and Guidance Values Technical and Operational Guidance Series 1.1.1. (1998) Class GA.
3. Detected compounds/analytes with an applicable NYS standard or guidance value are shown.
4. Exceedances include those detections that were detected at or above the applicable standard or guidance value.

ND – Not Detected

Table 5
Delphi Automotive Systems Site No. 828064
Indoor Air and Sub-slab Vapor Sample Results

Soil Vapor Intrusion Sampling Results - Pre and Post Remedy Implementation

Building 1

Sample Location			G-29 IA		G29-SS		L-39 IA		L-39 SS		W-25 IA		W-25 SS	
Location Description			Active Manufacturing Area				Inactive Equipment Storage Area				Adjacent to Pedestrian Walkway			
	NYSDOH Indoor Air Guideline Value	Reporting Limit	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021
Parameter		(ug/M3)	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Methylene Chloride	NV	1.7	1.5 U	1.7 U	1.5 U	1.7 U	1.5 U	**1.0 J**	58 U	1.7 U	1.5 U	**1.2 J**	150 U	**4.1**
1,1,1 Trichloroethane	NV	1.1	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	36 U	**1.9**	1.1 U	ND	91 U	**4.3**
1,1 Dichloroethene	NV	0.81	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	27 U	0.81 U	0.81 U	ND	68 U	0.81 U
Tetrachloroethene	30	1.4	1.4 U	1.4 U	**15**	**1.4**	1.4 U	1.4 U	45 U	**36**	1.4 U	ND	110 U	**0.91 J**
trans 1,2 Dichloroethene	NV	0.79	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	**58**	0.79 U	0.79 U	ND	66 U	**0.31 J**
Trichloroethene	2	0.2	**3.2**	**0.48**	**19**	**5.9**	**5.3**	**0.42**	**4000**	**24**	**14**	**0.52**	**9600**	**380**
cis 1,2 Dichloroethene	NV	0.2	**1.9**	0.2 U	**1.2**	**0.8**	**2.3**	0.2 U	26 U	0.2 U	**3.3**	**0.18 J**	**87**	**6.6**
Vinyl Chloride	NV	0.2	0.51 U	**0.31**	0.51 U	**3.2**	0.51 U	**0.53**	17 U	**1.4**	0.51 U	**0.66**	43 U	**1.2**

Sample Location			P-9 IA		P-9 SS		E-19 IA		E-19 SS		YF 25 IA	YF-25 SS	AA1-21621	AA2-21721	AA3-21821
Location Description			Active Equipment Storage Area				Active Manufacturing Area				Office Area		Upwind Outdoor Location		
	NYSDOH Indoor Air Guideline Value	Reporting Limit	2014	2021	2014	2021	2014	2021	2014	2021	2021	2021	2021	2021	2021
Parameter		(ug/M3)	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Post	Post	Post	Post	Post
Methylene Chloride	NV	1.7	1.5 U	**1.5 J**	**63**	**3.8**	1.5 U	1.7 U	44000 U	1.7 U	1.7 U	**19**	1.7 U	**1.6 J**	1.7 U
1,1,1 Trichloroethane	NV	1.1	1.1 U	ND	14 U	**0.5 J**	1.1 U	1.1 U	27000 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1 Dichloroethene	NV	0.81	0.81 U	ND	9.9 U	ND	0.81 U	0.81 U	20000U	**0.36 J**	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U
Tetrachloroethene	30	1.4	1.4 U	ND	**26**	**0.65 J**	1.4 U	1.4 U	34000 U	**77**	1.4 U	**3**	1.4 U	1.4 U	1.4 U
trans 1,2 Dichloroethene	NV	0.79	0.79 U	ND	**47**	ND	0.79 U	0.79 U	19000 U	**2.4**	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U
Trichloroethene	2	0.2	**1.8**	**0.47**	**390**	**0.87**	**3.2**	**0.93**	27000 U	**170**	0.2 U	**0.24**	0.2 U	**1**	0.2 U
cis 1,2 Dichloroethene	NV	0.2	**1.1**	**0.19 J**	**660**	ND	**1.9**	**0.38**	**1800000**	**9.5**	0.2 U	**0.3**	0.2 U	0.2 U	0.2 U
Vinyl Chloride	NV	0.2	0.51 U	**0.35**	**110**	**0.59**	0.51 U	**0.36**	**430000**	**4.4**	**2.3**	**4.6**	**4**	**2**	**1.8**

Building 2

Sample Location			VU-9 IA		VU-9 SS		SS-37 IA		SS-37 SS		HH-37 IA		HH-37 SS	
Location Description			Active Manufacturing Area				Restroom Access Area				Adjacent to Pedestrian Walkway			
	NYSDOH Indoor Air Guideline Value	Reporting Limit	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021
Parameter		(ug/M3)	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Methylene Chloride	NV	1.7	1.5 U	**2.2**	1.5 U	1.7 U	1.5 U	1.7 U	1.5 U	**1.6 J**	1.7 U	1.7 U	**15**	1.7 U
1,1,1 Trichloroethane	NV	1.1	1.1 U	1.1 U	**6.9**	**8.7**	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1 Dichloroethene	NV	0.81	0.81 U	0.81 U	**3.3**	**0.47 J**	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U
Tetrachloroethene	30	1.4	1.4 U	**21**	**6.9**	**9**	1.4 U	1.4 U	**2.5**	**13**	1.4 U	**0.51 J**	**1.7**	**21**
trans 1,2 Dichloroethene	NV	0.79	0.79 U	0.79 U	**0.96**	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U
Trichloroethene	2	0.2	1.1 U	**0.27**	**72**	**9**	1.1 U	0.2 U	**14**	**21**	1.1 U	**0.82**	**1.8**	**7**
cis 1,2 Dichloroethene	NV	0.2	0.79 U	0.2 U	**7.0**	0.2 U	0.79 U	0.2 U	**37**	0.2 U	1.0 U	**0.36 J**	**3.6**	0.2 U
Vinyl Chloride	NV	0.2	0.51 U	**1.7**	**0.51**	0.2 U	0.51 U	**1.9**	**6.6**	0.2 U	0.51 U	0.2 U	0.51 U	0.2 U

Sample Location			LL-25 / KK-25 IA		DD-31 IA		NN-58 IA		NN-58 SS		CC-60 IA	SS-13 IA	SS-13 SS
Location Description			Clean Room Manufacturing Area				Active Manufacturing Area				Loading Dock	Break Room Area	
	NYSDOH Indoor Air Guideline Value	Reporting Limit	2014	2021	2014	2021	2014	2021	2014	2021	2021	2021	2021
Parameter		(ug/M3)	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Post	Post	Post
Methylene Chloride	NV	1.7	1.5 U	1.7 U	1.5 U	**1.4 J**	1.5 U	1.7 U	17 U	1.7 U	1.4 J	1.7 U	1.7 U
1,1,1 Trichloroethane	NV	1.1	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	11 U	**0.49 J**	0.54 J	1.1 U	1.1 U
1,1 Dichloroethene	NV	0.81	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	7.9 U	**0.97**	0.81 U	0.81 U	0.81 U
Tetrachloroethene	30	1.4	1.4 U	**0.63 J**	1.4 U	1.4 U	1.4 U	1.4 U	**24**	**21**	1.4 U	1.4 U	**43**
trans 1,2 Dichloroethene	NV	0.79	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	7.9 U	0.79 U	0.79 U	0.79 U	0.79 U
Trichloroethene	2	0.2	1.1 U	**0.27**	1.1 U	0.2 U	1.1 U	**0.51**	11 U	**8.6**	**0.59**	0.2 U	**32**
cis 1,2 Dichloroethene	NV	0.2	0.79 U	**0.2**	0.79 U	0.2 U	0.79 U	0.2 U	7.9 U	0.2 U	**0.26**	0.2 U	0.2 U
Vinyl Chloride	NV	0.2	0.51 U	**1.1**	0.51 U	**1.1**	0.51 U	**4**	5.1 U	**3**	**6.7**	**3.6**	0.2 U

Notes:
units = micrograms per cubic meter (ug/M3)
U =Parameter Not Detected ata concentration greater than the Sample Detection Limit.
J = Estimated Value, concentration below Reporting Limit but above Method Detection Limit.
Bold - Parameter Detected a at concentration greater than the Sample Reporting Limit.
SS- Sub Slab Vapor Sample
IA - Indoor Air Sample
NV - No NYSDOH Indoor Air Guideline Value available for this parameter.
Pre - Sample collected before the implementation of Sub-Slab Depressurization
Post - Sample collected after the implementation of Sub-Slab Depressurization

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-105	DR-109	DR-109	DR-109	DR-109	DR-109	DR-109	DR-109	DR-109	DR-109	DR-109
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
DATE		1.1.1	4/24/2003	5/22/2012	5/30/2013	6/12/2014	6/23/2015	4/19/2016	5/23/2017	5/14/2018	6/14/2019	9/17/2020	5/27/2021	4/22/2003	5/23/2012	6/11/2014	6/22/2015	4/15/2016	5/19/2017	5/15/2018	6/17/2019	9/15/2020	6/1/2021
				Baseline										**Baseline**									
Volatile Organic Compounds (ug/L)	Cas No.																						
1,1,1-Trichloroethane	71-55-6	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,1,2-Trichloroethane	79-00-5	1	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,1-Dichloroethane	75-34-3	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,1-Dichloroethene	75-35-4	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2,4-Trichlorobenzene	120-82-1	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	10 U	13 U	5.0 U	2.0 U	2.0 U	4.0 U	4.0 U	20 U	20 U	20 U	20 U	10 U	13 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dichlorobenzene	95-50-1	3	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dichloroethane	107-06-2	0.6	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,2-Dichloropropane	78-87-5	1	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,3-Dichlorobenzene	541-73-1	3	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
1,4-Dichlorobenzene	106-46-7	3	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	**65**	**24 J**	**15**	**40**	**86**	**61**	**43**	**28 J**	**30 J**	50 U	**26 J**	**33**	**12 J**	**6.3**	**21**	**20**	**21**	**33**	**40**	**51**	**55**
2-Hexanone	591-78-6	50	10 U	25 U	**1.9 J**	5.0 U	5.0 U	10 U	10 U	50 U	50 U	50 U	50 U	1.0 J	25 U	5.0 U	**4.1 J**	**3.5 J**	**4.2 J**	**6.4**	**7.5**	**11**	**8.1**
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	10 U	25 U	**0.79 J**	5.0 U	5.0 U	10 U	10 U	50 U	50 U	50 U	50 U	10 U	25 U	5.0 U	5.0 U	5.0 U	5.0 U	**0.75 J**	**0.89 J**	5.0 U	**0.91 J**
Acetone	67-64-1	50	**310**	**120**	**140**	**580**	**200**	**360**	**240**	**150**	**210**	**250**	**180**	**120**	**45**	**36**	**80**	**80**	**85**	**110**	**180**	**200**	**220**
Benzene	71-43-2	1	**32**	**33**	**8.8**	**31**	**39**	**40**	**40**	**42**	**44**	**37**	**40**	**13**	**18**	**0.67 J**	**6.8**	**5.4**	**1.7**	**2**	**2.2**	**1.9**	**2.7**
Bromodichloromethane	75-27-4	50	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Bromoform	75-25-2	50	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Bromomethane (Methyl bromide)	74-83-9	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Carbon disulfide	75-15-0	60	10 U	25 U	10 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	25 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Carbon tetrachloride	56-23-5	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Chlorobenzene	108-90-7	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Chloroethane	75-00-3	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Chloroform (Trichloromethane)	67-66-3	7	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	**2.7 J**	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Chloromethane (Methyl chloride)	74-87-3	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.22 J**	1.0 U	1.0 U	**0.85 J**
cis-1,2-Dichloroethene	156-59-2	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Cyclohexane	110-82-7	-	10 U	25 U	10 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	25 U	1.0 U	**0.60 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Dibromochloromethane	124-48-1	50	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Ethylbenzene	100-41-4	5	10 U	13 U	**0.97 J**	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 UJ	**0.51 J**	**0.47 J**	**0.36 J**	1.0 U	**0.25 J**	1.0 U	2.0 U
Isopropyl benzene	98-82-8	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Methyl acetate	79-20-9	-	10 U	25 U	10 U	2.0 U	2.0 U	4.0 U	4.0 U	20 U	20 U	20 U	**3.5 J**	10 U	25 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**0.44 J**	2.0 U	4.0 U
Methyl cyclohexane	108-87-2	-	10 U	25 U	10 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	25 U	1.0 U	**0.31 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Methylene chloride	75-09-2	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	**0.99 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Styrene	100-42-5	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Tetrachloroethene	127-18-4	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Toluene	108-88-3	5	**3 J**	**3.7 J**	**5.5**	**3.2 J**	**3.9**	**4.5**	**4.3**	**5.3 J**	**6.8 J**	10 U	**4.5 J**	**3.0 J**	**3.7 J**	**2.1**	**5.9**	**4.3**	**1.6**	**1.1**	**1.5**	**1.4**	**1.3 J**
trans-1,2-Dichloroethene	156-60-5	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Trichloroethene	79-01-6	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	**1.9**	1.0 U	1.0 U	1.0 U	2.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Vinyl chloride	75-01-4	2	10 U	13 U	5.0 U	5.0 U	1.0 U	2.0 U	2.0 U	10 U	10 U	10 U	10 U	10 U	13 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U
Xylenes (total)	1330-20-7	5	10U	13 U	**0.83 J**	3.0 U	3.0 U	6.0 U	6.0 U	30 U	30 U	30 U	30 U	10 U	13 U	3.0 U	**1.4 J**	**1.5 J**	3.0 U	3.0 U	**0.80 J**	3.0 U	**0.58 J**

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-132	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315	DR-315
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N
DATE		1.1.1	4/24/2003	5/24/2012	5/31/2013	6/12/2014	6/19/2015	4/19/2016	5/23/2017	5/15/2018	6/13/2019	9/17/2020	5/28/2021	4/21/2003	5/31/2013	5/31/2013	6/12/2014	6/23/2015	4/19/2016	5/19/2017	5/15/2018	6/13/2019	9/16/2020	5/28/2021
			Baseline											Baseline										
Volatile Organic Compounds (ug/L)	Cas No.																							
1,1,1-Trichloroethane	71-55-6	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	10 U	10 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	20 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	100	5.0 U	10 U	10 U	10 U	65	30	31	25	35	6.3	40	23
2-Hexanone	591-78-6	50	10 U	20 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	13 U	2.2 J	2.0 J	2.1 J	1.9 J	5.0 U	5.0 U	1.3 J
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	10 U	20 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	0.83 J	0.72 J	5.0 U	5.0 U	0.62 J
Acetone	67-64-1	50	7.0 J	20 U	4.1 J	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	11.0 U	15	5.0 U	10 U	15	10 U	290	130	130	120	150	18.0 U	200	120
Benzene	71-43-2	1	13	280	0.38 J	2	31	23	6.6	9.7	15	2	35	120	8.7	9	93	150	170	130	85	130	100	110
Bromodichloromethane	75-27-4	50	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	10 U	2.1 J	10 U	1.0 U	1.0 U	1.0 U	1.0 U	2.2	0.37 J	7.8	1.8	10 U	10 U	10 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	4.0 J	20 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	0.44 J	0.61 J	1.0 U	1.1	2.0 J	1.9 J	2.2 J	3.4	3.4	1.0 U	3.3	2	1.5	1.8	1.4
Dibromochloromethane	124-48-1	50	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	10 U	10 U	5.0 U	1.0 UJ	1.0 U	0.27 J	0.25 J	1.0 U	0.33 J	1.0 U	0.49 J	10 U	5.0 U	5.0 U	2.5 U	0.59 J	0.65 J	0.84 J	0.59 J	0.28 J	1.0 U	0.40 J
Isopropyl benzene	98-82-8	5	10 U	10 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.21 J	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	10 U	20 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	10 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.63 J
Methyl cyclohexane	108-87-2	-	4.0 J	20 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.43 J	1.0 U	0.56 J	10 U	0.98 J	1.2 J	1.3	1.3	1.3	1.2	0.82 J	0.52 J	1.0 U	0.60 J
Methyl tert butyl ether (MTBE)	1634-04-4	10	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	10 U	10 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	3.0 J	1.2 J	0.43 J	0.21 J	0.34 J	0.86 J	0.86 J	1.1	2.2	1.0 U	2.4	9.0 J	1.5 J	1.5 J	9.8	17	16	12	7.8	5.1	5.7	5.9
trans-1,2-Dichloroethene	156-60-5	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	10 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	5.0 U	5.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	1330-20-7	5	8.0 J	8.4 J	5.0 U	3.0 U	3	3.9	2.1 J	2.1 J	4	3.0 U	4.6	2.0 J	0.60 J	0.64 J	2.3 J	4	4	4.3	2.2 J	1.4 J	3.0 U	1.6 J

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	PZ-111	PZ-111	PZ-111	PZ-111	PZ-111	PZ-111	PZ-112	PZ-112	PZ-112	PZ-112	PZ-112	PZ-112	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113	PZ-113
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
DATE		1.1.1	5/25/2012	6/4/2013	6/12/2014	6/19/2015	4/15/2016	5/23/2017	5/24/2012	6/4/2013	6/12/2014	6/19/2015	4/15/2016	5/23/2017	5/24/2012	5/31/2013	6/11/2014	6/19/2015	4/19/2016	5/23/2017	5/14/2018	6/17/2019	9/16/2020	5/28/2021
			Baseline						**Baseline**						**Baseline**									
Volatile Organic Compounds (ug/L)	Cas No.																							
1,1,1-Trichloroethane	71-55-6	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	**1.3 J**	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	**0.69 J**	10 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	**0.27 J**	10 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	**2.8 J**	**3.7 J**	5.0 U	5.0 U	5.0 U	**5.8 J**	**34**	**6.8**	**48**	**18**	5.0 U	**8.2 J**	**12**	**7.3**	**5**	**11**	**2.3 J**	5.0 U	12 U	5.0 U	5.0 U
Benzene	71-43-2	1	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.45 J**	**0.45 J**	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.49 J**	**3.8 J**	**0.78 J**	**0.60 J**	1.0 U	**0.23 J**	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.42 J**	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	**0.66 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**0.22 J**	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	**0.55 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.25 J**	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**15**	**19**	**17 J**	**9.8**	**16**	**22**	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.29 J**	10 U	1.0 U	1.0 U	**0.31 J**	1.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.49 J**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	**0.21 J**	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	1330-20-7	5	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	R-101	R-101	R-101	R-101	R-101	R-101	R-101	R-101	R-101	R-101	R-108	R-108	R-108	R-108	R-108	R-108	R-108	R-108	R-108	R-108	R-108
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
DATE		1.1.1	11/13/2004	5/29/2013	6/12/2014	6/18/2015	4/14/2016	5/18/2017	5/14/2018	6/12/2019	9/14/2020	5/27/2021	11/11/2004	5/31/2013	6/11/2014	6/22/2015	4/18/2016	5/23/2017	5/16/2018	5/16/2018	6/19/2019	9/16/2020	6/1/2021
			Baseline										**Baseline**										
Volatile Organic Compounds (ug/L)	Cas No.																						
1,1,1-Trichloroethane	71-55-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	**0.34 J**	**0.53 J**	**0.37 J**	1.0 U	**0.33 J**	**0.44 J**	1.0 U	**0.34 J**
1,1-Dichloroethene	75-35-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	**1.8 J**	**3.5 J**	5.0 U	**0.93 J**	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**0.79 J**	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	10 U	5.0 U	5.0 U	5.0 U	**4.0 J**	5.0 U	11.0 U	5.0 U	5.0 U	10 U	**2.1 J**	**2.4 J**	5.0 U	5.0 U	**2.8 J**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	71-43-2	1	2.0 U	**0.21 J**	**0.30 J**	**0.50 J**	**0.50 J**	**0.52 J**	**0.54 J**	**0.44 J**	1.0 U	**0.57 J**	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	**2.6**	1.0 U	1.0 U	**1.2**	2.0 U	10 U	1.0 U	1.0 U	1.0 U	**0.25 J**	**1.2**	**5.9**	1.0 U	1.0 U	**2.9**
Carbon tetrachloride	56-23-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	**6.0**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**52**	**0.37 J**	1.0 U	**1.3**	**0.94 J**	**0.73 J**	**0.39 J**	**0.73 J**	**0.71 J**	1.0 U	**0.74 J**
cis-1,3-Dichloropropene	10061-01-5	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.23 J**	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	2.0 U	10 U	1.0 U	1.0 U	**0.29 J**	1.0 U	**0.30 J**	1.0 U	1.0 U	**0.69 J**	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	**0.59 J**	**0.50 J**	**0.45 J**	1.0 U	**0.54 J**	**0.52 J**	1.0 U	**0.60 J**
trans-1,3-Dichloropropene	10061-02-6	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**0.24 J**	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	**3.0**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**320**	**1.4 J**	1.0 U	**4.4**	**1.6**	**1.8**	1.0 U	**1.4**	**1.1**	1.0 U	1.0 U
Xylenes (total)	1330-20-7	5	2.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	**0.66 J**	2.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	R-109	R-109	R-109	R-109	R-109	R-109	R-109	R-109	R-109	R-109	R-109	R-3	R-3	R-3	R-3	R-3	R-3	R-3	R-3	R-3	R-3
SAMPLE TYPE		TOGS	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
DATE		1.1.1	4/15/2004	5/31/2013	6/11/2014	6/22/2015	4/15/2016	4/15/2016	5/19/2017	5/15/2018	6/17/2019	9/15/2020	6/1/2021	4/15/2004	5/29/2013	6/12/2014	6/22/2015	4/14/2016	5/18/2017	5/14/2018	6/13/2019	9/14/2020	5/27/2021
			Baseline											**Baseline**									
Volatile Organic Compounds (ug/L)	Cas No.																						
1,1,1-Trichloroethane	71-55-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	**9**	**2.0 J**	**3.4**	**1.9**	**2.1**	**2**	**9.5**	**9**	**9.6**	**12**	**9.8**	**8.0**	**5.8**	**5.8**	**5**	**5.6**	**3.5**	**3.1**	**2.4**	**1.9**	**1.9**
1,1-Dichloroethene	75-35-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.26 J**	1.0 U	**0.22 J**	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**1.5 J**	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	**2.7 J**	**2.6 J**	5.0 U	5.0 U	5.0 U	**1.8 J**	5.0 U	12 U	5.0 U	5.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	11.0 U	5.0 U	5.0 U
Benzene	71-43-2	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	2.0 U	10 U	**0.28 J**	1.0 U	1.0 U	1.0 U	1.0 U	**4.9**	**1.9 J**	1.0 U	**1.6**	2.0 U	10 U	**0.29 J**	1.0 U	1.0 U	1.0 U	**3.8**	**0.42 J**	1.0 U	**0.83 J**
Carbon tetrachloride	56-23-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**2.0**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**0.24 J**	1.0 U	1.0 U	**1.5**	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	**120**	**9**	**12**	**4.8**	**4.4**	**4.8**	**42**	**35**	**26**	**27**	**18**	**4.0**	**2.1 J**	**1.7**	**1.7**	**1.9**	**1.6**	**1.4**	**1.2**	**2.1**	**1.6**
cis-1,3-Dichloropropene	10061-01-5	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	**0.49 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	**50**	**15**	**22**	**16**	**12**	**12**	**83**	**100**	**100**	**130**	**85**	**9.0**	**4.1 J**	**4.8**	**4**	**3.7**	**2.9**	**2.2**	1.0 U	**2.5**	**2**
Xylenes (total)	1330-20-7	5	2.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	R-301	R-301	R-301	R-301	R-301	R-301	R-301	R-301	R-301	R-301	R-303	R-303	R-303	R-303	R-303	R-303	R-303	R-303	R-303	R-303	R-303
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
DATE		1.1.1	10/20/2004	5/29/2013	6/12/2014	6/18/2015	4/14/2016	5/18/2017	5/14/2018	6/14/2019	9/14/2020	6/1/2021	11/10/2004	5/23/2012	5/30/2013	6/12/2014	6/18/2015	4/18/2016	5/22/2017	5/15/2018	6/18/2019	9/15/2020	6/2/2021
			Baseline										**Baseline**										
Volatile Organic Compounds (ug/L)	Cas No.																						
1,1,1-Trichloroethane	71-55-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	**0.25 J**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**1.3 J**	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	**2.1 J**	5.0 U	5.0 U	5.0 U	**2.7 J**	5.0 U	11.0 U	5.5 U	5.0 U	10 U	10 U	**3.4 J**	**6.2**	5.0 U	**3.0 J**	5.0 U	5.0 U	12 U	5.1 U	5.0 U
Benzene	71-43-2	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.41 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.21 J**	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	2.0 U	10 U	**0.22 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	**3.9**	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.35 J**
cis-1,2-Dichloroethene	156-59-2	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**3.0**	**1.6 J**	5.0 U	1.0 U	**0.31 J**	1.0 U	1.0 U	**0.68 J**	1.0 U	1.0 U	**0.33 J**
cis-1,3-Dichloropropene	10061-01-5	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	**0.29 J**	**0.43 J**	1.0 U	1.0 U	**0.27 J**	1.0 U	**0.21 J**
Methyl tert butyl ether (MTBE)	1634-04-4	10	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**1.8**	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**16**	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.76 J**
Xylenes (total)	1330-20-7	5	2.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	2.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	R-306	R-306	R-306	R-306	R-306	R-306	R-306	R-306	R-306	R-306	R-306	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401	R-401
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N	N	N	N	N
DATE		1.1.1	1/11/2004	5/24/2012	6/3/2013	6/12/2014	6/22/2015	4/18/2016	5/18/2017	5/16/2018	6/19/2019	9/16/2020	6/2/2021	1/12/2005	5/24/2012	6/3/2013	6/12/2014	6/12/2014	6/23/2015	4/18/2016	5/22/2017	5/22/2017	5/15/2018	6/18/2019	9/15/2020	6/3/2021
			Baseline											**Baseline**												
Volatile Organic Compounds (ug/L)	Cas No.																									
1,1,1-Trichloroethane	71-55-6	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.24 J**	1.0 U	**0.21 J**
1,1-Dichloroethene	75-35-4	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.35 J**	1.0 U	**0.39 J**
1,2,4-Trichlorobenzene	120-82-1	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	**0.25 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**0.20 J**	**0.22 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	2.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	**1.4 J**	**1.6 J**	**1.6 J**	5.0 U	**1.7 J**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	**1.6 J**	**2.5 J**	**2.0 J**	**1.8 J**	5.0 U	**1.5 J**	**1.3 J**	**1.4 J**	5.0 U	12 U	5.4 U	5.0 U
Benzene	71-43-2	1	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.96 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.88 J**	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	2.0 U	**0.28 J**	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	**0.23 J**	**0.76 J**	**0.27 J**	**0.43 J**	1.0 U	1.0 U	1.0 U	1.0 U	**1.4**	**0.34 J**	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.56 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.51 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	**15**	**6.8**	**7.9**	**8.4**	**9.4**	**18**	**5.7**	**3.3**	**6.3**	**6.5**	**6.5**	**31**	**5.9**	**4.9 J**	**2.9**	**2.7**	**11**	**16**	**15**	**15**	**18**	**18**	**24**	**22**
cis-1,3-Dichloropropene	10061-01-5	0.4	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	**0.41 J**	**0.43 J**	**0.57 J**	**0.51 J**	**0.65 J**	**0.44 J**	1.0 U	**0.57 J**
trans-1,3-Dichloropropene	10061-02-6	0.4	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	2.0 U	**1.0 J**	**0.38 J**	**0.52 J**	**0.50 J**	**0.78 J**	**0.57 J**	1.0 U	**0.39 J**	1.0 U	**0.32 J**	**5**	**0.81 J**	**1.2 J**	**0.86 J**	**0.77 J**	**3.6**	**2.8**	**4.8**	**4.4**	**5**	**2.9**	**4.5**	**4.8**
Trichlorofluoromethane (CFC-11)	75-69-4	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	**9**	**0.93 J**	**0.70 J**	1.0 U	1.0 U	1.0 U	1.0 U	**1.1**	1.0 U	1.0 U	**0.35 J**	**16**	**0.59 J**	**1.3 J**	**0.51 J**	**0.49 J**	**4.7**	**12**	**5.4**	**5.3**	**3.8**	**9.3**	**9.3**	**7.3**
Xylenes (total)	1330-20-7	5	2.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	2.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	R-403	R-403	R-403	R-403	R-403	R-403	R-403	R-403	R-403	R-403	R-403	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101	SR-101
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
DATE		1.1.1	5/4/2010	5/25/2012	6/3/2013	6/12/2014	6/23/2015	4/18/2016	5/23/2017	5/15/2018	6/18/2019	9/15/2020	6/2/2021	4/15/2004	5/22/2012	5/29/2013	6/11/2014	6/18/2015	6/18/2015	4/14/2016	5/18/2017	5/14/2018	6/12/2019	9/14/2020	5/27/2021
				Baseline											**Baseline**										
Volatile Organic Compounds (ug/L)	Cas No.																								
1,1,1-Trichloroethane	71-55-6	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	13 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	25 U	10 U	10 U	**2.5 J**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**1.1 J**	5.0 U	5.0 U
2-Hexanone	591-78-6	50	25 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	13 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**0.24 J**	2.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	**5.8 J**	**1.5 J**	10 U	**61**	5.0 U	**6.3**	5.0 U	5.0 U	12 U	5.5 U	5.0 U	10 U	10 U	**2.2 J**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	71-43-2	1	13 U	5.0 U	5.0 U	**0.86 J**	1.0 U	**0.47 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	**3.1 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.96 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	13 U	**0.22 J**	10 U	**0.76 J**	1.0 U	**0.54 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.6**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	**13 J**	**6.3**	**1.1 J**	**1.2**	**0.48 J**	**0.34 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	13 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	13 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	13 U	10 U	10 U	**0.41 J**	**0.67 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	13 U	5.0 U	5.0 U	**0.44 J**	1.0 U	**0.23 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	**0.78 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	13 U	**0.94 J**	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	13 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	**280**	**0.79 J**	**18**	**39**	**5**	**0.58 J**	**1.4**	**1.3**	**0.58 J**	1.0 U	**0.73 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	1330-20-7	5	13 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	2.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

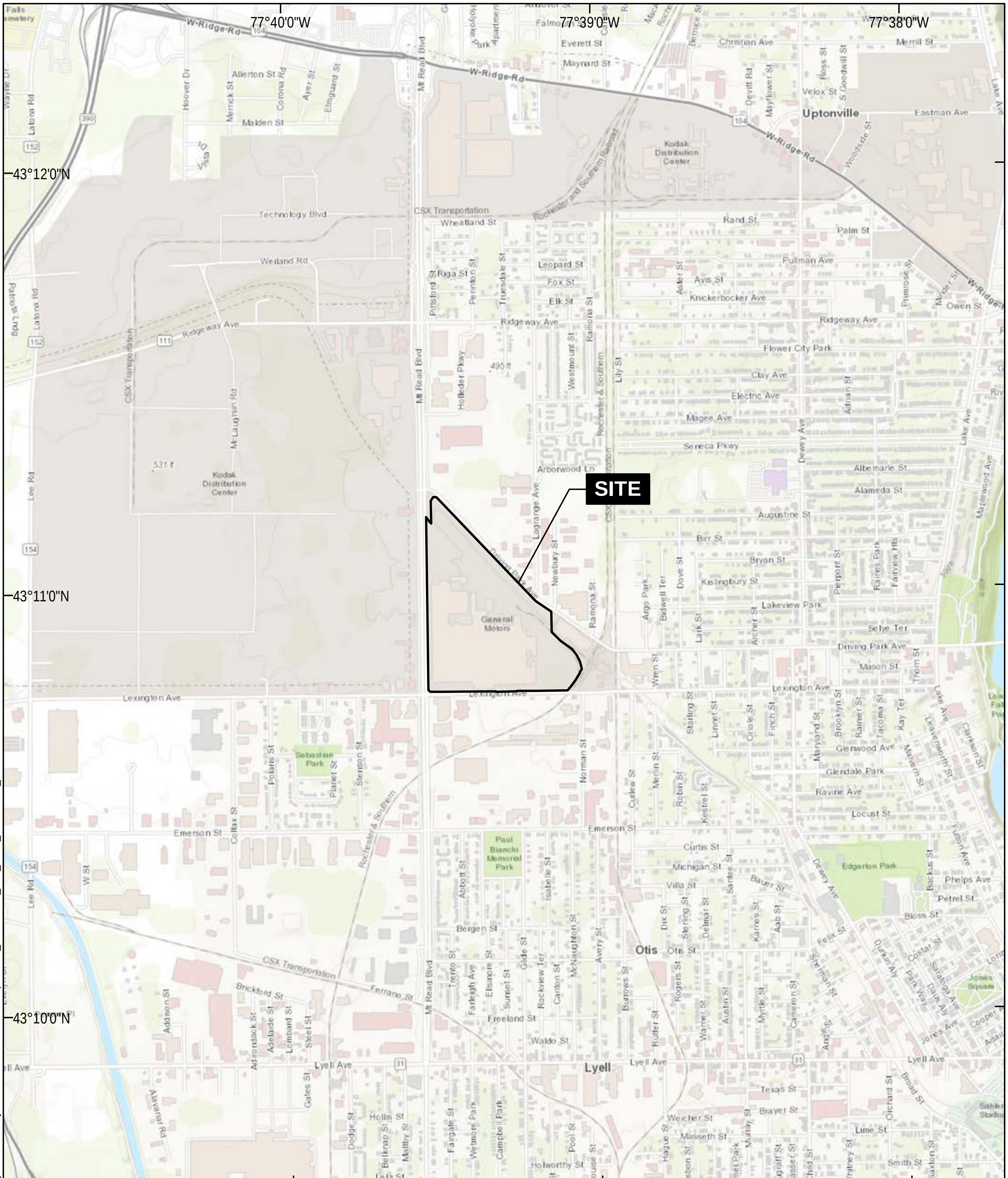
Notes shown on last page.

TABLE 9
SUMMARY OF ANALYTICAL RESULTS
GROUNDWATER SAMPLING EVENTS
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

LOCATION		Class GA	SR-301	SR-301	SR-301	SR-301	SR-301	SR-301	SR-301	SR-301	SR-301	SR-301	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303	SR-303
SAMPLE TYPE		TOGS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
DATE		1.1.1	10/20/2004	5/24/2013	6/11/2014	6/18/2015	4/14/2016	5/18/2017	5/14/2018	6/14/2019	9/14/2020	6/1/2021	10/19/2004	5/23/2012	5/30/2013	6/12/2014	6/18/2015	4/18/2016	5/22/2017	5/15/2018	6/18/2019	9/15/2020	6/2/2021
			Baseline										**Baseline**										
Volatile Organic Compounds (ug/L)	Cas No.																						
1,1,1-Trichloroethane	71-55-6	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	2.0 U	**0.61 J**	1.0 U	1.0 U	**0.83 J**	**0.78 J**	**0.82 J**	**0.64 J**	1.0 U	**0.79 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	120-82-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.04	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane (Ethylene dibromide)	106-93-4	0.0006	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	95-50-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	0.6	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	541-73-1	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	106-46-7	3	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (Methyl ethyl ketone) (MEK)	78-93-3	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	108-10-1	-	2.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	10 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	10 U	**2.6 J**	**1.7 J**	5.0 U	5.0 U	5.0 U	5.0 U	11.0 U	5.0 U	5.0 U	10 U	10 U	**3.0 J**	**1.5 J**	5.0 U	5.0 U	**1.6 J**	5.0 U	12 U	5.1 U	5.0 U
Benzene	71-43-2	1	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	75-27-4	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane (Methyl bromide)	74-83-9	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide	75-15-0	60	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	56-23-5	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform (Trichloromethane)	67-66-3	7	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane (Methyl chloride)	74-87-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.49 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	**0.40 J**	1.0 U	1.0 U	**1.3**	**0.91 J**
cis-1,2-Dichloroethene	156-59-2	5	**16**	**81**	**66**	**110**	**120**	**140**	**130**	**120**	**120**	**120**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	110-82-7	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	50	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane (CFC-12)	75-71-8	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl benzene	98-82-8	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl acetate	79-20-9	-	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	10 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl cyclohexane	108-87-2	-	2.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert butyl ether (MTBE)	1634-04-4	10	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene chloride	75-09-2	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	2.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	156-60-5	5	2.0 U	5.0 U	1.0 U	**0.48 J**	**0.43 J**	**0.57 J**	**0.66 J**	**0.54 J**	1.0 U	**0.56 J**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	**19**	**42**	**33**	**17**	**42**	**47**	**41**	**36**	**35**	**37**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane (CFC-11)	75-69-4	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trifluorotrichloroethane (CFC-113)	76-13-1	5	2.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	75-01-4	2	2.0 U	**6.4**	**5**	**7.6**	**6.7**	**6**	**5**	**6.7**	**7.1**	**4.6**	2.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)	1330-20-7	5	2.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	2.0 U	5.0 U	5.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U

Notes shown on last page.

Notes and Abbreviations:
1. Results in Red exceed the NYSDEC Division of Water Class GA Groundwater Quality Standard (TOGS Memorandum 1.1.1. 1998).
2. U - Parameter not detected at a concentration above the method detection limit.
3. J - Estimated result - Parameter detected at a concentration below the Laboratory Reporting Limit but above the Method Detection Limit.
4. Sample Types: N - Normal Sample, FD - Field Duplicate Sample.
5. D - Sample was diluted to achieve a concentration within the instrument calibration.
6. Results presented in **Bold** were detected at concentrations above the Method Detection Limit.
7. Data shown from sampling events conducted from 2012 to present.



MAP SOURCE: ESRI
SITE COORDINATES: 43°10'56"N, 77°39'22"W

HALEY ALDRICH

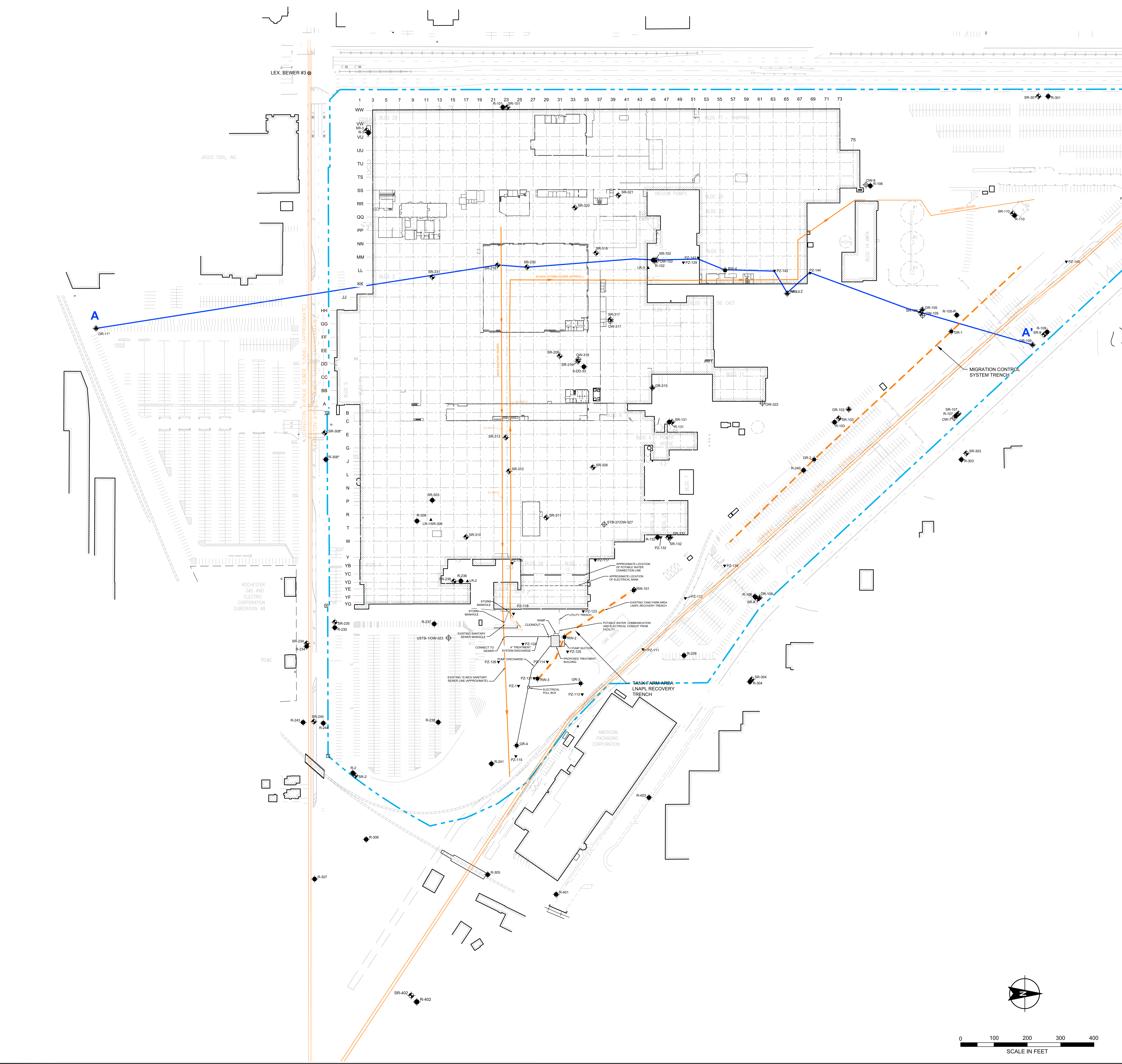
GMCH ROCHESTER FACILITY - SITE MANAGEMENT PLAN
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
NOVEMBER 2020

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\roc_common\Projects\70014\Global\GIS\Maps\2020_10\127982_105_0001_PROJECT_LOCUS.mxd — USER: anichols — LAST SAVED: 10/22/2020 3:16:27 PM



MAP NOTES

1. BASE MAP PREPARED IN DECEMBER 1997 FROM AN ELECTRONIC COPY OF A DRAWING DERIVED FROM DELPHI AUTOMOTIVE SYSTEMS, LX_SITE, UNDATED.
2. WELL LOCATIONS HAVE BEEN ADJUSTED WHERE NECESSARY TO CORRESPOND WITH SITE FEATURES ON THE MAP. ALL LOCATIONS ARE APPROXIMATE.
3. LOCATION OF CITY OF ROCHESTER SEWER TUNNEL DETERMINED BY MONROE COUNTY DIVISION OF PURE WATER PERSONNEL DURING TUNNEL SURVEY PERFORMED 3 MAY 1991. LOCATIONS SHOWN ARE APPROXIMATE.
4. LOCATIONS SHOWN FOR WELLS DR-11, SR-103, R-103, DR-103, PZ-125, SR-308 AND R-308 ARE APPROXIMATED RELATIVE TO FENCELINES. LOCATION OF WELL LR-3 IS APPROXIMATE RELATIVE TO BUILDING WALL.
5. LOCATION OF GR-3 AND GR-4 ARE APPROXIMATE.
6. REFER TO TEXT FOR ADDITIONAL INFORMATION.

HALEY ALDRICH

GM ROCHESTER FACILITY - SITE MANAGMENT PLAN
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

SITE LAYOUT PLAN

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 2

ERVIN, DAYNA Printed: 11/9/2020 1:19 PM Layout: E017
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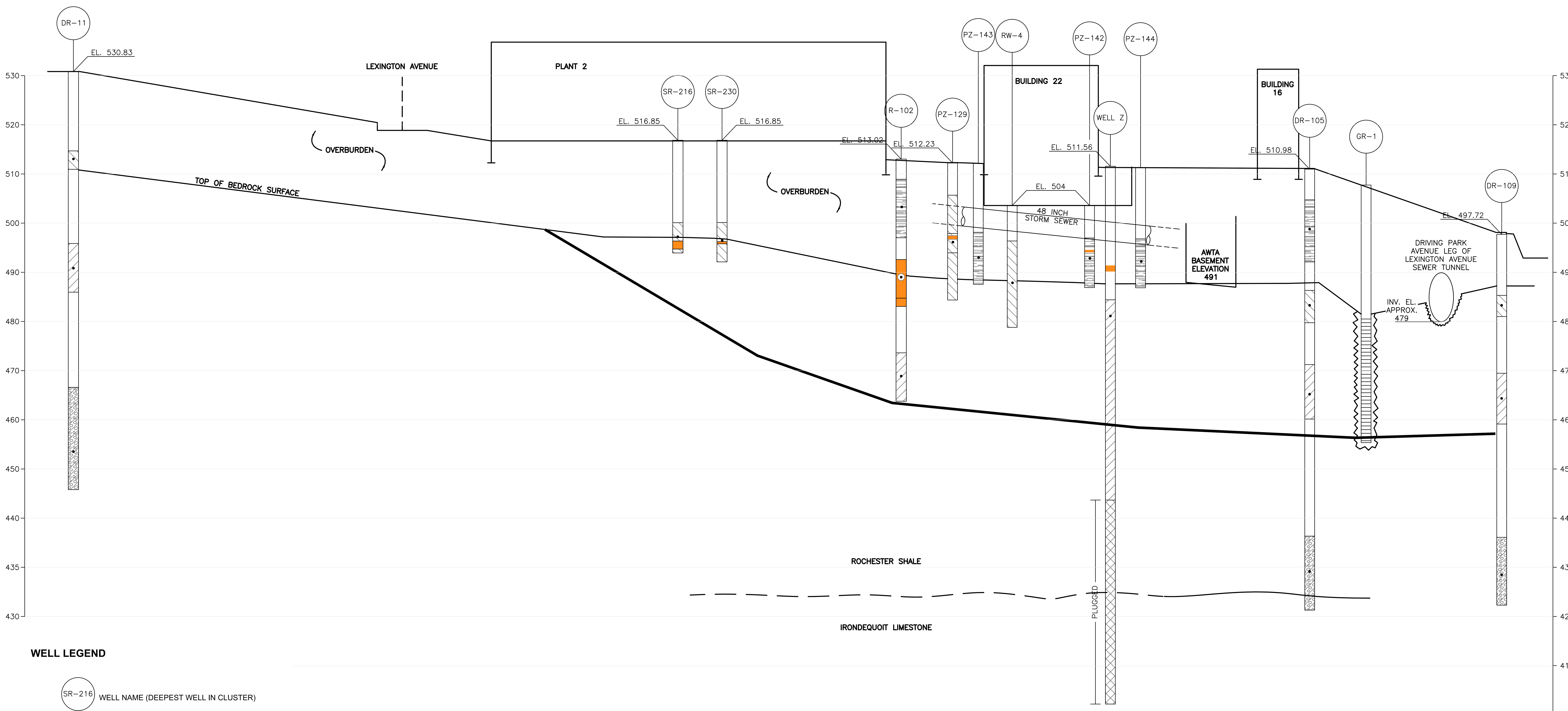


WELL LEGEND

SR-216 WELL NAME (DEEPEST WELL IN CLUSTER)

EL. 516.85 GROUND SURFACE ELEVATION

OVERBURDEN MONITORING INTERVAL

SHALLOW BEDROCK WELL MONITORING INTERVAL

LNAPL

INTERMEDIATE BEDROCK WELL MONITORING INTERVAL

DEEP BEDROCK WELL MONITORING INTERVAL

MONITORING INTERVAL MIDPOINT

RECOVERY WELL WITHIN BLASTED BEDROCK TRENCH

HORIZ. 0 100 200 300 400

VERT. 0 10 20 30 40

SCALE IN FEET

LEGEND

APPARENT EXTENT OF ON-SITE CHLORINATED VOCs PLUME

NOTES

1. REFER TO TEXT FOR ADDITIONAL INFORMATION.

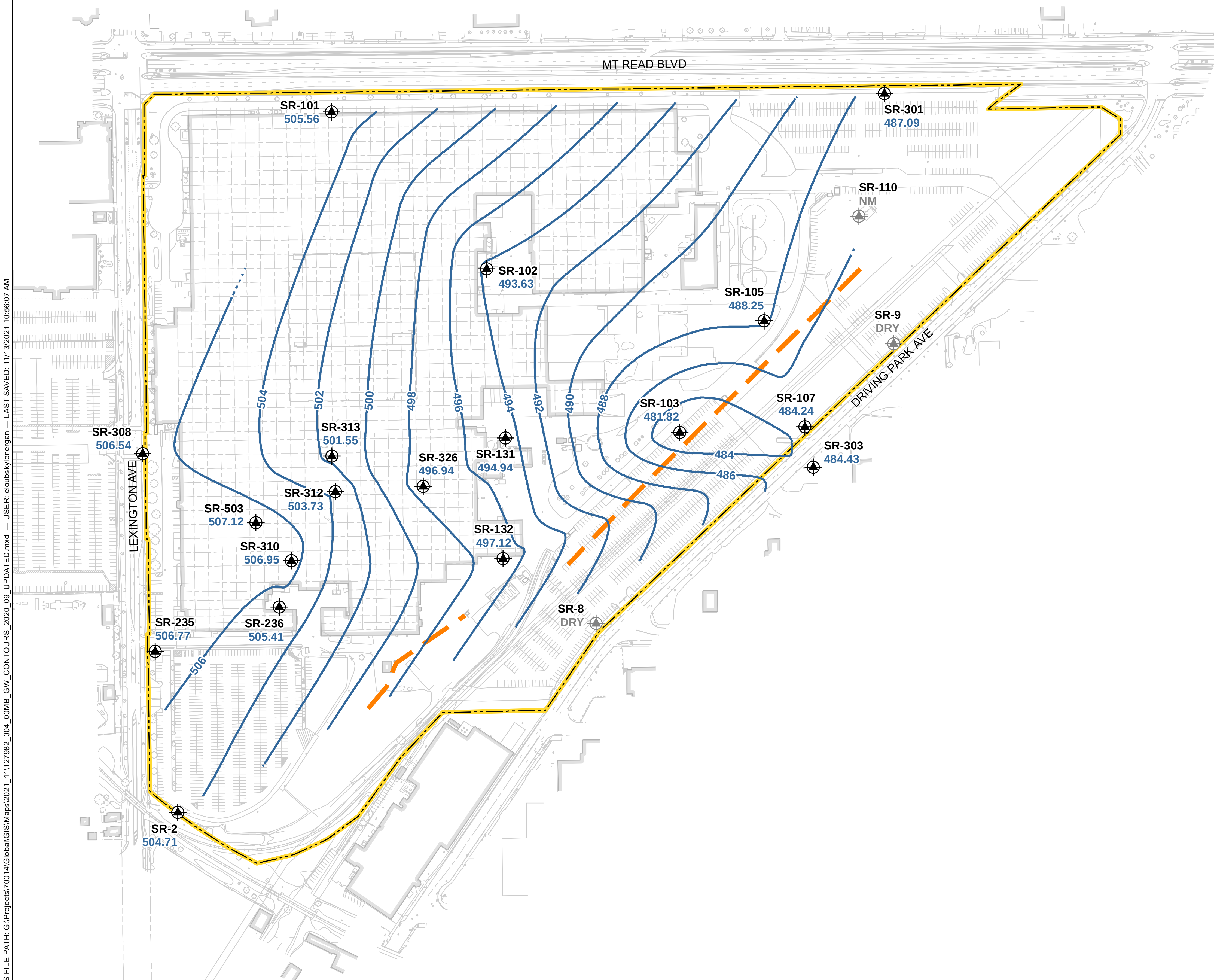
HALEY ALDRICH

GMCH ROCHESTER FACILITY - SITE MANAGEMENT PLAN
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

CROSS SECTION A - A'

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 3



LEGEND

- MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
- MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (ELEVATION NOT USED IN CONTOURING)
- GROUNDWATER ELEVATION CONTOUR, IN FEET ABOVE MEAN SEA LEVEL
- BLASTED BEDROCK TRENCH
- SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED 14 THROUGH 17 SEPTEMBER 2020
3. BASE MAP SOURCE: DELPHI AUTOMOTIVE SYSTEMS
4. NM = NOT MEASURED

0 300 600
SCALE IN FEET

HALEY ALDRICH

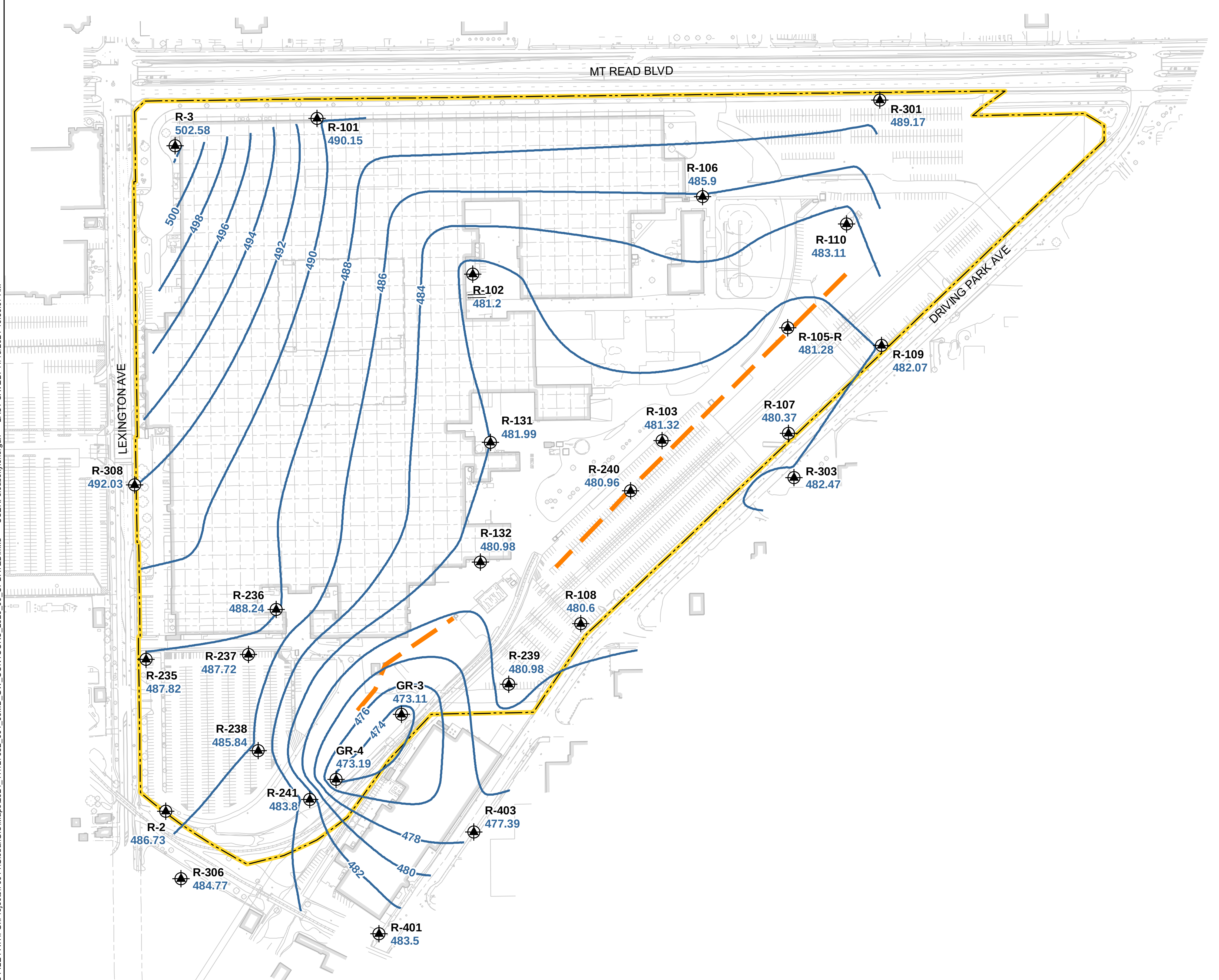
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

GROUNDWATER CONTOURS
SHALLOW BEDROCK ZONE
SEPTEMBER 2020

MARCH 2022

FIGURE 4

GIS FILE PATH: G:\Projects\70014\Global\GIS\Maps\2021_11\127982_004_00MB_GW_CONTOURS_2020_09_UPDATED.mxd — USER: eloubskylonergan — LAST SAVED: 11/13/2021 10:56:07 AM



LEGEND

MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

GROUNDWATER ELEVATION CONTOUR, IN FEET ABOVE MEAN SEA LEVEL

BLASTED BEDROCK TRENCH

SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED 14 THROUGH 17 SEPTEMBER 2020
3. BASE MAP SOURCE: DELPHI AUTOMOTIVE SYSTEMS

0 300 600
SCALE IN FEET

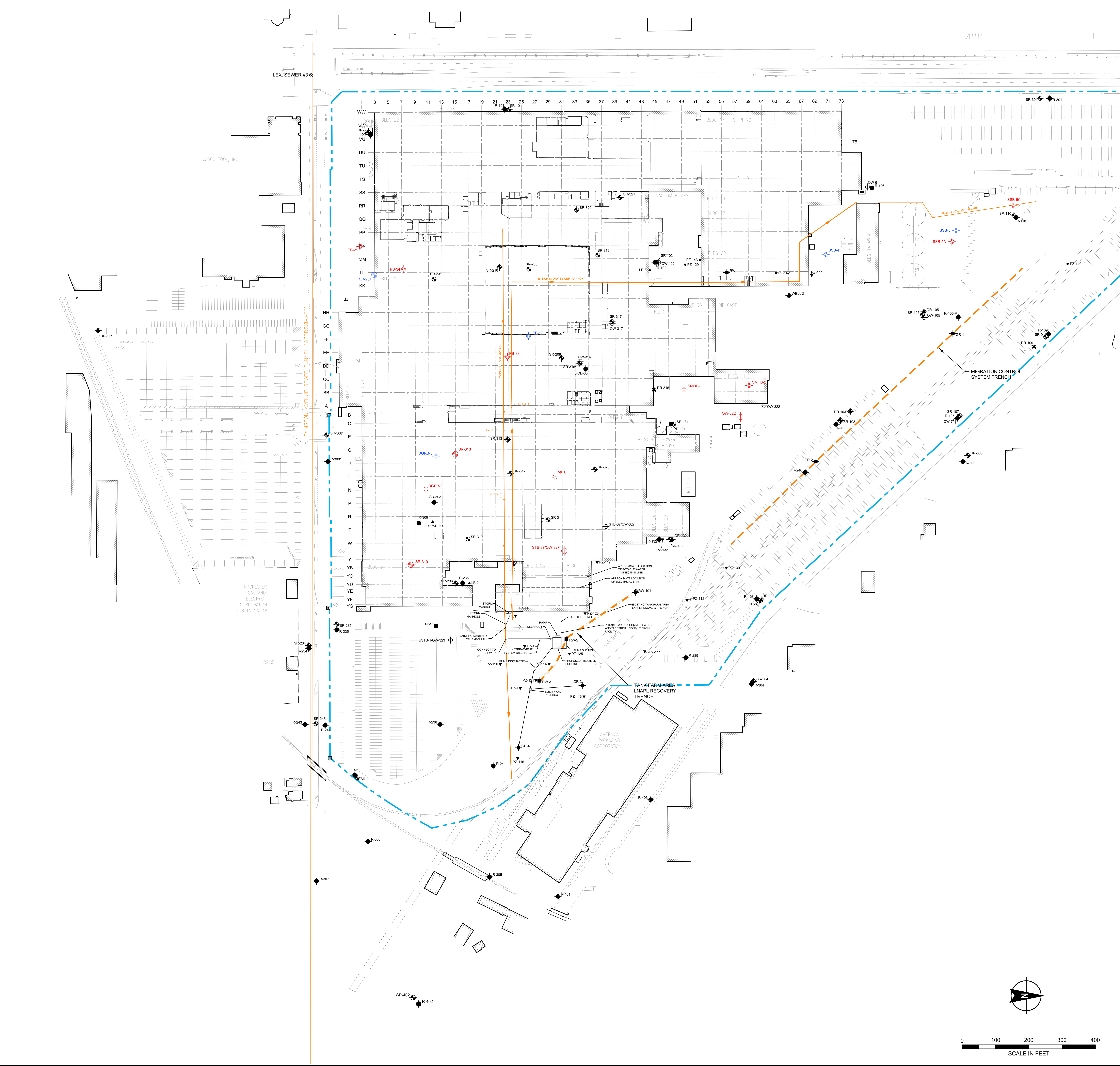
HALEY ALDRICH

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

GROUNDWATER CONTOURS
INTERMEDIATE BEDROCK ZONE
SEPTEMBER 2020

MARCH 2022

FIGURE 5



LEGEND

SAMPLE LOCATIONS IN RED EXCEED BCP INDUSTRIAL AND COMMERCIAL SCOs.

SAMPLE LOCATIONS IN BLUE EXCEED BCP COMMERCIAL SCOs.

- SITE BOUNDARY (PROPERTY LINE)
- LOCATION OF BLASTED BEDROCK TRENCH
- LOCATION OF FLOATING PRODUCT RECOVERY TRENCH
- LOCATION OF MAIN SANITARY SEWER
- OW-7 OVERBURDEN WELL
- SR-2 SHALLOW BEDROCK WELL
- R-107 INTERMEDIATE BEDROCK WELL
- DR-109 DEEP BEDROCK WELL
- RW-3 RECOVERY WELL (FLOATING PRODUCT); GR-1 RECOVERY WELL (GROUNDWATER)
- PZ-111 PIEZOMETER
- LR-2 LNAPL RECOVERY WELL

MAP NOTES

1. BASE MAP PREPARED IN DECEMBER 1997 FROM AN ELECTRONIC COPY OF A DRAWING DERIVED FROM DELPHI AUTOMOTIVE SYSTEMS, LX_SITE, UNDATED.
2. PREVIOUS MONITORING, RECOVERY WELL, PIEZOMETER AND P.K. NAIL LOCATIONS SURVEYED BY BERGMANN ASSOCIATES USING THE NORTHING AND EASTING GRID FOR THE SITE PREPARED BY LOCKWOOD SUPPORT SERVICES, INC. LOCATIONS OF WELLS SHOWN ON THIS PLAN HAVE BEEN ADJUSTED WHERE NECESSARY TO MAKE LOCATIONS OF THE WELLS CORRESPOND WITH LOCATIONS OF SITE FEATURES SHOWN ON THE MAP. ALL WELL LOCATIONS ARE APPROXIMATE.
3. LOCATIONS SHOWN FOR WELLS DR-11, SR-103, R-103,DR-103,PZ-122, PZ-125, SR-308 AND R-308 ARE APPROXIMATED RELATIVE TO FENCELINES. LOCATION OF WELL R-302 IS APPROXIMATE RELATIVE TO EDGE OF ROAD. ACTUAL SURVEY COORDINATES DIFFER.
4. TEST BORING AND MONITORING WELL LOCATIONS SHOWN ARE BASED ON TAPE MEASUREMENTS BY HALEY & ALDRICH USING BUILDING COLUMN LINE OR OTHER REFERENCES. ALL LOCATIONS ARE APPROXIMATE.
5. LOCATION OF GR-3 AND GR-4 ARE APPROXIMATE.
6. REFER TO TEXT FOR ADDITIONAL INFORMATION.

HALEY ALDRICH

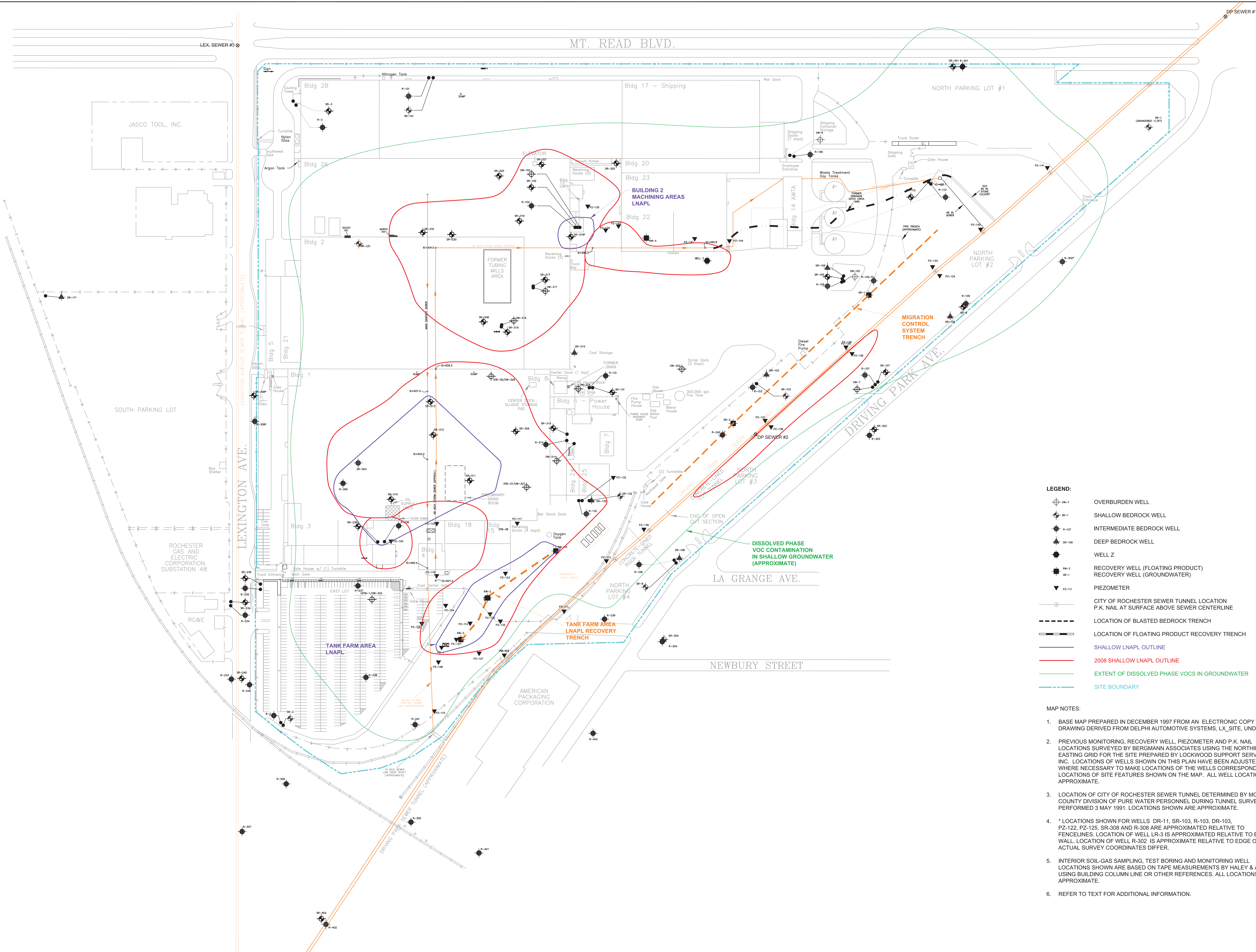
GM ROCHESTER FACILITY - SITE MANAGMENT PLAN
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

SOIL COC CONCENTRATIONS GREATER THAN PART 375-6 INDUSTRIAL AND COMMERICAL SCOs

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 6

ERVIN, DAYNA Printed: 11/9/2020 1:31 PM Layout: SOIL COC
\\HALEYALDRICH.COM\SHARE\ROC_COMMON\127982_GMCH LEXINGTON\2020\CAD\127982-004-E014.DWG



LEGEND:

- OVERBURDEN WELL
- SHALLOW BEDROCK WELL
- INTERMEDIATE BEDROCK WELL
- DEEP BEDROCK WELL
- WELL Z
- RECOVERY WELL (FLOATING PRODUCT)
  RECOVERY WELL (GROUNDWATER)
- PIEZOMETER
- CITY OF ROCHESTER SEWER TUNNEL LOCATION
  P.K. NAIL AT SURFACE ABOVE SEWER CENTERLINE
- LOCATION OF BLASTED BEDROCK TRENCH
- LOCATION OF FLOATING PRODUCT RECOVERY TRENCH
- SHALLOW LNAPL OUTLINE
- 2008 SHALLOW LNAPL OUTLINE
- EXTENT OF DISSOLVED PHASE VOCS IN GROUNDWATER
- SITE BOUNDARY

MAP NOTES:

1. BASE MAP PREPARED IN DECEMBER 1997 FROM AN ELECTRONIC COPY OF A DRAWING DERIVED FROM DELPHI AUTOMOTIVE SYSTEMS, LX_SITE, UNDATED.
2. PREVIOUS MONITORING, RECOVERY WELL, PIEZOMETER AND P.K. NAIL LOCATIONS SURVEYED BY BERGMANN ASSOCIATES USING THE NORTHING AND EASTING GRID FOR THE SITE PREPARED BY LOCKWOOD SUPPORT SERVICES, INC. LOCATIONS OF WELLS SHOWN ON THIS PLAN HAVE BEEN ADJUSTED WHERE NECESSARY TO MAKE LOCATIONS OF THE WELLS CORRESPOND WITH LOCATIONS OF SITE FEATURES SHOWN ON THE MAP. ALL WELL LOCATIONS ARE APPROXIMATE.
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4. * LOCATIONS SHOWN FOR WELLS DR-11, SR-103, R-103, DR-103, PZ-122, PZ-125, SR-308 AND R-308 ARE APPROXIMATED RELATIVE TO FENCELINES. LOCATION OF WELL LR-3 IS APPROXIMATED RELATIVE TO BUILDING WALL. LOCATION OF WELL R-302 IS APPROXIMATE RELATIVE TO EDGE OF ROAD. ACTUAL SURVEY COORDINATES DIFFER.
5. INTERIOR SOIL-GAS SAMPLING, TEST BORING AND MONITORING WELL LOCATIONS SHOWN ARE BASED ON TAPE MEASUREMENTS BY HALEY & ALDRICH USING BUILDING COLUMN LINE OR OTHER REFERENCES. ALL LOCATIONS ARE APPROXIMATE.
6. REFER TO TEXT FOR ADDITIONAL INFORMATION.

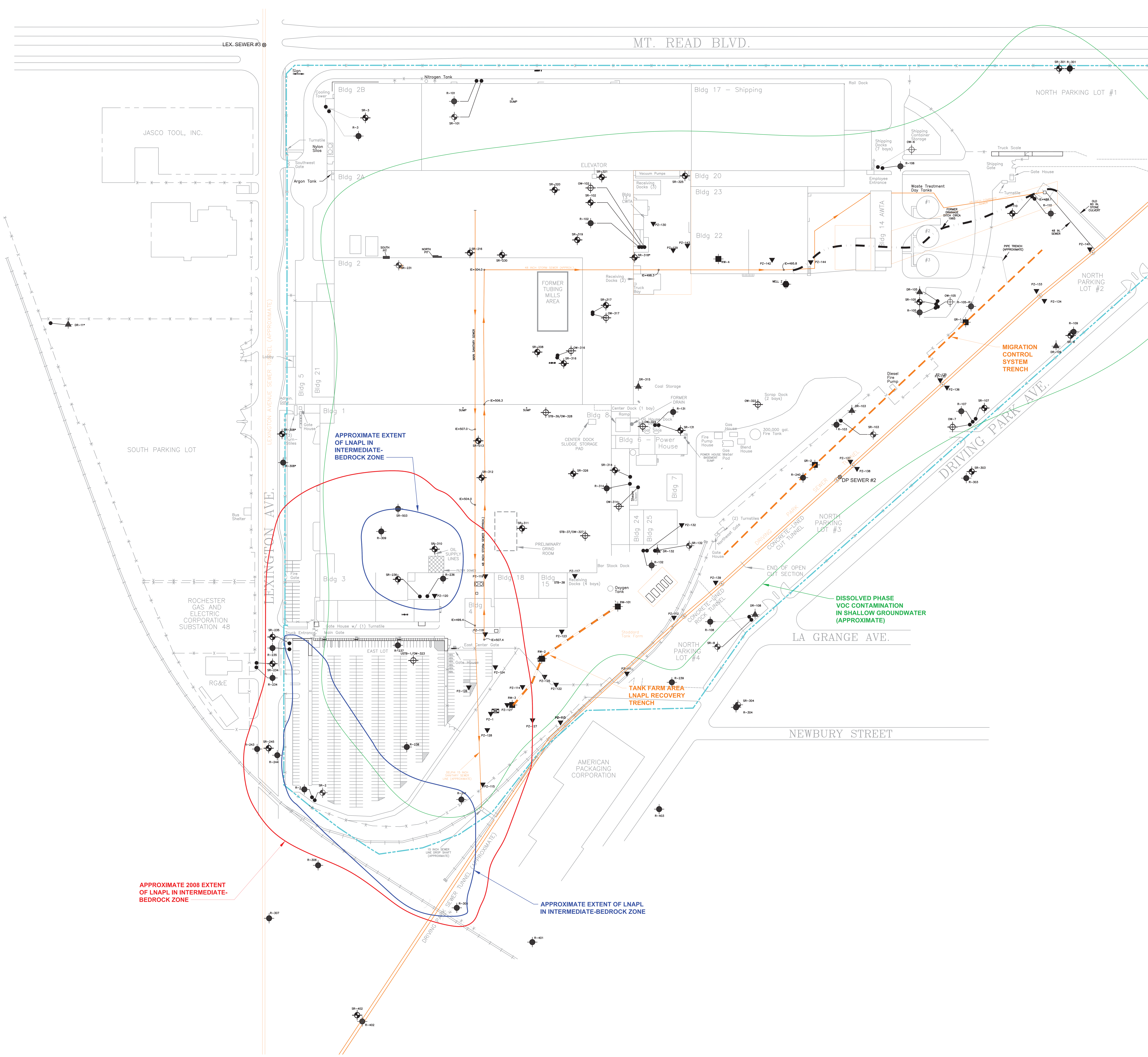
HALEY ALDRICH

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE, ROCHESTER, NEW YORK
SITE MANAGEMENT PLAN

OVERBURDEN/SHALLOW BEDROCK LNAPL PLUME

SCALE: AS SHOWN
MARCH 2022

FIGURE 7



LEGEND:

- OVERBURDEN WELL
- SHALLOW BEDROCK WELL
- INTERMEDIATE BEDROCK WELL
- DEEP BEDROCK WELL
- WELL Z
- RECOVERY WELL (FLOATING PRODUCT)
  RECOVERY WELL (GROUNDWATER)
- PIEZOMETER
- CITY OF ROCHESTER SEWER TUNNEL LOCATION
  P.K. NAIL AT SURFACE ABOVE SEWER CENTERLINE
- LOCATION OF BLASTED BEDROCK TRENCH
- LOCATION OF FLOATING PRODUCT RECOVERY TRENCH
- INTERMEDIATE BEDROCK LNAPL OUTLINE
- 2008 INTERMEDIATE BEDROCK LNAPL OUTLINE
- SITE BOUNDARY
- AOI LOCATION
- EXTENT OF DISSOLVED PHASE VOCS IN GROUNDWATER

MAP NOTES:

1. BASE MAP PREPARED IN DECEMBER 1997 FROM AN ELECTRONIC COPY OF A DRAWING DERIVED FROM DELPHI AUTOMOTIVE SYSTEMS, LX_SITE, UNDATED.
2. PREVIOUS MONITORING, RECOVERY WELL, PIEZOMETER AND P.K. NAIL LOCATIONS SURVEYED BY BERGMANN ASSOCIATES USING THE NORTHING AND EASTING GRID FOR THE SITE PREPARED BY LOCKWOOD SUPPORT SERVICES, INC. LOCATIONS OF WELLS SHOWN ON THIS PLAN HAVE BEEN ADJUSTED WHERE NECESSARY TO MAKE LOCATIONS OF THE WELLS CORRESPOND WITH LOCATIONS OF SITE FEATURES SHOWN ON THE MAP. ALL WELL LOCATIONS ARE APPROXIMATE.
3. LOCATION OF CITY OF ROCHESTER SEWER TUNNEL DETERMINED BY MONROE COUNTY DIVISION OF PURE WATER PERSONNEL DURING TUNNEL SURVEY PERFORMED 3 MAY 1991. LOCATIONS SHOWN ARE APPROXIMATE.
4. * LOCATIONS SHOWN FOR WELLS SR-11, R-11, DR-11, SR-103, R-103, DR-103, PZ-122, PZ-125, SR-308 AND R-308 ARE APPROXIMATED RELATIVE TO FENCELINES. LOCATION OF WELL SR-318 IS APPROXIMATED RELATIVE TO BUILDING WALL. LOCATION OF WELL R-302 IS APPROXIMATED RELATIVE TO EDGE OF ROAD. ACTUAL SURVEY COORDINATES DIFFER.
5. INTERIOR SOIL-GAS SAMPLING, TEST BORING AND MONITORING WELL LOCATIONS SHOWN ARE BASED ON TAPE MEASUREMENTS BY HALEY & ALDRICH USING BUILDING COLUMN LINE OR OTHER REFERENCES. ALL LOCATIONS ARE APPROXIMATE.
6. REFER TO TEXT FOR ADDITIONAL INFORMATION.

HALEY ALDRICH

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE, ROCHESTER, NEW YORK
SITE MANAGEMENT PLAN

INTERMEDIATE BEDROCK LNAPL PLUME

SCALE: AS SHOWN
MARCH 2022

FIGURE 8

Printed: 3/15/2022 10:03 AM Sheet: E021
Saved by: DTE
\\HALEYALDRICH.COM\SHARE\ROC_COMMON\127982_GMCH LEXINGTON\2022\CAD\127982-101-E021.DWG

LEGEND

- COLUMN LINE
- SUB SLAB SOIL VAPOR/ INDOOR AIR SAMPLING LOCATIONS
- INDOOR AIR SAMPLING LOCATION ONLY
- AMBIENT AIR SAMPLING LOCATIONS

NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. REFERENCE FILE FOR THE DRAWING AS PROVIDED BY GMCH FACILITY ENGINEERING 2014.
3. SUBSLAB AND INDOOR AIR SAMPLING COMPLETED IN FEBRUARY 2021
4. AMBIENT OUTDOOR AIR SAMPLE LOCATIONS ARE APPROXIMATE AND WERE COLLECTED UPWIND OF THE FACILITY CONCURRENTLY WITH THE COLLECTION OF INDOOR AIR/SUB-SLAB VAPOR SAMPLES TO EVALUATE BACKGROUND CONDITIONS.

0 160 320
SCALE IN FEET

HALEY ALDRICH

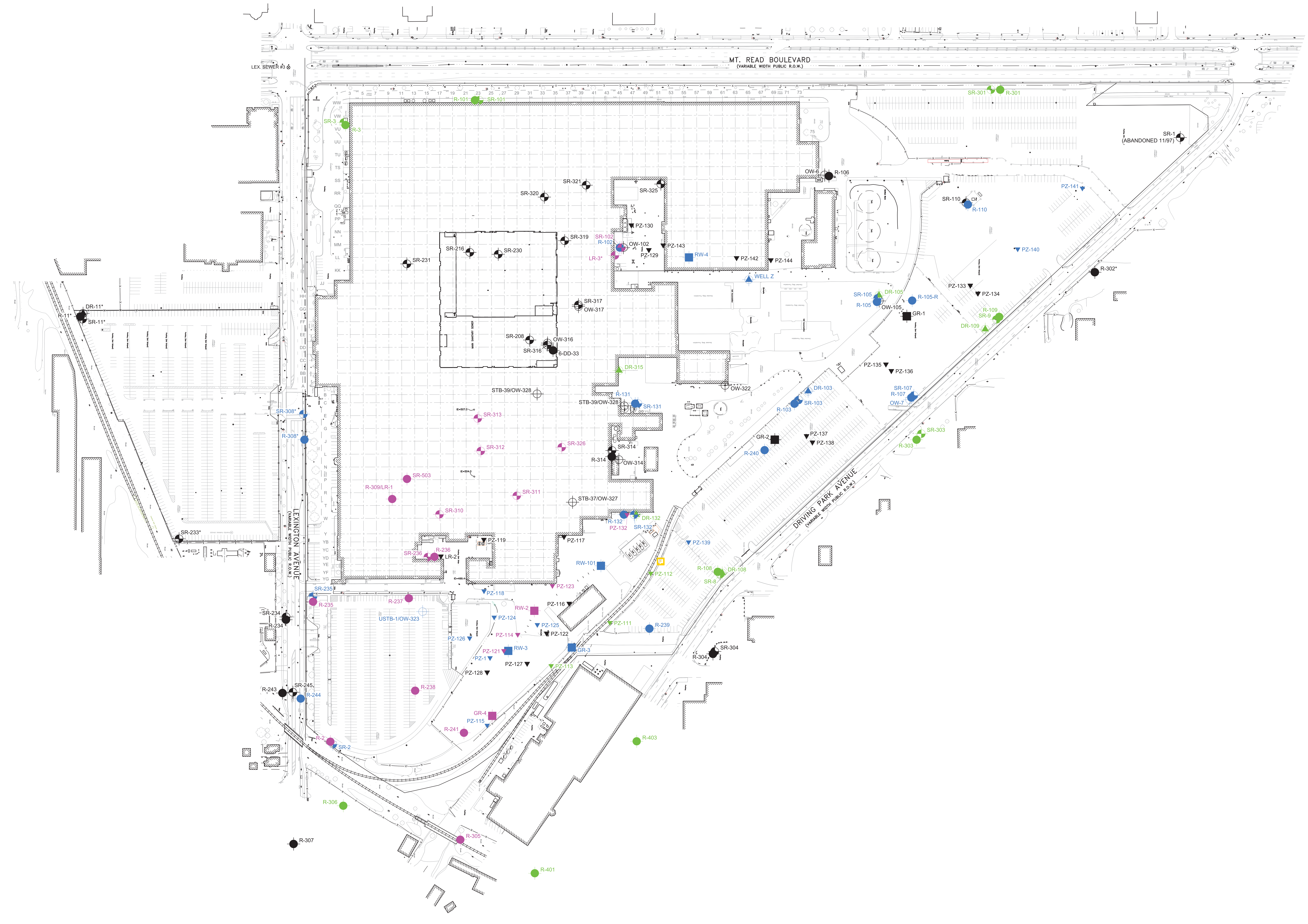
DELPHI AUTOMOTIVE SYSTEMS SITE #828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

INDOOR AIR AND SUB SLAB SOIL VAPOR SAMPLE LOCATIONS

SCALE: AS SHOWN
MARCH 2022

FIGURE 9

SANGER, JONATHAN Printed: 7/1/2021 4:52 PM Layout: B009
\\HALEYALDRICH.COM\SHARE\ROC_COMMON\PROJECTS\70014\120 - RWP\APPENDIX B - IA QUALITY WORK PLAN\FIGURES\ACAD\127982-009-B009_F.DWG



LEGEND

- MEASURE WATER LEVEL ONLY
- MEASURE WATER LEVEL AND LNAPL LEVEL
- MEASURE WATER LEVEL AND COLLECT SAMPLE
- NO MEASUREMENT OR SAMPLE REQUIRED

HALEY ALDRICH

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

MONITORING WELL LOCATIONS

MONITORING WELL LOCATIONS
MARCH 2022

FIGURE 10

LIBBY, PAT
\\ROC\COMMON\PROJECTS\70014122\CAD\70014-122_WELL_SMPL_PLAN.DWG
Printed: 1/25/2016 10:20 AM Layout: FIG-1

LEGEND

- SITE FENCE LINE
- SITE BOUNDARY
- ASPHALT
- GRAVEL
- LAWN

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AWTA = AUXILLARY WASTE TREATMENT AREA
3. EWTA: EAST SIDE WASTE TREATMENT AREA
4. BASE MAP SOURCE: NEARMAP, DECEMBER 2021

N

0 325 650
SCALE IN FEET

HALEY ALDRICH

DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

SURFACE SOIL COVER SYSTEM

SEPTEMBER 2022

FIGURE 11

GIS FILE PATH: G:\Projects\70014\Global\GIS\Maps\2022_09\127982_004_0001_SURF_SOIL_COVER_SYSTEM.mxd — USER: kbartlett — LAST SAVED: 9/30/2022 3:11:02 PM

APPENDIX A – ENVIRONMENTAL EASEMENT / SURVEY

MONROE COUNTY CLERK'S OFFICE

THIS IS NOT A BILL. THIS IS YOUR RECEIPT.

Receipt # 3206106

Book Page D 12725 0001

No. Pages: 12

Instrument: EASEMENT AGREEMENT

Control #: 202209260913
Ref #: TT0000003956

Date: 09/26/2022

Time: 4:13:50 PM

Return To:
AMROCK, LLC - COMMERCIAL
662 WOODWARD AVE.
DETROIT, MI 48226

GM COMPONENTS HOLDINGS LLC,

PEOPLE OF THE STATE OF NEW YORK,

Recording Fee	$26.00
Pages Fee	$55.00
State Fee Cultural Education	$14.25
State Fee Records Management	$4.75
TP-584 Form Fee	$5.00
Total Fees Paid:	$105.00

Employee: RRR

State of New York

MONROE COUNTY CLERK'S OFFICE
WARNING – THIS SHEET CONSTITUTES THE CLERKS ENDORSEMENT, REQUIRED BY SECTION 317-a(5) & SECTION 319 OF THE REAL PROPERTY LAW OF THE STATE OF NEW YORK. DO NOT DETACH OR REMOVE.

Consideration: $0.00

JAMIE ROMEO

MONROE COUNTY CLERK

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

Prepared by and Return To:

General Motors LLC
Legal Staff
300 Renaissance Center
Mail Code: 482-C25-A68
Detroit, MI 48265
Attn: Ingrid Szura

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 8th day of September, 2022 between Owner, GM Components Holdings, LLC (GMCH), having an office at 300 Renaissance Center, 19th Fl., Detroit, Michigan, 48265 (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 1000 Lexington Ave. in the City of Rochester, County of Monroe and State of New York, known and designated on the tax map of the County Clerk of Monroe as tax map parcel number: Section #090.790, Block 0001, Lot 001.002, being a portion of the property conveyed to Grantor by deed dated October 6, 2009 and recorded in the Monroe County Clerk's Office in Liber and Page 10802/483. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 86.701 +/- acres, and is hereinafter more fully described in the Land Title Survey dated October 14, 2020 prepared by John E. McIntosh III of McIntosh & McIntosh, P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Order on Consent Index Number: B8-0531-98-06, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii)
and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Monroe County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

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

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: 828064
Office of General Counsel
NYSDEC
625 Broadway, 14th Fl
Albany New York 12233-1500

With a copy to:

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

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

GM Components Holdings, LLC (GMCH)

By: General Motors LLC, its member

By: Debra H. Hoge

Print Name: Debra H. Hoge

Title: Global Director Real Estate Date: Aug 25, 2022

Grantor's Acknowledgment

STATE OF MICHIGAN)
) ss:
COUNTY OF WAYNE)

On the 25th day of August, in the year 2022, before me, the undersigned personally appeared Debra H. Hoge, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kathleen M. Rentenbach
Notary Public - State of Michigan

KATHLEEN M. RENTENBACH
NOTARY PUBLIC, STATE OF MI
COUNTY OF WAYNE
MY COMMISSION EXPIRES Sep 22, 2028
ACTING IN COUNTY OF Wayne

County: Monroe Site No: 828064 Order on Consent Index : B8-0531-98-06

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting by and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: Andrew Guglielmi
Andrew Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 8th day of September in the year 2022 before me, the undersigned, personally appeared Andrew Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Jennifer Andaloro
Notary Public - State of New York

JENNIFER ANDALORO
Notary Public, State of New York
No. 02AN6098246
Qualified in Albany County
Commission Expires January 14, 2024

SCHEDULE "A" PROPERTY DESCRIPTION

Legal Description 86.701± Acres

Job No. M-4366

ALL THAT TRACT OR PARCEL OF LAND situate in the City of Rochester, County of Monroe, State of New York and being part of Town Lot 72 of the 20,000 Acre Tract, bounded and described as follows:
BEGINNING AT A POINT on the easterly line of Mt. Read Boulevard (variable width R.O.W.) where the same is intersected by the northerly line of Lexington Avenue (variable width R.O.W.), and from said beginning point running thence:
RUNNING THENCE the following courses along the easterly line of Mt. Read Boulevard:

1. N-00° -28'-03"-W a distance of 2471.63 feet to a point;
2. S-36°-37'-11"-E a distance of 91.38 feet to a point;
3. S-42°-24'-06"-E a distance of 12.01 feet to a point;
4. N-00°-56'-03"-W a distance of 328.51 feet to a point;
5. N-31°-32'-13"-E a distance of 65.19 feet to a point;
6. N-89°-03'-57"-E a distance of 45.02 feet to a point on the southwesterly line of Driving Park Avenue (variable width R.O.W.);
7. S-43°-30'-22"-E, along said Driving Park Avenue, a distance of 2069.0 feet to a point;
8. S-55°-41'-18"-E, continuing along said Driving Park Avenue, a distance of 273.02 feet to a point;

RUNNING THENCE the following courses along the southerly line of Parcel 090.790-0001-003.001, lands n/f American Packaging Corp.:

1. S-00°-58'-12"-E a distance of 295.07 feet to a point;
2. S-46°-54'-48"-E a distance of 179.71 feet to a point;
3. S-54°-02'-14"-E a distance of 205.43 feet to a point;
4. S-36°-23'-14"-E a distance of 108.91 feet to a point;
5. S-24°-43'-22"-E a distance of 106.67 feet to a point;
6. S-13°-04'-09"-E a distance of 108.91 feet to a point on the northwesterly line of lands n/f Rochester & Southern Railroad;
7. S-28°-54'-11"-W, along said Railroad, a distance of 44.49 feet to a point;

8. Continuing along said Railroad along the arc of a tangent curve to the right with a radius of 1587.28 feet, an arc length of 320.48 feet to a point on the above referenced northerly line of Lexington Avenue,;

RUNNING THENCE the following courses along said northerly line of Lexington Avenue:

1. S-89°-11'-21"-W a distance of 450.38 feet to a point;
2. N-00°-48'-39"-W a distance of 5.00 feet to a point;
3. S-89°-11'-21"-W a distance of 273.50 feet to a point;
4. S-00°-48'-39"-E a distance of 5.00 feet to a point;
5. S-89°-11'-21"-W a distance of 305.00 feet to a point;
6. N-00°-48'-39"-W a distance of 5.00 feet to a point;
7. S-89°-11'-21"-W a distance of 737.00 feet to a point;
8. N-00°-48'-39"-W a distance of 5.00 feet to a point;
9. S-89°-11'-21"-W a distance of 202.80 feet to a point;
10. N-45°-47'-10"-W a distance of 42.41 feet to the POINT OR PLACE OF BEGINNING, containing 86.701 Acres, be the same, more or less.

Note: Explanation of Deviation of Easement Area from Land Parcel Records for Easement Area

The land acquisition located along the northerly line of Lexington Avenue in Liber 4561, Page 173, resulted in the reduction of approximately 40.0' along the corner of Mt. Read Boulevard in Map No. 110, Parcel No. 128 and the northerly line of Lexington Avenue. (see attached ordinance).

Parcel tax ID No. 105.23-1-1 located at 891 Lexington Ave as referred to in the quitclaim deed is not listed in the easement area description as this portion of the property was not included in the Record of Decision issued by the Department in March 31, 2011 and under Item 3 of the Order on Consent #B8-0531-98-06 dated September 18, 2020.

Legal Description 86.701± Acres

Job No. M-4366

ALL THAT TRACT OR PARCEL OF LAND situate in the City of Rochester, County of Monroe, State of New York and being part of Town Lot 72 of the 20,000 Acre Tract, bounded and described as follows:

BEGINNING AT A POINT on the easterly line of Mt. Read Boulevard (variable width R.O.W.) where the same is intersected by the northerly line of Lexington Avenue (variable width R.O.W.), and from said beginning point running thence:

RUNNING THENCE the following courses along the easterly line of Mt. Read Boulevard:

1. N-00° -28'-03"-W a distance of 2471.63 feet to a point;
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3. S-42°-24'-06"-E a distance of 12.01 feet to a point;
4. N-00°-56'-03"-W a distance of 328.51 feet to a point;
5. N-31°-32'-13"-E a distance of 65.19 feet to a point;
6. N-89°-03'-57"-E a distance of 45.02 feet to a point on the southwesterly line of Driving Park Avenue (variable width R.O.W.);
7. S-43°-30'-22"-E, along said Driving Park Avenue, a distance of 2069.0 feet to a point;
8. S-55°-41'-18"-E, continuing along said Driving Park Avenue, a distance of 273.02 feet to a point;

RUNNING THENCE the following courses along the southerly line of Parcel 090.790-0001-003.001, lands n/f American Packaging Corp.:

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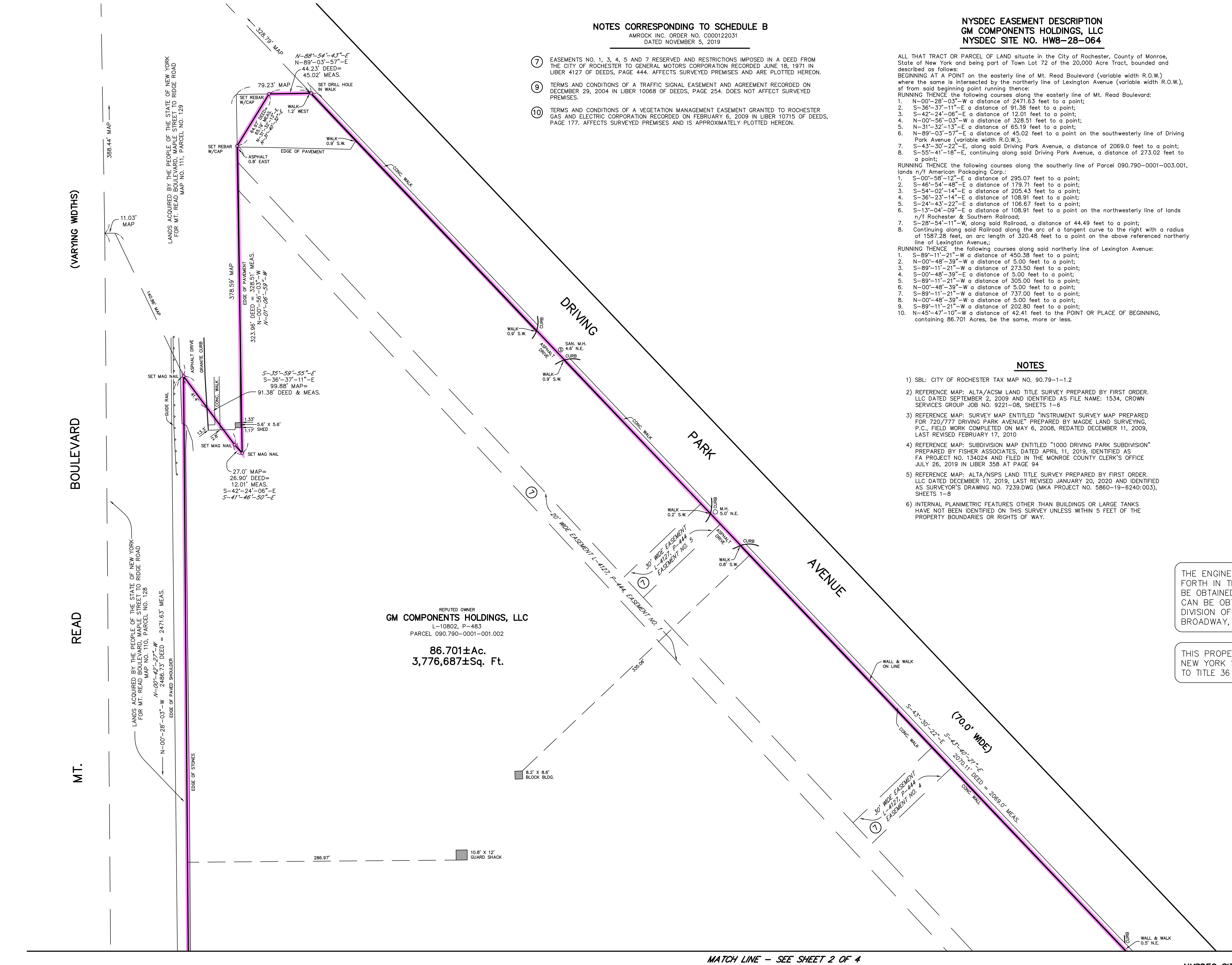
3. S-54°-02'-14"-E a distance of 205.43 feet to a point;
4. S-36°-23'-14"-E a distance of 108.91 feet to a point;
5. S-24°-43'-22"-E a distance of 106.67 feet to a point;
6. S-13°-04'-09"-E a distance of 108.91 feet to a point on the northwesterly line of lands n/f Rochester & Southern Railroad;
7. S-28°-54'-11"-W, along said Railroad, a distance of 44.49 feet to a point;
8. Continuing along said Railroad along the arc of a tangent curve to the right with a radius of 1587.28 feet, an arc length of 320.48 feet to a point on the above referenced northerly line of Lexington Avenue,;

RUNNING THENCE the following courses along said northerly line of Lexington Avenue:

1. S-89°-11'-21"-W a distance of 450.38 feet to a point;
2. N-00°-48'-39"-W a distance of 5.00 feet to a point;

3. S-89°-11'-21"-W a distance of 273.50 feet to a point;
4. S-00°-48'-39"-E a distance of 5.00 feet to a point;
5. S-89°-11'-21"-W a distance of 305.00 feet to a point;
6. N-00°-48'-39"-W a distance of 5.00 feet to a point;
7. S-89°-11'-21"-W a distance of 737.00 feet to a point;
8. N-00°-48'-39"-W a distance of 5.00 feet to a point;
9. S-89°-11'-21"-W a distance of 202.80 feet to a point;
10. N-45°-47'-10"-W a distance of 42.41 feet to the POINT OR PLACE OF BEGINNING, containing 86.701 Acres, be the same, more or less.



NOTES CORRESPONDING TO SCHEDULE B

AMROCK INC. ORDER NO. C000122031
DATED NOVEMBER 5, 2019

7. EASEMENTS NO. 1, 3, 4, 5 AND 7 RESERVED AND RESTRICTIONS IMPOSED IN A DEED FROM THE CITY OF ROCHESTER TO GENERAL MOTORS CORPORATION RECORDED JUNE 18, 1971 IN LIBER 4127 OF DEEDS, PAGE 444. AFFECTS SURVEYED PREMISES AND ARE PLOTTED HEREON.

9. TERMS AND CONDITIONS OF A TRAFFIC SIGNAL EASEMENT AND AGREEMENT RECORDED ON DECEMBER 29, 2004 IN LIBER 10068 OF DEEDS, PAGE 254. DOES NOT AFFECT SURVEYED PREMISES.

10. TERMS AND CONDITIONS OF A VEGETATION MANAGEMENT EASEMENT GRANTED TO ROCHESTER GAS AND ELECTRIC CORPORATION RECORDED ON FEBRUARY 6, 2009 IN LIBER 10715 OF DEEDS, PAGE 177. AFFECTS SURVEYED PREMISES AND IS APPROXIMATELY PLOTTED HEREON.

NYSDEC EASEMENT DESCRIPTION
GM COMPONENTS HOLDINGS, LLC
NYSDEC SITE NO. HW8-28-064

ALL THAT TRACT OR PARCEL OF LAND situate in the City of Rochester, County of Monroe, State of New York and being part of Town Lot 72 of the 20,000 Acre Tract, bounded and described as follows:
BEGINNING AT A POINT on the easterly line of Mt. Read Boulevard (variable width R.O.W.) where the same is intersected by the northerly line of Lexington Avenue (variable width R.O.W.), sf from said beginning point running thence:
RUNNING THENCE the following courses along the easterly line of Mt. Read Boulevard:
1. N-00°-28'-03"-W a distance of 2471.63 feet to a point;
2. S-36°-37'-11"-E a distance of 91.38 feet to a point;
3. S-42°-24'-06"-E a distance of 12.01 feet to a point;
4. N-00°-56'-03"-W a distance of 328.51 feet to a point;
5. N-31°-32'-13"-E a distance of 65.19 feet to a point;
6. N-89°-03'-57"-E a distance of 45.02 feet to a point on the southwesterly line of Driving Park Avenue (variable width R.O.W.);
7. S-43°-30'-22"-E, along said Driving Park Avenue, a distance of 2069.0 feet to a point;
8. S-55°-41'-18"-E, continuing along said Driving Park Avenue, a distance of 273.02 feet to a point;

RUNNING THENCE the following courses along the southerly line of Parcel 090.790-0001-003.001, lands n/f American Packaging Corp.:
1. S-00°-58'-12"-E a distance of 295.07 feet to a point;
2. S-46°-54'-48"-E a distance of 179.71 feet to a point;
3. S-54°-02'-14"-E a distance of 205.43 feet to a point;
4. S-36°-23'-14"-E a distance of 108.91 feet to a point;
5. S-24°-43'-22"-E a distance of 106.67 feet to a point;
6. S-13°-04'-09"-E a distance of 108.91 feet to a point on the northwesterly line of lands n/f Rochester & Southern Railroad;
7. S-28°-54'-11"-W, along said Railroad, a distance of 44.49 feet to a point;
8. Continuing along said Railroad along the arc of a tangent curve to the right with a radius of 1587.28 feet, an arc length of 320.48 feet to a point on the above referenced northerly line of Lexington Avenue,;

RUNNING THENCE the following courses along said northerly line of Lexington Avenue:
1. S-89°-11'-21"-W a distance of 450.38 feet to a point;
2. N-00°-48'-39"-W a distance of 5.00 feet to a point;
3. S-89°-11'-21"-W a distance of 273.50 feet to a point;
4. S-00°-48'-39"-E a distance of 5.00 feet to a point;
5. S-89°-11'-21"-W a distance of 305.00 feet to a point;
6. N-00°-48'-39"-W a distance of 5.00 feet to a point;
7. S-89°-11'-21"-W a distance of 737.00 feet to a point;
8. N-00°-48'-39"-W a distance of 5.00 feet to a point;
9. S-89°-11'-21"-W a distance of 202.80 feet to a point;
10. N-45°-47'-10"-W a distance of 42.41 feet to the POINT OR PLACE OF BEGINNING, containing 86.701 Acres, be the same, more or less.

RECORD DESCRIPTION
L-10802, P-483

PARCEL 090.790-0001-001.002

Beginning at a point on the easterly line of Mt. Read Boulevard (variable width R.O.W.) where the same is intersected by the northerly line of Lexington Avenue (variable width R.O.W.), and from said beginning point running thence:
Running the following courses along the easterly line of Mt. Read Boulevard:
1. North 00°42'27" West a distance of 2486.73 feet to a point, thence
2. South 35°59'55" East a distance of 91.38 feet to a point, thence
3. South 41°46'50" East a distance of 26.90 feet to a point, thence
4. North 01°06'59" West a distance of 323.96 feet to a point, thence
5. North 31°40'32" East a distance of 64.97 feet to a point, thence
6. North 88°54'43" East a distance of 44.23 feet to a point on the southwesterly line of Driving Park Avenue (variable width R.O.W.), thence
7. Along said Driving Park Avenue, South 43°40'21" East a distance of 2070.11 feet to a point, thence
8. Continuing along said Driving Park Avenue, South 55°54'42" East a distance of 270.06 feet to a point, thence

Running the following courses along the southerly line of Parcel 090.790-0001-003.001, lands n/f American Packaging Corp.:
9. South 01°11'23" East a distance of 295.07 feet to a point, thence
10. South 47°07'29" East a distance of 179.71 feet to a point, thence
11. South 54°15'44" East a distance of 205.43 feet to a point, thence
12. South 36°35'46" East a distance of 108.91 feet to a point, thence
13. South 24°56'33" East a distance of 106.67 feet to a point, thence
14. South 13°17'20" East a distance of 108.91 feet to a point on the northwesterly line of lands n/f Rochester & Southern Railroad, thence
15. Along said Railroad, South 28°41'00" West a distance of 45.25 feet to a point, thence
16. Continuing along said Railroad along the arc of a tangent curve to the right with a with a radius of 1587.28 feet, turning a central angle of 11°46'45", for an arc length of 326.32 feet, the chord of which bears South 34°34'23" West for a distance of 325.75 feet to a rail monument found on the above referenced northerly line of Lexington Avenue, thence;

Running the following courses along said northerly line of Lexington Avenue:
17. South 89°10'51" West a distance of 450.26 feet to a point, thence
18. North 00°49'08" West a distance of 5.00 feet to a point, thence
19. South 89°10'52" West a distance of 273.50 feet to a point, thence
20. South 00°49'08" West a distance of 5.00 feet to a point, thence
21. South 89°10'52" West a distance of 305.00 feet to a brass monument found, thence
22. North 00°49'08" West a distance of 5.00 feet to a point, thence
23. South 89°10'52" West a distance of 737.00 feet to a drill hole found, thence
24. North 00°49'08" West a distance of 5.00 feet to a point, thence
25. South 89°10'52" West a distance of 202.80 feet to a point, thence
26. North 45°47'39" West a distance of 42.41 feet to the point and place of beginning.

Containing 3,793,907 square feet or 87.0961 acres of land.

NOTES

1) SBL: CITY OF ROCHESTER TAX MAP NO. 90.79-1-1.2
2) REFERENCE MAP: ALTA/ACSM LAND TITLE SURVEY PREPARED BY FIRST ORDER. LLC DATED SEPTEMBER 2, 2009 AND IDENTIFIED AS FILE NAME: 1534, CROWN SERVICES GROUP JOB NO. 9221-08, SHEETS 1-6
3) REFERENCE MAP: SURVEY MAP ENTITLED "INSTRUMENT SURVEY MAP PREPARED FOR 720/777 DRIVING PARK AVENUE" PREPARED BY MAGDE LAND SURVEYING, P.C., FIELD WORK COMPLETED ON MAY 6, 2008, REDATED DECEMBER 11, 2009, LAST REVISED FEBRUARY 17, 2010
4) REFERENCE MAP: SUBDIVISION MAP ENTITLED "1000 DRIVING PARK SUBDIVISION" PREPARED BY FISHER ASSOCIATES, DATED APRIL 11, 2019, IDENTIFIED AS FA PROJECT NO. 134024 AND FILED IN THE MONROE COUNTY CLERK'S OFFICE JULY 26, 2019 IN LIBER 358 AT PAGE 94
5) REFERENCE MAP: ALTA/NSPS LAND TITLE SURVEY PREPARED BY FIRST ORDER. LLC DATED DECEMBER 17, 2019, LAST REVISED JANUARY 20, 2020 AND IDENTIFIED AS SURVEYOR'S DRAWING NO. 7239.DWG (MKA PROJECT NO. 5860-19-6240:003), SHEETS 1-8
6) INTERNAL PLANIMETRIC FEATURES OTHER THAN BUILDINGS OR LARGE TANKS HAVE NOT BEEN IDENTIFIED ON THIS SURVEY UNLESS WITHIN 5 FEET OF THE PROPERTY BOUNDARIES OR RIGHTS OF WAY.

THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT derweb@dec.ny.gov.

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW

LEGEND

Symbol	Description
OE	OVERHEAD ELECTRIC
OE&T	OVERHEAD ELECTRIC & TELEPHONE
	RAILROAD TRACKS
X	FENCE
	GUARD RAIL
P.P.	POWER POLE
L.P.	LIGHT POLE
C.B.	CATCH BASIN
C.B.	CATCH BASIN
SAN. M.H.	SANITARY MANHOLE
ELEC. H.H.	ELECTRIC HAND HOLE
G.P.	GUARD POST
TRANSF.	TRANSFORMER
G.V.	GAS VALVE
TEL. M.H.	TELEPHONE MANHOLE
ELEC. M.H.	ELECTRIC MANHOLE
TRAF. M.H.	TRAFFIC SIGNAL MANHOLE
M.H.	MANHOLE
S-89°-42'-15"-W	DEED BEARING
S-89°-42'-15"-W	NEW YORK STATE PLANE BEARING – WEST ZONE (NAD83)
	EASEMENT BOUNDARY

GRAPHIC SCALE
(IN METERS)
1 : 600

GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.

STATE OF NEW YORK
LICENSED LAND SURVEYOR

NOTE: THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATE OF FACTS THAT MAY BE REVEALED BY AN EXAMINATION OF SUCH.

RESURVEY	REVISION

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NYSDEC SITE NO. HW8-28-064, SITE ADDRESS: "1000 LEXINGTON AVENUE", ROCHESTER, NEW YORK

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
429 PINE STREET, LOCKPORT, NEW YORK 14094
PHONE 433-2535 PHONE 625-8360

SURVEY OF PART OF LOT-72, 20,000 ACRE TRACT
LOCATION: CITY OF ROCHESTER, MONROE COUNTY, NEW YORK
SHEET 1 OF 4

JOB No.	SCALE:	DATE:	DRAWN	COMP.	DESC.	CADFILE
M-4366	1"= 50'	OCTOBER 14, 2020	MAS	JEM, III		M4366.DWG

NYSDEC SITE NO. HW8-28-064, SITE ADDRESS: "1000 LEXINGTON AVENUE", ROCHESTER, NEW YORK

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CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
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RESURVEY	REVISION

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

SURVEY OF PART OF LOT-72, 20,000 ACRE TRACT

LOCATION: CITY OF ROCHESTER, MONROE COUNTY, NEW YORK

SHEET 3 OF 4

JOB No. M-4366 | SCALE: 1"= 50' | DATE: OCTOBER 14, 2020

DRAWN MAS
COMP. JEM, III
DESC.
CADFILE M4366.DWG

GRAPHIC SCALE

(IN METERS)

1 : 600

GRAPHIC SCALE

(IN FEET)

1 inch = 50 ft.

NYSDEC SITE NO. HW8-28-064, SITE ADDRESS: "1000 LEXINGTON AVENUE", ROCHESTER, NEW YORK

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
429 PINE STREET, LOCKPORT, NEW YORK 14094
PHONE 433-2535 PHONE 625-8360

NOTE: THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATE OF FACTS THAT MAY BE REVEALED BY AN EXAMINATION OF SUCH.

RESURVEY	REVISION

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

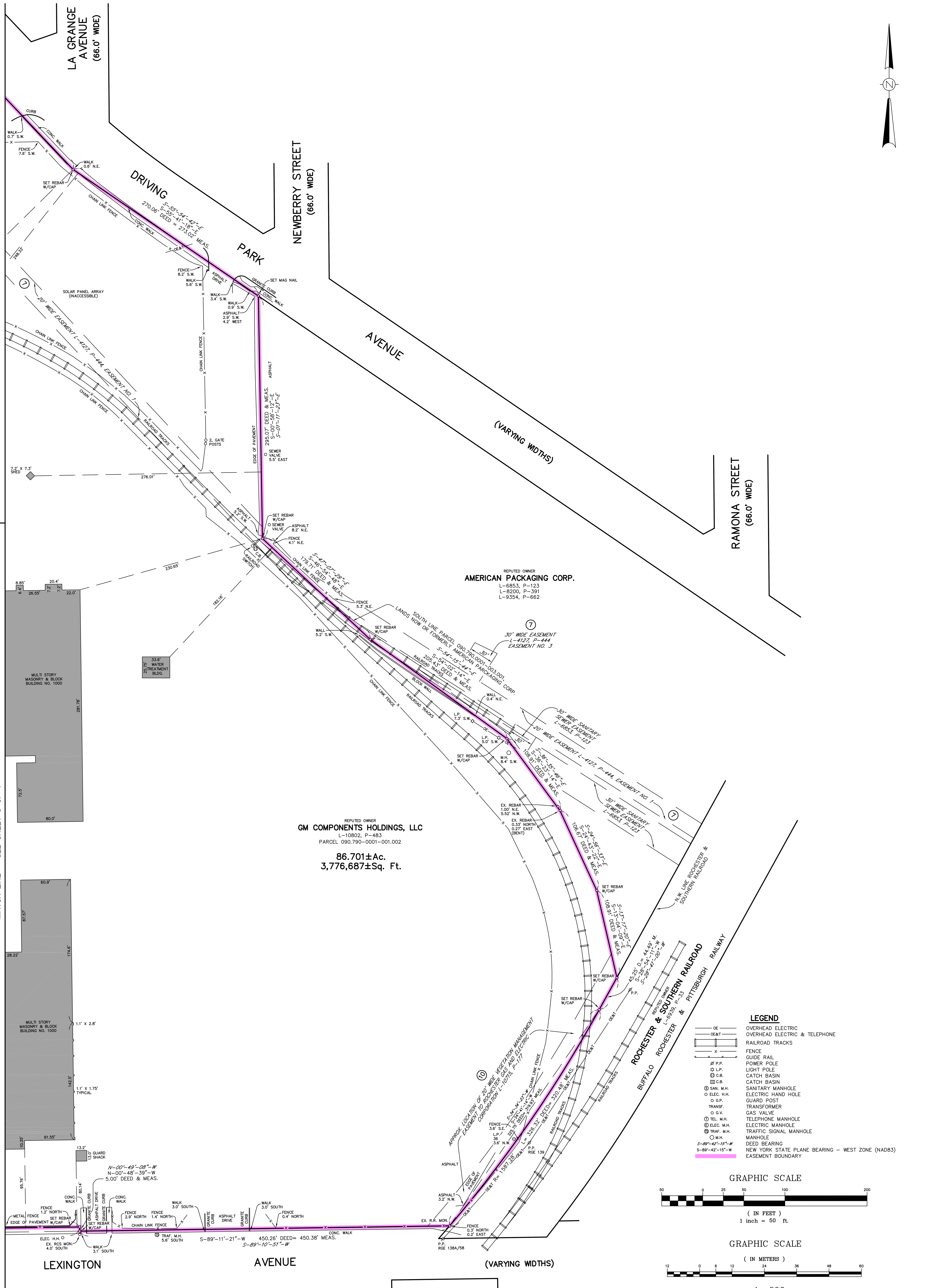
SURVEY OF PART OF LOT-72, 20,000 ACRE TRACT

LOCATION **CITY OF ROCHESTER, MONROE COUNTY, NEW YORK**

SHEET 2 OF 4

JOB No. **M-4366** SCALE: **1"= 50'** DATE: **OCTOBER 14, 2020**

DRAWN	MAS
COMP.	JEM, III
DESC.	
CADFILE	M4366.DWG



NYSDEC SITE NO. HW8-28-064, SITE ADDRESS: "1000 LEXINGTON AVENUE", ROCHESTER, NEW YORK

McINTOSH & McINTOSH, P.C.
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NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

RESURVEY	REVISION

	SURVEY OF PART OF LOT-72, 20,000 ACRE TRACT
LOCATION	CITY OF ROCHESTER, MONROE COUNTY, NEW YORK
	SHEET 4 OF 4
JOB No. M-4366	SCALE: 1"= 50' DATE: OCTOBER 14, 2020

DRAWN	MAS
COMP.	JEM, III
DESC.	
CADFILE	M4366.DWG

APPENDIX B – LIST OF SITE CONTACTS

Name	Contact Information
Danielle Miles NYSDEC Project Manager	(585) 226-5349 danielle.miles@dec.ny.gov
David Pratt, P.E. NYSDEC Region 8 Remediation Engineer	(585) 226-5449 david.pratt@dec.ny.gov
John Maher GMCH Remediation Project Manager	(765) 860-8543; john.maher@gm.com
Natalie Hahn GMCH Site Contact	(585) 647-7254; natalie.hahn@gm.com

APPENDIX C – MONITORING WELL BORING AND CONSTRUCTION LOGS

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

PIEZOMETER INSTALLATION REPORT

PROJECT: TANK FARM OIL RECOVERY

LOCATION: LEXINGTON AVE. FACILITY - ROCHESTER, NY

CLIENT: AC ROCHESTER DIVISION - GENERAL MOTORS CORP.

CONTRACTOR: ---

DRILLER: --- INSPECTOR: ---

INSTALLATION DATE 9/89 BY AC ROCHESTER

FILE NO. 70043-41

INSTRUMENT TYPE ---

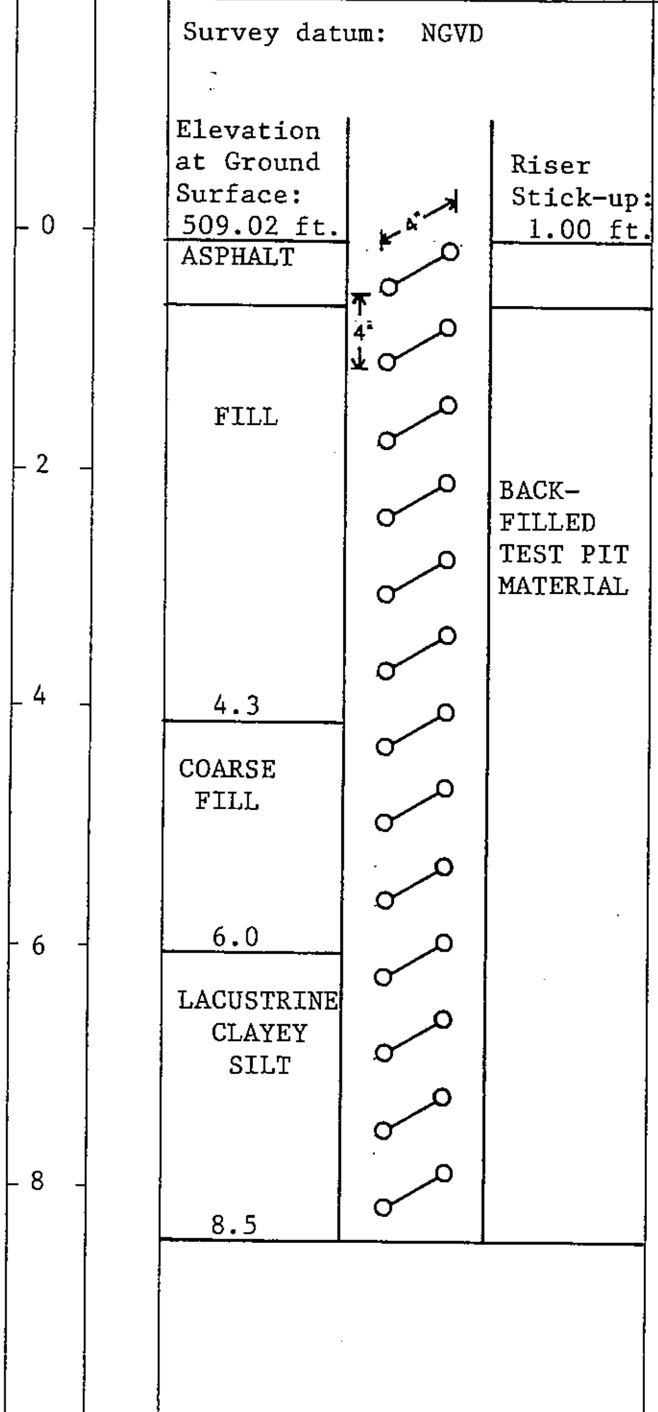
INSTRUMENT NO. PZ-1

LOCATION 50,593.74 N

58,435.73 E

SHEET 1 OF 2

DEPTH IN FEET	ELEV. IN FEET	INSTALLATION DIAGRAM	INSTALLATION COMMENTS



Piezometer consists of continuously perforated 3 7/8 in. I.D. (4-in, O.D.) PVC pipe. Perforations are pairs of 9/16-in. holes connected by 4-in. long, 3/16-in. wide slots spaced four inches apart, as shown

Piezometer installed in center of test pit TP-3; test pit dimensions approximately 13 ft. X 8 ft.

Bottom of wellscreen 8.5 ft.
Bottom of test pit 8.5 ft.

[------ LENGTH OF CASING] [9.5 ft. LENGTH OF RISER PIPE] + [---------- LENGTH OF POINT] = [----- PAY LENGTH]

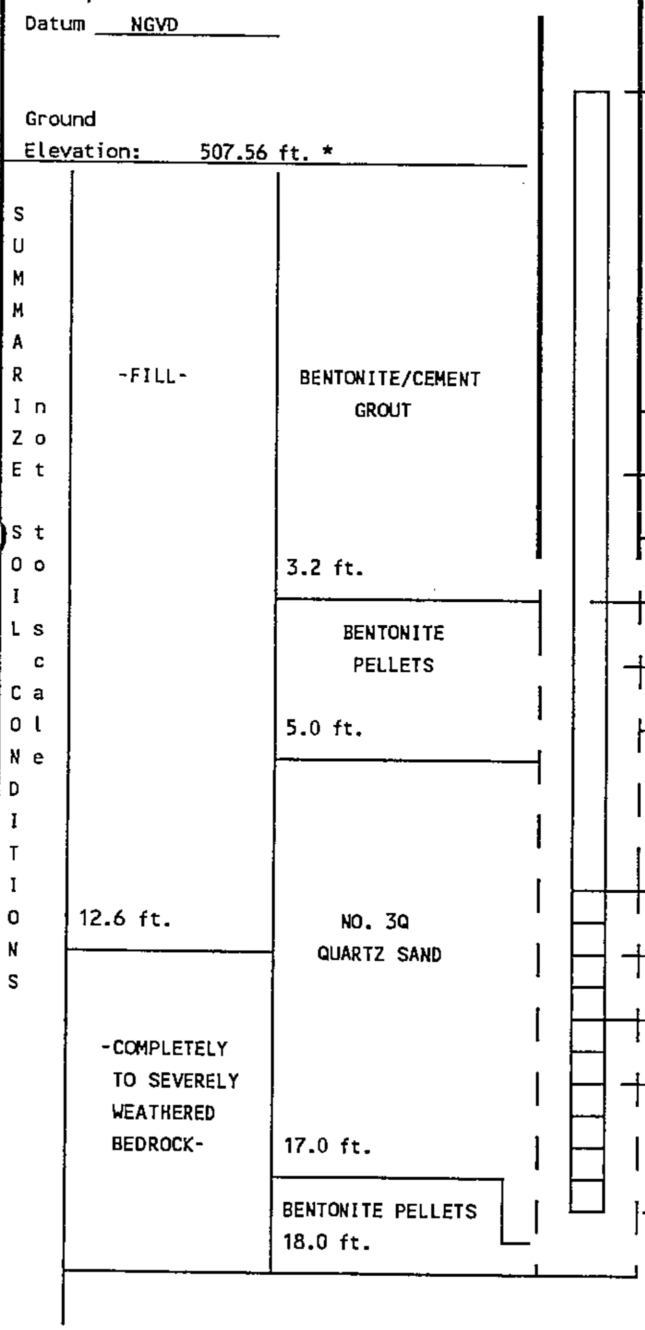
H & A FORM Aug.76

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	TANK FARM OIL RECOVERY	FILE NO.:	70043-41
LOCATION:	LEXINGTON AVENUE FACILITY	PIEZ. NO.:	PZ-111
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS	LOCATION:	50,980.89N 58,402.34E
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	S. LDRANTHY RIG TYPE: CME 55	SHEET:	1 OF
INSTALLATION DATE:	30 JANUARY 1990	INSPECTOR:	T. WELLS

Survey Datum NGVD

Ground Elevation: 507.56 ft. *



Stickup above ground surface of protective casing. *	2.42 ft.
Stickup above ground surface of riser pipe. *	2.29 ft.
Thickness of Surface Seal	3.2 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.4 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8.0 in.+/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	6.16 ft.
Top of slots at 6.38 ft.	
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of Slots at 15.83 ft.	
Depth of Bottom of Wellscreen	16.23 ft.
Depth of Bottom of Borehole	18.0 ft.

Remarks: * From nail in grout.
Total length of PVC screen + riser = 18.52 ft.

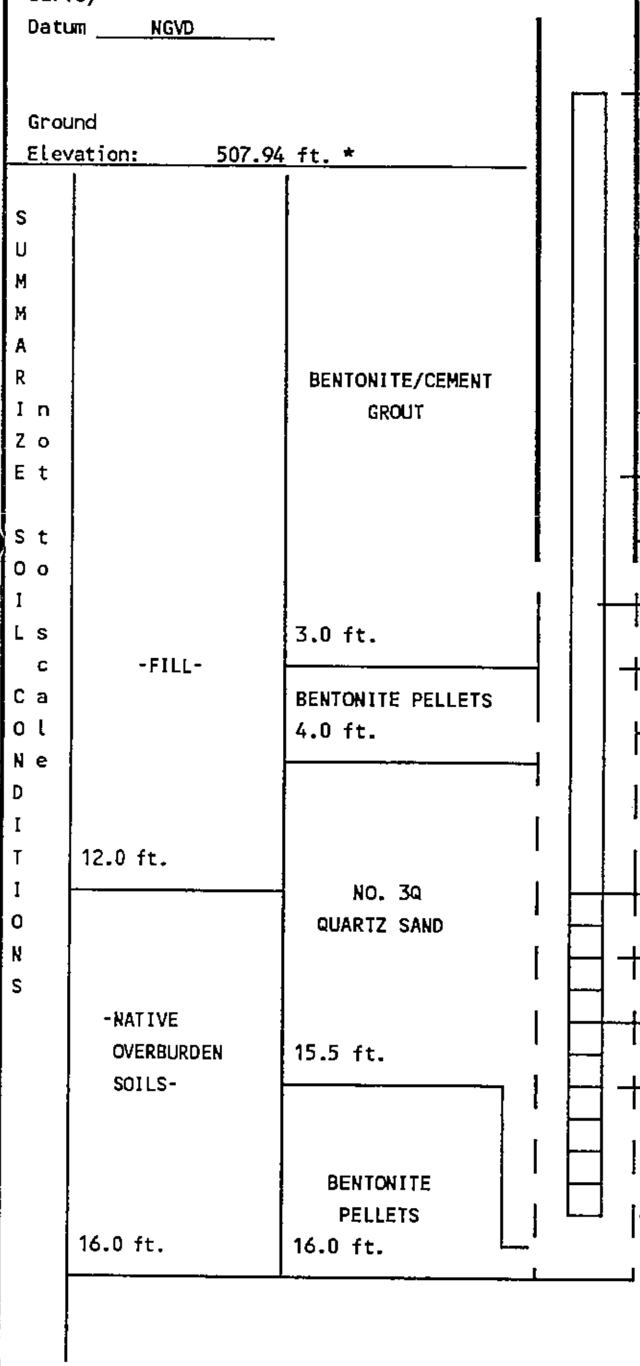
Well No. PZ-111

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	TANK FARM OIL RECOVERY	FILE NO.:	70043-41
LOCATION:	LEXINGTON AVENUE FACILITY	WELL NO.:	PZ-112
CLIENT:	AC ROCHESTER DIVISION (GENERAL MOTORS)	LOCATION:	51,136.38N 58,277.23E
CONTRACTOR:	NOTHANAGLE DRILLING		
DRILLER:	S. LORANTHY RIG TYPE: CME 55	SHEET:	1 OF
INSTALLATION DATE:	31 JANUARY 1990	INSPECTOR:	T. WELLS

Survey Datum NGVD

Ground Elevation: 507.94 ft. *



Stickup above ground surface of protective casing. *	2.51 ft.
Stickup above ground surface of riser pipe. *	2.38 ft.
Thickness of Surface Seal	3.1 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.3 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	5.07 ft.
Top of slots at 5.29 ft.	
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 14.74 ft.	
Depth of Bottom of Wellscreen	15.14
Depth of Bottom of Borehole	16.0

Remarks: * From nail in grout.
Total length of PVC screen + riser = 17.52 ft.

Well No. PZ-112

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

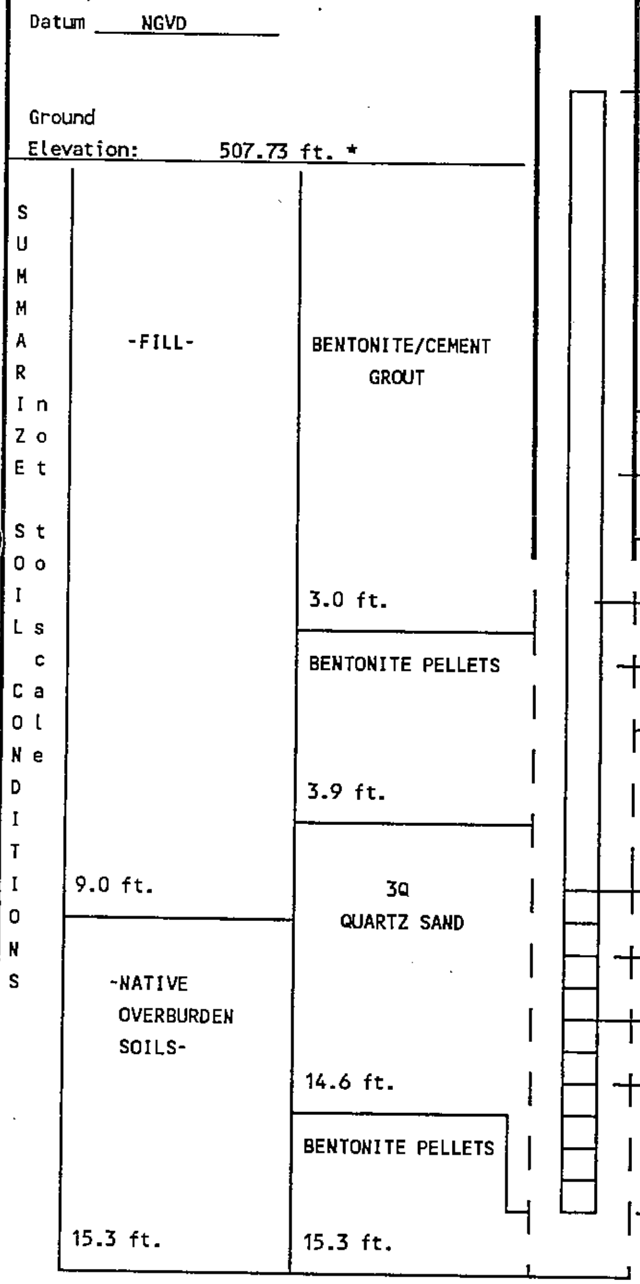
PIEZOMETER INSTALLATION REPORT

PROJECT:	TANK FARM OIL RECOVERY
LOCATION:	LEXINGTON AVENUE FACILITY
CLIENT:	AC ROCHESTER DIVISION (GENERAL MOTORS)
CONTRACTOR:	NOTHNAGLE DRILLING
DRILLER:	S. LORANTHY RIG TYPE: CME 55
INSTALLATION DATE:	31 JANUARY 1990

FILE NO.:	70043-41
WELL NO.:	PZ-113
LOCATION:	50,775.78N 58,498.30E
SHEET:	1 OF
INSPECTOR:	T. WELLS

Survey Datum: NGVD

Ground Elevation: 507.73 ft. *



Top of Rock at 15.3 ft.

Stickup above ground surface of protective casing. *	2.44 ft.
Stickup above ground surface of riser pipe. *	2.33 ft.
Thickness of Surface Seal	3.1 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.2 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8-14 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	3.91 ft.
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Depth of Bottom of Wellscreen	13.98 ft.
Depth of Bottom of Borehole	15.3 ft.

Remarks: * From nail in grout.
Total length of PVC screen + riser = 16.35 ft.

Well No. PZ-113

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT: TANK FARM OIL RECOVERY
LOCATION: LEXINGTON AVENUE FACILITY
CLIENT: AC ROCHESTER DIVISION (GENERAL MOTORS)
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTHY RIG TYPE: CME 55
INSTALLATION DATE: 1 FEBRUARY 1990

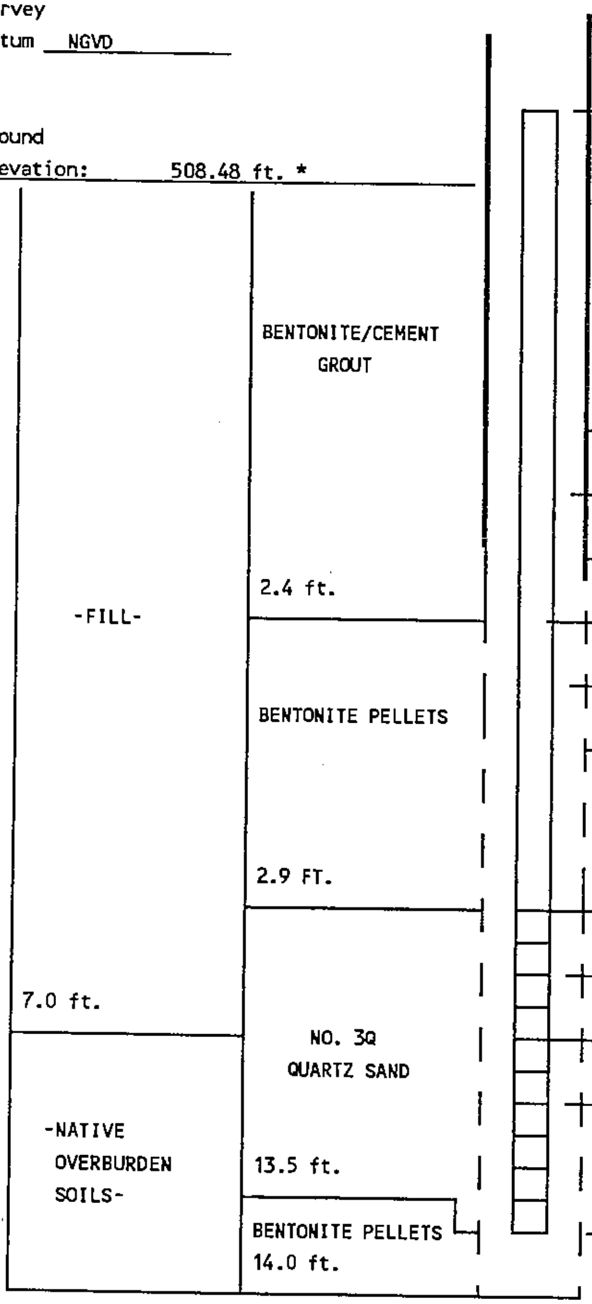
FILE NO.: 70043-41
WELL NO.: PZ-114
LOCATION: 50,692.52N
58,381.96E
SHEET: 1 OF
INSPECTOR: T. WELLS

Survey
Datum NGVD

Ground
Elevation: 508.48 ft. *

SUMMARIZE SOIL CONDITIONS

Note to Scale



Stickup above ground surface of protective casing. *	2.66 ft.
Stickup above ground surface of riser pipe. *	2.51 ft.
Thickness of Surface Seal	2.4 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 ft.
Depth of Bottom of Protective Casing	2.1 ft.
Inside Diameter of Riser Pipe	2.0 ft.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8-12 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	2.93 ft.
Top of slots at 3.15 ft.	
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 12.6 ft.	
Depth of Bottom of Wellscreen	13.00
Depth of Bottom of Borehole	14.0 ft.

Remarks: * From nail in grout.
Total length of PVC screen + riser = 15.51 ft.

Well No. PZ-114

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

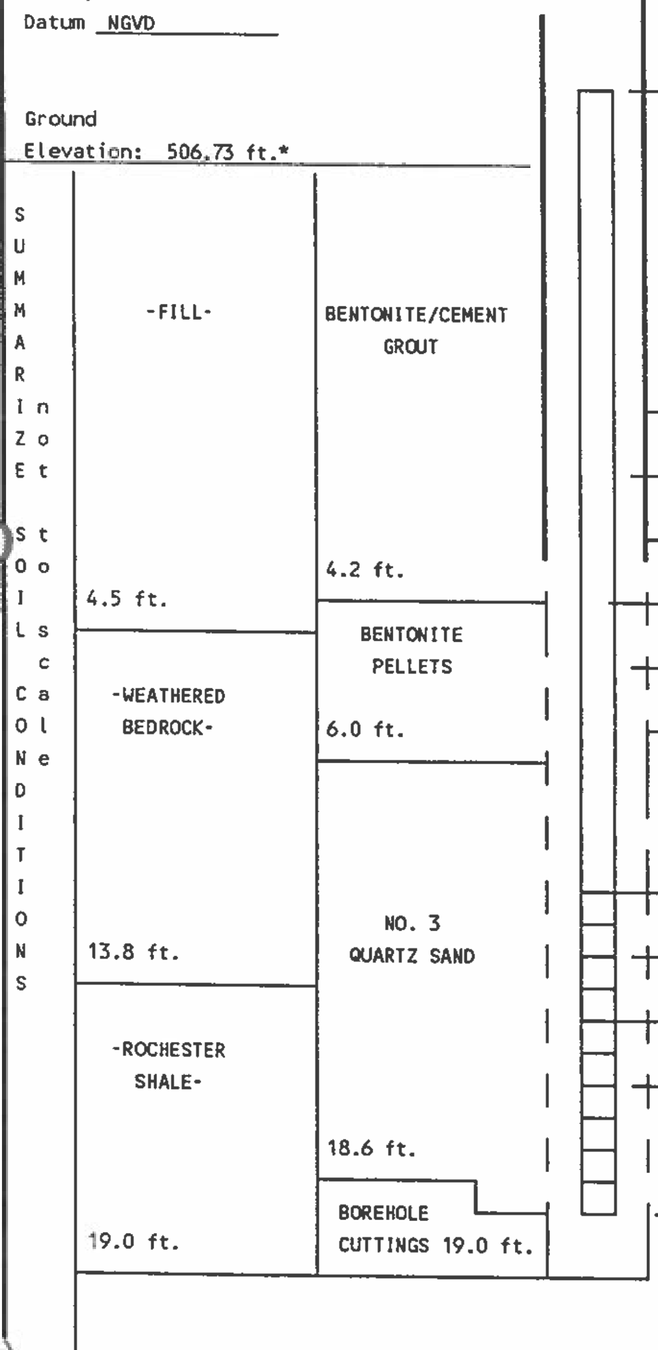
PIEZOMETER INSTALLATION REPORT

PROJECT: TANK FARM OIL RECOVERY
LOCATION: LEXINGTON AVENUE FACILITY
CLIENT: AC ROCHESTER DIVISION (GENERAL MOTORS)
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTHY RIG TYPE: CME 55
INSTALLATION DATE: 6 FEBRUARY 1990

FILE NO.: 70043-41
WELL NO.: PZ-115
LOCATION: 50,543.76N
58,640.76E
SHEET: 1 OF
INSPECTOR: T. WELLS

Survey
Datum NGVD

Ground
Elevation: 506.73 ft.*



Stickup above ground surface of protective casing. *	2.55 ft.
Stickup above ground surface of riser pipe. *	2.38 ft.
Thickness of Surface Seal	4.2 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.20 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	0.0-13.8 ft.: 8-12 in. 13.8-19.0 ft.: 4 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	8.50 ft.
Type of Wellscreen Top of slots: 8.72 ft.	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots: 18.17 ft.	Quartz Sand
Depth of Bottom of Wellscreen	18.57 ft.
Depth of Bottom of Borehole	19.0 ft.

Remarks: * From nail in grout.
Total length of PVC screen riser = 20.95 ft.

Well No. PZ-115

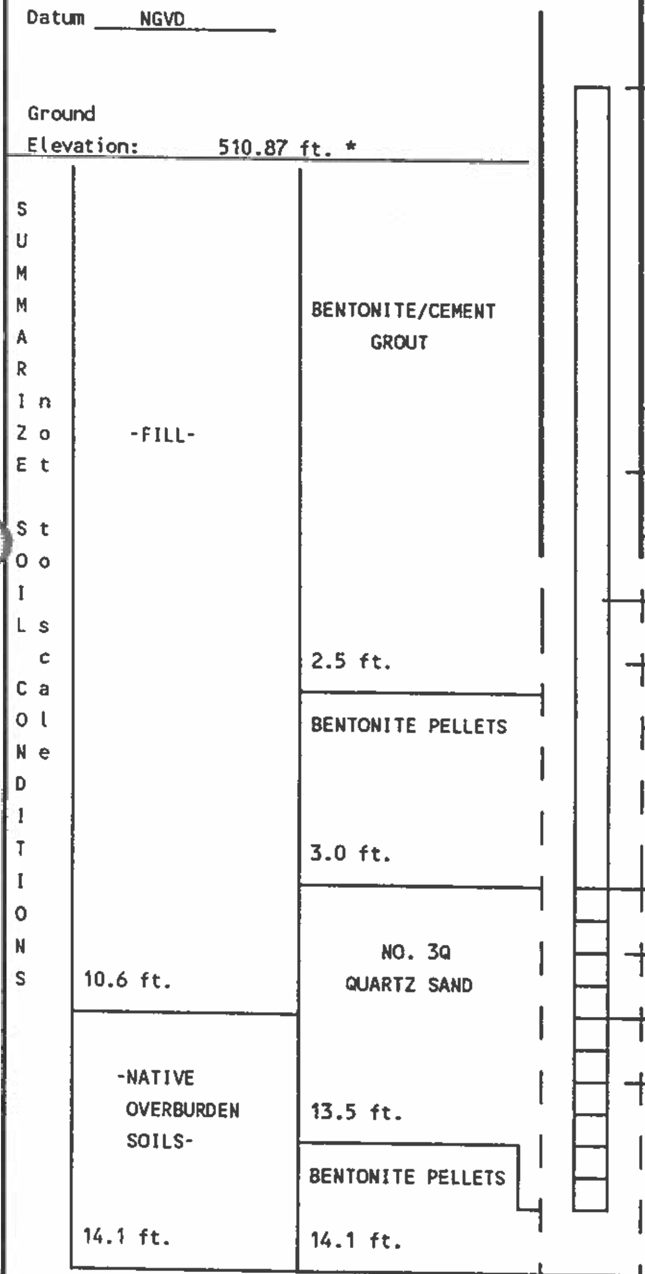
H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

PIEZOMETER INSTALLATION REPORT

PROJECT:	TANK FARM OIL RECOVERY	FILE NO.:	70043-41
LOCATION:	LEXINGTON AVENUE FACILITY	WELL NO.:	PZ-116
CLIENT:	AC ROCHESTER DIVISION (GENERAL MOTORS)	LOCATION:	50,869.49N 58,319.09E
CONTRACTOR:	NOTHNAGLE DRILLING	SHEET:	1 OF
DRILLER:	S. LORANTHY RIG TYPE: CME 55	INSPECTOR:	T. WELLS
INSTALLATION DATE:	2 FEBRUARY 1990		

Survey Datum NGVD

Ground Elevation: 510.87 ft. *



Stickup above ground surface of protective casing. *	2.50 ft.
Stickup above ground surface of riser pipe. *	2.34 ft.
Thickness of Surface Seal	2.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.3 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8-12 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	3.06 ft.
Top of slots at 3.28 ft.	
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 12.73 ft.	
Depth of Bottom of Wellscreen	13.13 ft.
Depth of Bottom of Borehole	14.1 ft.

Remarks: * From nail in grout.
Total length of PVC screen + riser = 15.47 ft.

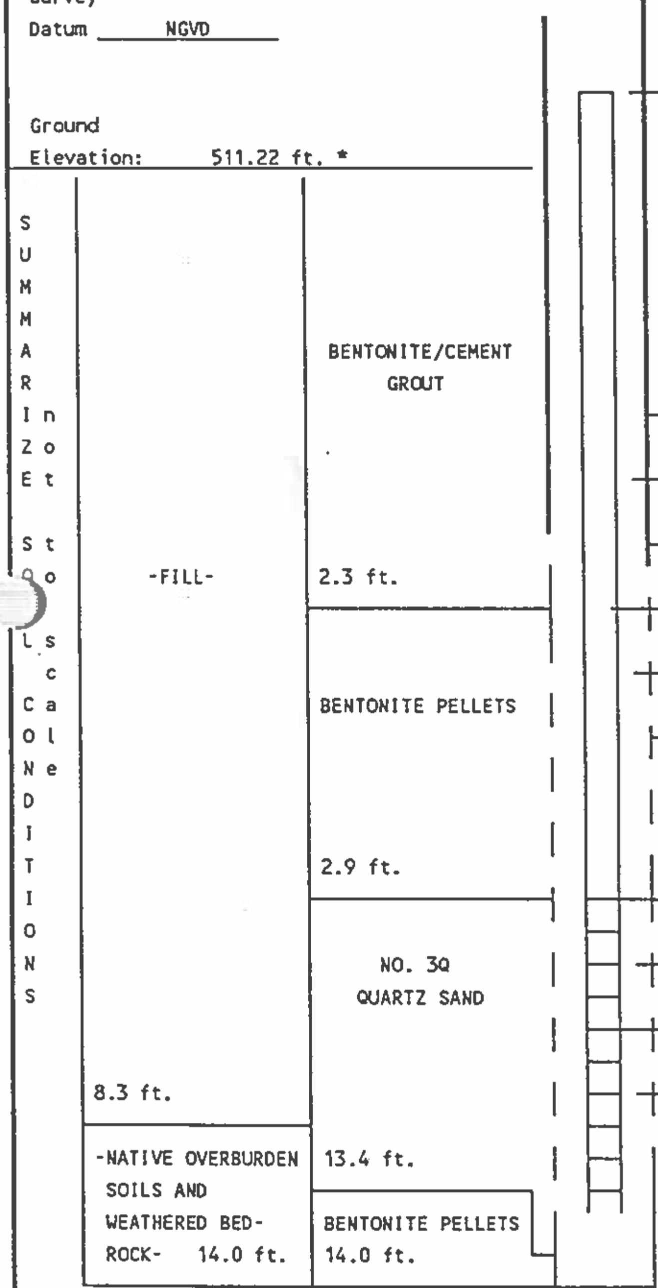
Well No. PZ-116

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	TANK FARM OIL RECOVERY	FILE NO.:	70043-41
LOCATION:	LEXINGTON AVENUE FACILTY	WELL NO.:	PZ-118
CLIENT:	AC ROCHESTER DIVISION (GENERAL MOTORS)	LOCATION:	50,621.73N
CONTRACTOR:	NOTHNAGLE DRILLING		58,220.52E
DRILLER:	S. LORANTHY RIG TYPE: CME 55	SHEET:	1 OF
INSTALLATION DATE:	7 FEBRUARY 1990	INSPECTOR:	T. WELLS

Survey Datum NGVD

Ground Elevation: 511.22 ft. *



Stickup above ground surface of protective casing. *	2.46 ft.
Stickup above ground surface of riser pipe. *	2.29 ft.
Thickness of Surface Seal	2.3 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	3.75 in.
Depth of Bottom of Protective Casing	2.3 ft.
Inside Diameter of Riser Pipe	2.0 ft.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8-12 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	2.93 ft.
Top of slots at 3.15 ft.	
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 12.60 ft.	
Depth of Bottom of Wellscreen	13.00 ft.
Depth of Bottom of Borehole	14.0 ft.

Remarks: * From nail in grout.
Total length of PVC screen + riser = 15.29 ft.

Well No. PZ-118

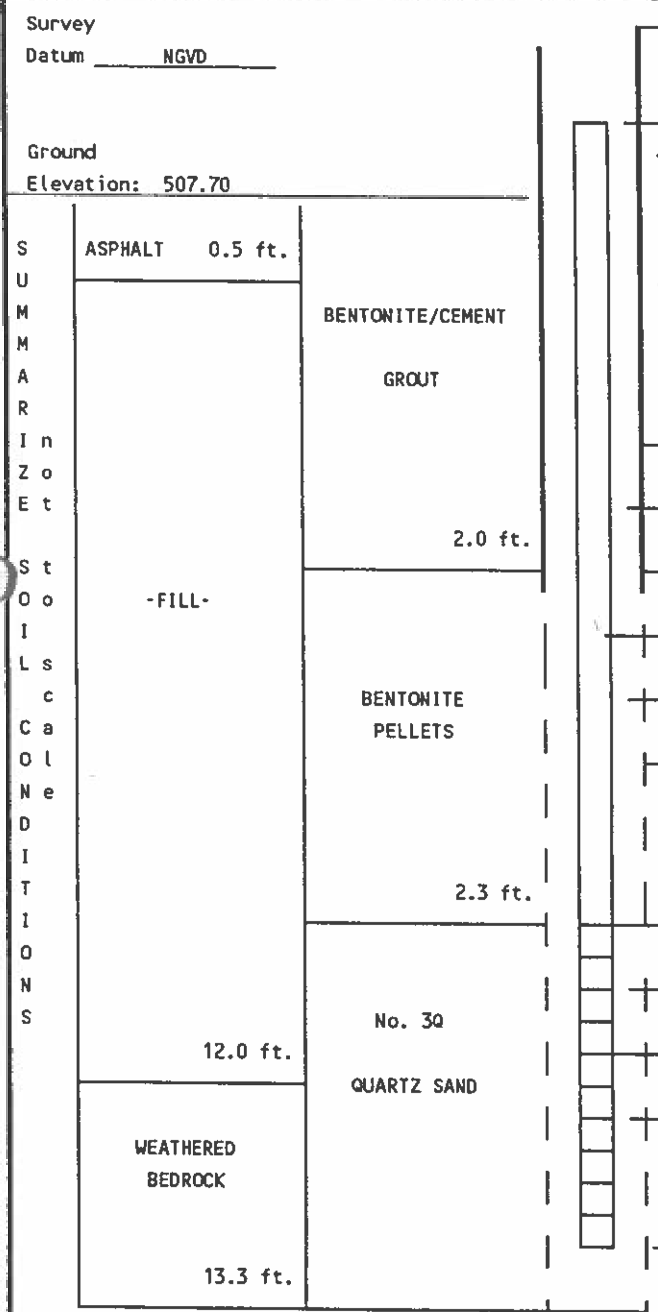
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT: AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION: ROCHESTER, NEW YORK
CLIENT: AC ROCHESTER DIVISION - GENERAL MONTORS
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTY RIG TYPE: DIEDRICH D-50
INSTALLATION DATE: 20 APRIL 1990

FILE NO.: 70043-41
WELL NO.: PZ-121
LOCATION: 50,643.83 N
58,422.30 E
SHEET: 1 OF 2
INSPECTOR: H. THURSTON

Survey Datum NGVD

Ground Elevation: 507.70



Stickup above ground surface of protective casing.	3.14 ft.
Stickup above ground surface of riser pipe.	2.87 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Stainless steel
Inside Diameter of Protective Casing	4 1/4 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite
Diameter of Borehole	8.0 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	2.3 ft.
Top of slots at 2.70 ft.	
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 11.9 ft.	
Depth of Bottom of Wellscreen	12.3 ft.
Depth of Bottom of Borehole	13.3 ft.

Remarks:

Well No. PZ-121

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

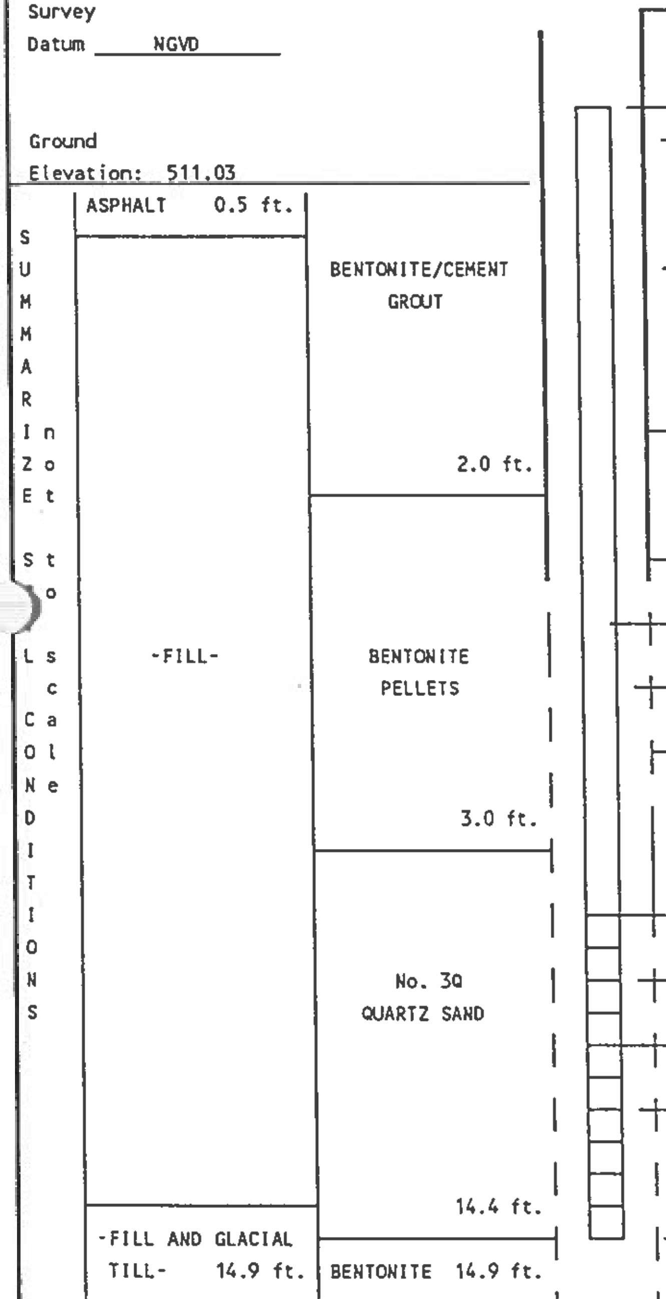
PIEZOMETER INSTALLATION REPORT

PROJECT: AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION: ROCHESTER, NEW YORK
CLIENT: AC ROCHESTER DIVISION - GENERAL MOTORS
CONTRACTOR: NOTHNAGEL DRILLING
DRILLER: S. LORANTY   RIG TYPE: DIEDRICH D-50
INSTALLATION DATE: 18 APRIL 1990

FILE NO.: 70043-41
WELL NO.: PZ-123
LOCATION: 50,828.42 N
58,254.64 E
SHEET: 1 OF 2
INSPECTOR: T. CLEARY

Survey
Datum NGVD

Ground
Elevation: 511.03



Stickup above ground surface of protective casing.	3.19 ft.
Stickup above ground surface of riser pipe.	2.93 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Stainless Steel
Inside Diameter of Protective Casing	4 1/4 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite
Diameter of Borehole	8.0 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	3.7 ft.
Top of Slots at 4.1 ft.	
Type of Wellscreen	PVC
Screen Slot Size	.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of Slots at 13.3 ft.	
Depth of Bottom of Wellscreen	13.7 ft.
Depth of Bottom of Borehole	14.9 ft.

Remarks:

Well No. PZ-123

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT: AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION: ROCHESTER, NEW YORK
CLIENT: AC ROCHESTER DIVISION - GENERAL MOTORS
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTY RIG TYPE: DIEDRICH D-50
INSTALLATION DATE: 19 APRIL 1990

FILE NO.: 70043-41
WELL NO.: PZ-124
LOCATION: 50,631.33 N
58,314.65 E
SHEET: 1 OF 2
INSPECTOR: T. CLEARY

Survey Datum NGVD

Ground Elevation: 508.59

SUMMARIZE SOIL CONDITIONS

In Zone to Scale

Soil	Depth	Backfill	Depth
ASPHALT	0.5 ft.	BENTONITE/CEMENT GROUT	1.8 ft.
-FILL-	9.8 ft.	BENTONITE PELLETS	2.0 ft.
FILL AND WEATHERED BEDROCK	12.5 ft.	No. 3Q QUARTZ SAND	12.5 ft.

Item	Value
Stickup above ground surface of protective casing.	3.75 ft.
Stickup above ground surface of riser pipe.	3.5 ft.
Thickness of Surface Seal	1.8 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Stainless Steel
Inside Diameter of Protective Casing	4 1/4 in.
Depth of Bottom of Protective Casing	2.3 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite
Diameter of Borehole	8.0 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	1.9 ft.
Top of Slots at 2.3 ft.	
Type of Wellscreen	PVC
Screen Slot Size	.01 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of Slots at 11.5 ft.	
Depth of Bottom of Wellscreen	11.9 ft.
Depth of Bottom of Borehole	12.5 ft.

Remarks:

Well No. PZ-124

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

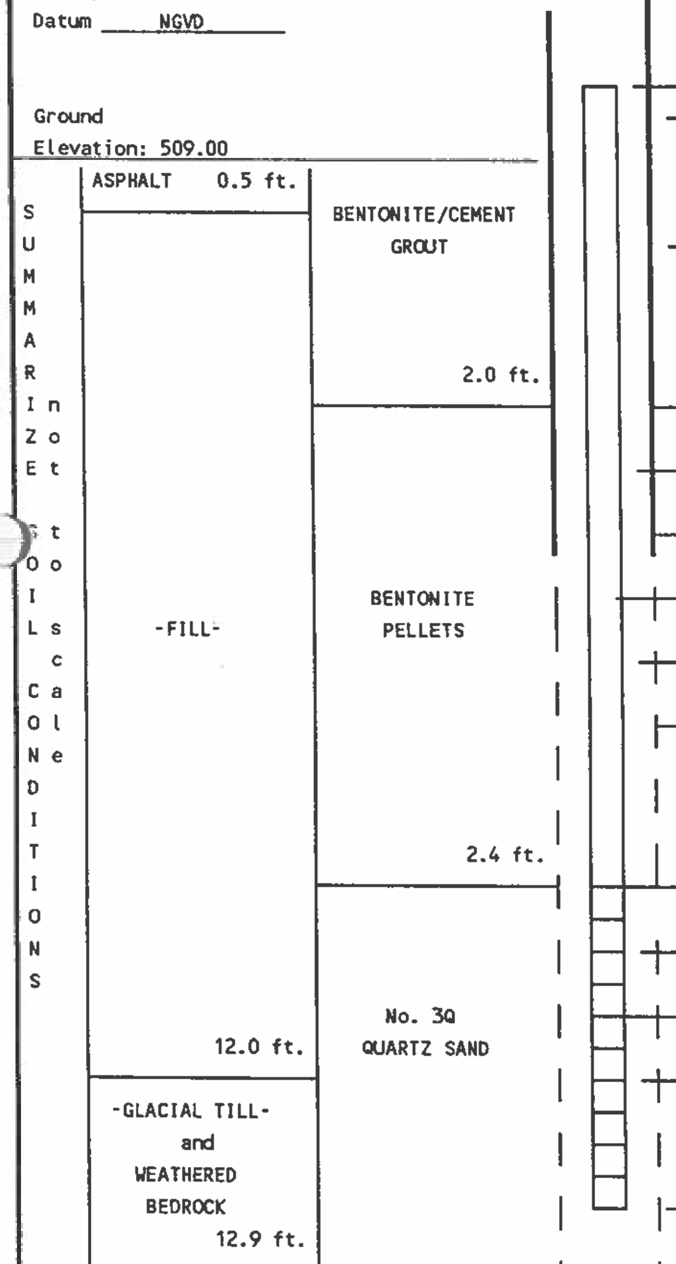
PIEZOMETER INSTALLATION REPORT

PROJECT: AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION: ROCHESTER, NEW YORK
CLIENT: AC ROCHESTER DIVISION - GENERAL MOTORS
CONTRACTOR: NOTHNAGLE DRILLING COMPANY
DRILLER: S. LORANTY RIG TYPE: DIEDRICH D-50
INSTALLATION DATE: 20 APRIL 1990

FILE NO.: 70043-41
WELL NO.: PZ-125
LOCATION: 50,758.14 N
58,364.03 E
SHEET: 1 OF 2
INSPECTOR: H. THURSTON

Survey
Datum NGVD

Ground
Elevation: 509.00



Depth/Stickup above ground surface of protective casing.	3.04 ft.
Depth/Stickup above ground surface of riser pipe.	2.9 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Stainless Steel
Inside Diameter of Protective Casing	4 1/4 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite
Diameter of Borehole	8.0 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	2.4 ft.
Top of Slots at 2.8 ft.	
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of Slots at 12.0 ft.	
Depth of Bottom of Wellscreen	12.4 ft.
Depth of Bottom of Borehole	12.9 ft.

Remarks:

Well No. PZ-125

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

PIEZOMETER INSTALLATION REPORT

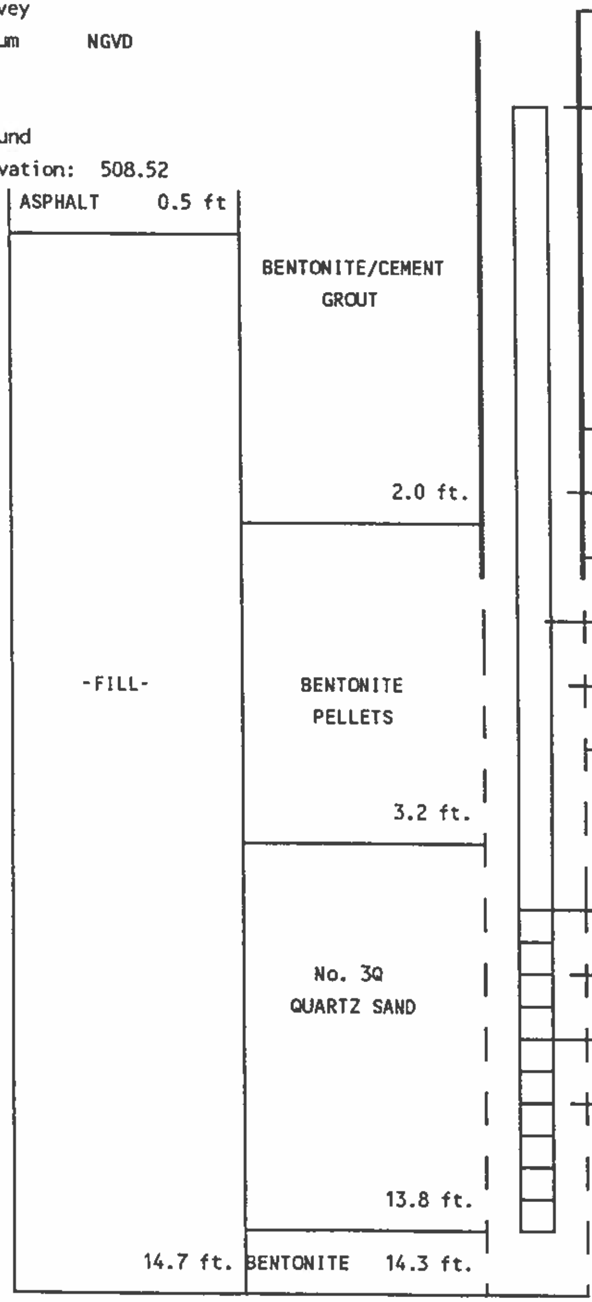
PROJECT:	AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION:	ROCHESTER, NEW YORK
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS
CONTRACTOR:	NOTHNAGLE DRILLING
DRILLER:	S. LORANTY RIG TYPE: DIEDRICH D-50
INSTALLATION DATE:	23 APRIL 1990

FILE NO.:	70043-41
WELL NO.:	PZ-126
LOCATION:	50,548.66 N 58,353.28 E
SHEET:	1 OF 2
INSPECTOR:	T. CLEARY/H. THURSTON

Survey Datum NGVD

Ground Elevation: 508.52

SUMMARIZE SOIL CONDITIONS In Notes Scale



Stickup above ground surface of protective casing.	3.28 ft.
Stickup above ground surface of riser pipe.	2.83 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Stainless Steel
Inside Diameter of Protective Casing	4 1/4 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite
Diameter of Borehole	8.0 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	3.8 ft.
Top of Slots at 4.2 ft.	
Type of Wellscreen	PVC
Screen Slot Size	.01 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of Slots at 12.6 ft.	
Depth of Bottom of Wellscreen	13.0 ft.
Depth of Bottom of Borehole	14.3 ft.

Remarks:

Well No. PZ-126

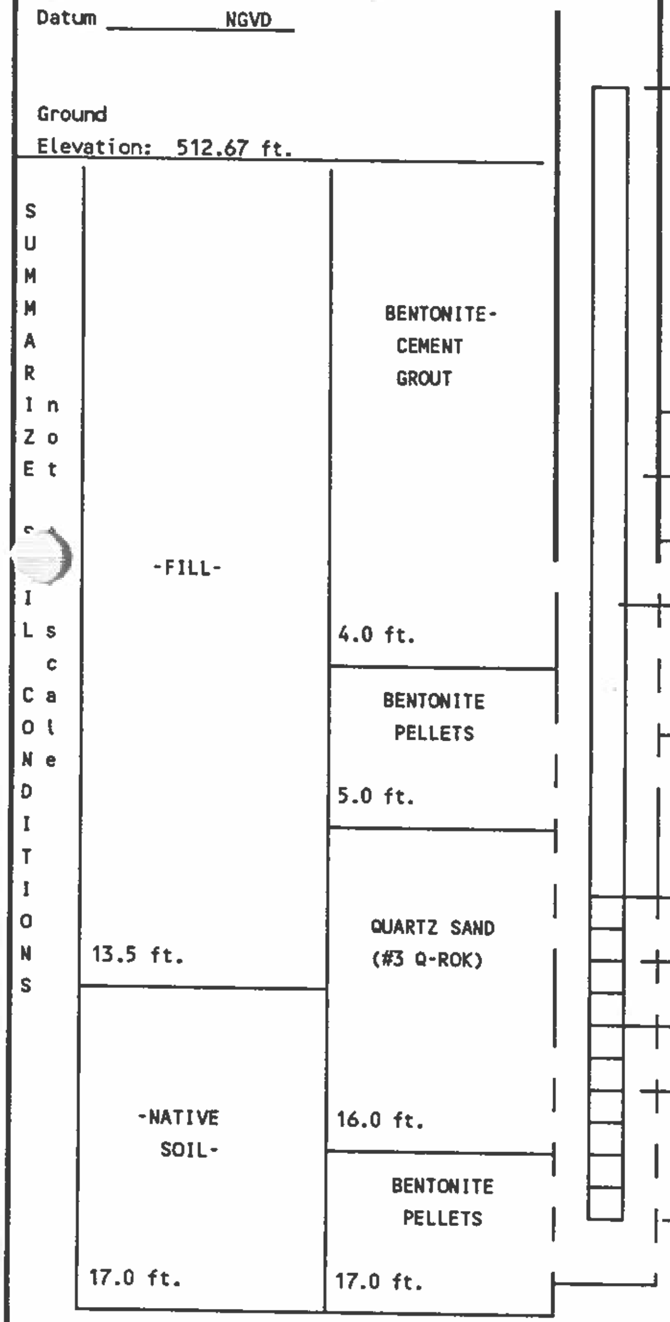
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	Hydrogeologic Investigation
LOCATION:	Lexington Avenue Facility - Rochester, New York
CLIENT:	AC Rochester Division - General Motors Corp.
CONTRACTOR:	Nothnagle Drilling
DRILLER:	S. Loranty H&A REPRESENTATIVE: T. Wells
INSTALLATION DATE:	23 August 1990

FILE NO.:	70014-42
WELL NO.:	PZ-132
BORING NO.:	B-132C
LOCATION:	51101.16N 58081.88E
SHEET:	1 OF 2

Survey Datum NGVD

Ground Elevation: 512.67 ft.



Stickup above ground surface of protective casing.	2.99 ft.
Stickup above ground surface of riser pipe.	2.84 ft.
Thickness of Surface Seal	4.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite-Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.0 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See diagram
Diameter of Borehole	8 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of slots at 5.19 ft.	5.06 ft.
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 14.83 ft.	Quartz sand
Depth of Bottom of Wellscreen	15.19 ft.
Depth of Bottom of Borehole	17.0 ft.

Remarks:

Well No. PZ-132

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	MIGRATION CONTROL	FILE NO.:	70014-43
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.:	PZ-139
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	BORING NO.:	B-139-PZ
CONTRACTOR:	ROCHESTER DRILLING COMPANY	LOCATION:	51269.0N
DRILLER:	D. ROBINSON H&A REPRESENTATIVE: T. WELLS		58206.0E
INSTALLATION DATE:	23 MAY 1991	SHEET:	1 OF 1

Survey Datum NGVD

Ground Elevation: 507.37 ft.

SUMMARIZE SOIL CONDITIONS

not to scale

Soil	Backfill
-FILL- 10.5 ft.	-BENTONITE CEMENT GROUT- 5.0 ft.
	-BENTONITE PELLETS- 7.0 ft.
-LACUSTRINE- 14.0 ft.	-QUARTZ SAND- (#4 Q-ROK) 29.6 ft.
-GLACIOLACUSTRINE- 15.5 ft.	
HIGHLY WEATHERED BEDROCK 17.0 ft.	-BENTONITE PELLETS- 30.8 ft.
-ROCHESTER SHALE-	DRILL CUTTINGS 32.0 ft.

Stickup above ground surface of protective casing.	2.96 ft.
Stickup above ground surface of riser pipe.	2.49 ft.
Thickness of Surface Seal	5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.25 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Grout
Diameter of Borehole	0-15.5': 12 in.+ 15.5-32.0': 6 in. +
Type of Coupling (Threaded, Solvent Welded, Welded, ETC.)	Threaded
Depth of Bottom of Riser Top of slots at 9.51 ft.	9.26 ft.
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 29.15 ft.	Quartz sand
Depth of Bottom of Wellscreen	29.55 ft.
Depth of Bottom of Borehole	32.0 ft.

Remarks:

Well No. PZ-139

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	PIEZOMETER INSTALLATION REPORT

PROJECT:	MIGRATION CONTROL	FILE NO.:	70014-43
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.:	PZ-140
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	BORING NO.:	B-140-PZ
CONTRACTOR:	ROCHESTER DRILLING COMPANY	LOCATION:	52454.5N
DRILLER:	D. ROBINSON H&A REPRESENTATIVE: T. WELLS		57512.8E
INSTALLATION DATE:	28 MAY 1991	SHEET:	1 OF 1

Survey Datum NGVD

Ground Elevation: 497.15 ft.

SUMMARIZE SOIL CONDITIONS
In Zone Of Scale

Soil	Depth	Backfill	Depth
-FILL-	5.0 ft.	-BENTONITE CEMENT GROUT-	8.0 ft.
-LACUSTRINE-	8.8 ft.	BENTONITE PELLETS	10.0 ft.
-GLACIOLACUSTRINE-	13.8 ft.	QUARTZ SAND (#4 Q-ROK)	27.3 ft.
-HIGHLY WEATHERED BEDROCK-	18.0 ft.	-BENTONITE PELLETS-	27.8 ft.
-ROCHESTER SHALE-	28.0 ft.	-DRILL CUTTINGS-	28.0 ft.

Stickup above ground surface of protective casing.	2.79 ft.
Stickup above ground surface of riser pipe.	2.35 ft.
Thickness of Surface Seal	8 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.25 in.
Depth of Bottom of Protective Casing	2.2 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Grout
Diameter of Borehole	0-18': 12 in. + 18-30': 6 in. +
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of slots at 12.40 ft.	12.15 ft.
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 26.87 ft.	Quartz sand
Depth of Bottom of Wellscreen	27.28 ft.
Depth of Bottom of Borehole	28.0 ft.

Remarks:

Well No. PZ-140

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

PIEZOMETER INSTALLATION REPORT

PROJECT:	MIGRATION CONTROL
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION
CONTRACTOR:	ROCHESTER DRILLING COMPANY
DRILLER:	D. ROBINSON H&A REPRESENTATIVE: T. WELLS
INSTALLATION DATE:	29 MAY 1991

FILE NO.:	70014-43
WELL NO.:	PZ-141
BORING NO.:	B-141-PZ
LOCATION:	52690.9N 57370.2E
SHEET:	1 OF 1

Survey Datum: NGVD

Ground Elevation: 494.49 ft.

SUMMARIZE SOIL CONDITIONS

not to scale

Soil conditions	Backfill
-FILL- 4.0 ft.	-BENTONITE CEMENT GROUT- 6.0 ft.
-LACUSTRINE- 10.8 ft.	-BENTONITE PELLETS- 8.0 ft.
-WEATHERED BEDROCK- 15.0 ft.	-QUARTZ SAND- (#4 Q-ROK) 21.0 ft.
-ROCHESTER SHALE- 22.0 ft.	-BENTONITE PELLETS- 21.5 ft.
	-DRILL CUTTINGS- 22.0 ft.

Stickup above ground surface of protective casing.	2.83 ft.
Stickup above ground surface of riser pipe.	2.37 ft.
Thickness of Surface Seal	6.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.25 in.
Depth of Bottom of Protective Casing	2.2 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Grout
Diameter of Borehole	0-15': 12 in. + 15-22': 6 in. +
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of slots at 10.45 ft.	10.20 ft.
Type of Wellscreen	PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 20.05 ft.	Quartz sand
Depth of Bottom of Wellscreen	20.45 ft.
Depth of Bottom of Borehole	22.0 ft.

Remarks:

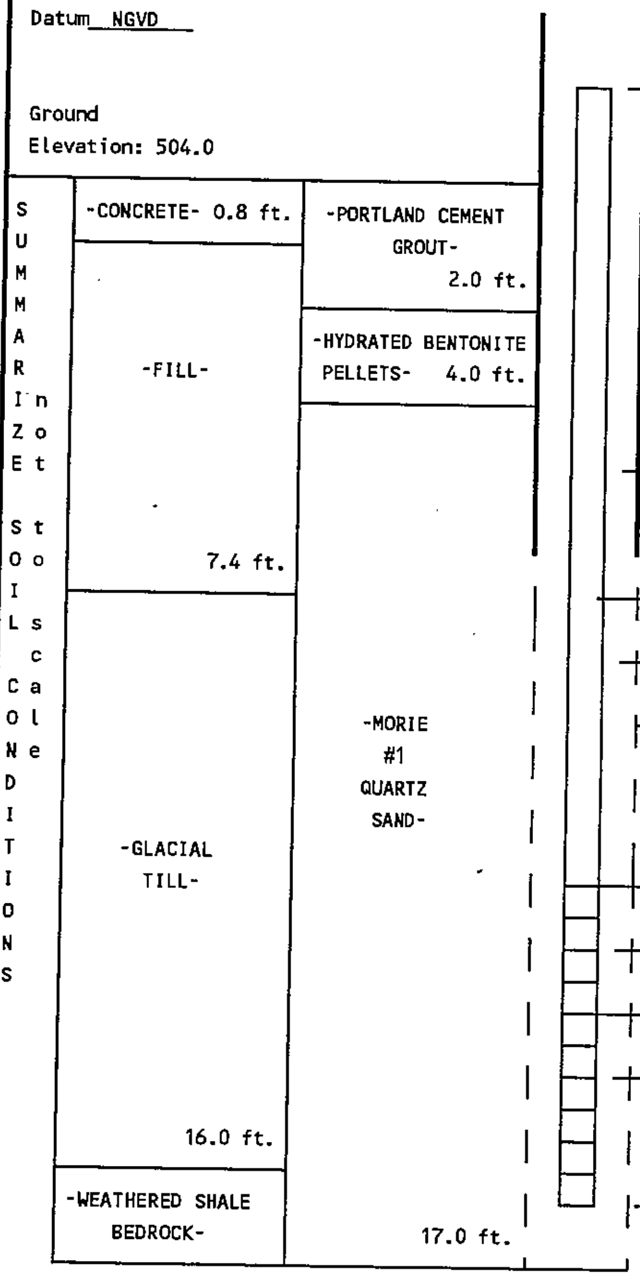
Well No. PZ-141

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	OVERBURDEN GROUNDWATER MONITORING WELL REPORT

PROJECT:	BUILDING 22 RECOVERY WELLS	FILE NO.:	70014-47
LOCATION:	LEXINGTON AVENUE, ROCHESTER, NEW YORK	WELL NO.:	PZ-142
CLIENT:	AC ROCHESTER DIVISION	LOCATION:	5 ft. northeast of column LKL-63
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	K. Busch RIG TYPE: Gus Pech 750-C Mite-e-Mite	SHEET:	1 OF 2
INSTALLATION DATE:	29 December 1993	INSPECTOR:	J. Talpey/J. Marschner

Survey Datum NGVD

Ground Elevation: 504.0



Depth/Stickup above/below ground surface of protective casing.	Flushmount
Depth below ground surface of riser pipe.	0.48 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Portland Cement Grout
Type of Protective Casing	Steel Roadway Box
Inside Diameter of Protective Casing	8 in.
Depth of Bottom of Protective Casing	1.1 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Hydrated Bentonite Pellets
Diameter of Borehole	8 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	5.0 ft.
Type of Wellscreen	Slotted PVC
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Morie #1 Quartz Sand
Depth of Bottom of Wellscreen	15.0 ft.
Depth of Bottom of Borehole	17.0 ft.

Remarks: Wellscreen Summary - Bottom plug 0.3 ft.
Screen section 9.8 ft.
Riser pipe 4.5 ft.

Well No. PZ-142

H&A OF NEW YORK Consulting Geotechnical Engineers Geologists and Hydrogeologists	EXISTING MONITORING WELL EVALUATION FORM

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 6 - Renumbered OW-6
Date Installed: 27 May-4 June 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Overburden Soils

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 499.4
Inner Casing El. (NGVD): 499.1
Outer Casing El. (NGVD): 499.4

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	12.8	None

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	6	NA	0.0	NA
Riser Casing	2	10.0	0.5	10.5
Screen	2	2.0	10.5	12.5

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	1.0	2.5
Backfill	2.5	7.1
Bentonite	7.1	9.0
Sand Filter Pack	9.0	12.8

* Depths measured from ground surface.

DRILLING METHOD

Method: Truck Rotary
Fluid: None
Was Fluid Analyzed: ---
Sampling: Split Spoon: 5 ft. Interval
Rock Core: None
Types of Tests Performed on Samples: Visual Classification

CONSTRUCTION MATERIALS

Primary Casing: 2-1/4 in. ID Stainless
Protective Casing: Steel Roadway Box
Screen: 0.01 in. Slotted Stainless
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: Yes

If no, How does it Disagree:

Condition of Protective Casing: Good

Condition of Seals:

Well Depth (Ft): 12.45 ft.
Depth To Water (Ft): 5.72 ft.

Note: Top of rock encountered at 12.8 ft.

H&A of New York	WELL UPGRADE SUMMARY FORM	File No. 70014-41

WELL DEVELOPMENT

Date Re-Developed: 28 September and 5 October 1989
H&A Representative: T. Wells
Static Water Level (feet below top of protective casing): 9.39 ft.
Depth to Bottom of Well Prior to Development (feet):
Gallons Removed:
Depth to the Bottom of the Well (feet) After Development:
Comments:

HYDRAULIC CONDUCTIVITY TESTING

Date Tested: 31 October 1989
H&A Representative: T. Wells
Static Water Level (feet below the top of protective casing): 9.19 ft.
Method Used to Perform Test: Rising Head
Method Used to Calculate Hydraulic Conductivity: Hvorslev Method
Hydraulic Conductivity (cm/sec): 5.4 X 10-4
Comments:

PHYSICAL UPGRADE

Date Upgraded: 6 September 1989
H&A Representative: T. Wells
Work Performed: Existing roadway box removed, above ground riser extension and protective casing installed.

Comments: Upgrade performed by Rochester Drilling Company.

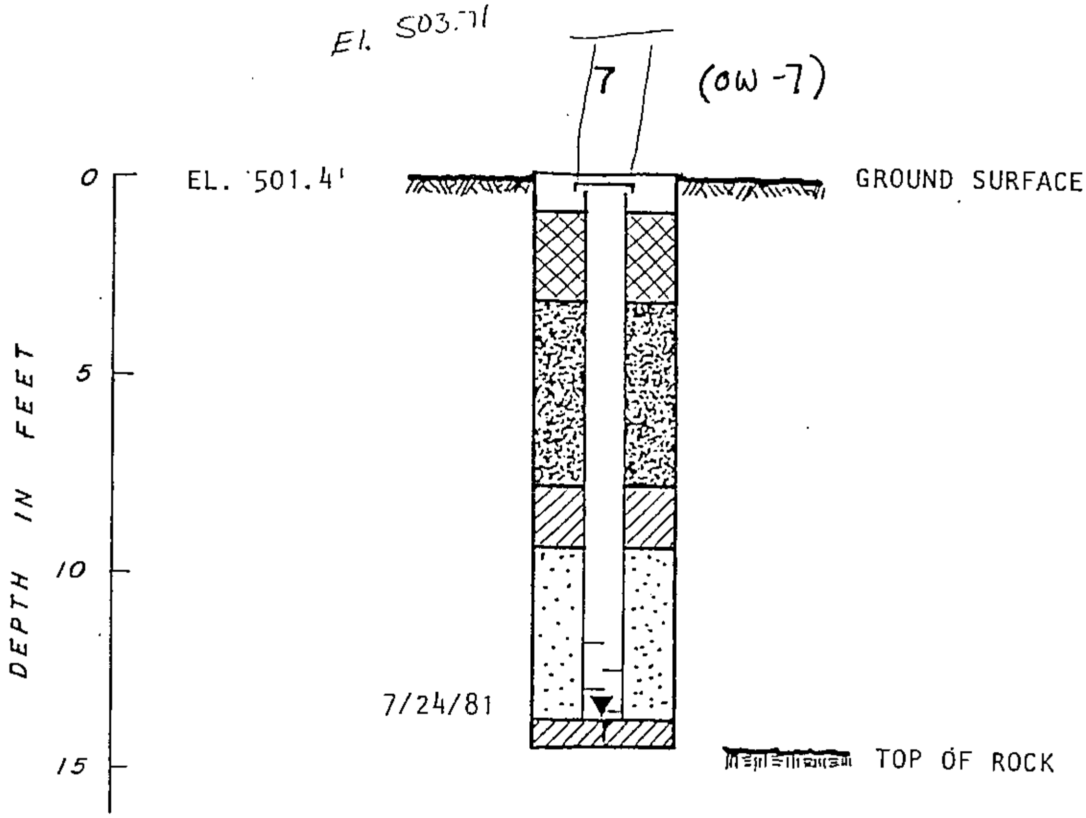
SURVEYING INFORMATION

Date Surveyed: 6 December 1989
Surveyor: Bergmann Associates
Ground Surface Elevation (feet): 498.14 (NGVD)
Top on Protective Casing Elevation (feet): 501.05 (NGVD)
Northing: 51,930.23
Easting: 57,176.63
Comments: AC Rochester coordinate system

REVISIONS
BY ______ DATE ______

FILE 00299-0

BY L. moore DATE 11/7/81
CHECKED BY ______



KEY:

- GROUT
- BENTONITE SEAL
- SAND FILTER
- WELL SCREEN (.010" SLOTS)
- MISC. BACKFILL
- WATER LEVEL

WELL SCHEMATIC
EXISTING WELL 7

DAMES & MOORE

H&A OF NEW YORK Consulting Geotechnical Engineers Geologists and Hydrogeologists	EXISTING MONITORING WELL EVALUATION FORM Page 1 of 2

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 7-Renumbered OW-7
Date Installed: 27 May-4 June 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Overburden Soils

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 501.4-See Note
Inner Casing El. (NGVD): 503.69
Outer Casing El. (NGVD): 503.83

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	14.5	None

DRILLING METHOD

Method: Truck Rotary
Fluid: None
Was Fluid Analyzed: No
Sampling: Split Spoon: 5 ft. Interval
Rock Core: None
Types of Tests Performed on Samples: Visual Classification

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	4	NA	+2.45	NA
Riser Casing	2	13.9	+2.29	11.6
Screen	2	2.0	11.6	13.6

CONSTRUCTION MATERIALS

Primary Casing: 2-in. ID Stainless
Protective Casing: NA
Screen: 1 in. Slotted Stainless
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	0.8	3.1
Backfill	3.1	7.8
Bentonite	7.8	9.3
Sand Filter Pack	9.3	13.6
Bentonite	13.6	14.5

* Depths measured from ground surface.

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: No

If no, How does it Disagree: Casing Stickup

Condition of Protective Casing: Good, somewhat rusty

Condition of Seals: Good

Well Depth (Ft): 13.5 f
Depth To Water (Ft): 12.7 ft.

Note: Revised elevations and location 6 December 1989:
Vertical Datum: USC & GSVD Top of prot. casing: 502.18 ft.
Ground surf.: 499.76 ft. AC Rochester Coordinates: 52,033.52N 57,909.93E

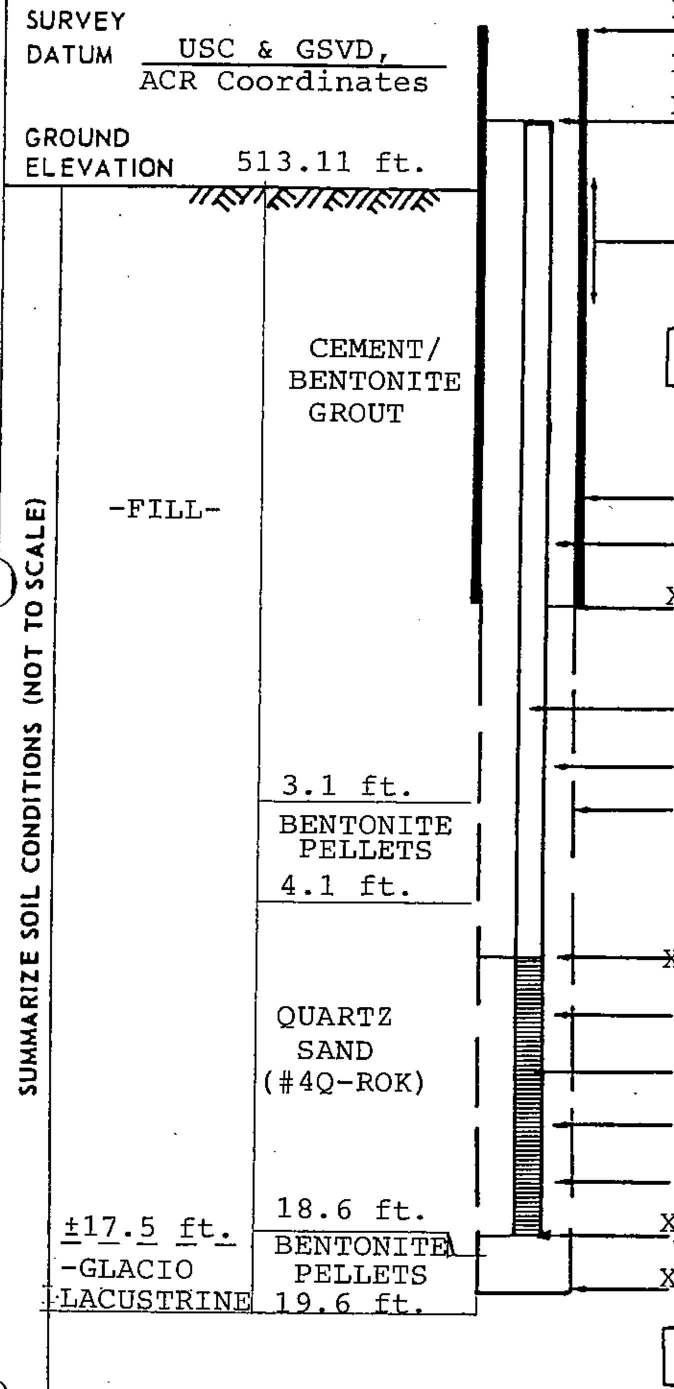
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

OVERBURDEN OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO. 70014-41
LOCATION: ROCHESTER, NEW YORK	WELL NO. OW-102
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO.
CONTRACTOR: ROCHESTER DRILLING CO., INC.	LOCATION 51,258.16 N
DRILLER: S. KAHN H&A REPRESENTATIVE: T. WELLS	57,265.18 E
INSTALLATION DATE 29 AUGUST 1989	SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 513.11 ft.



STICKUP ABOVE/ GROUND SURFACE OF CASING	2.71 ft.
STICKUP ABOVE/ GROUND SURFACE OF RISER PIPE.	2.41 ft.
THICKNESS OF SURFACE SEAL	3.0 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	3.75 in.
/DEPTH OF BOTTOM OF CASING	2.1 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	See Diagram
DIAMETER OF BOREHOLE	10 in.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
/DEPTH OF BOTTOM OF RISER	5.13 ft.
TYPE OF WELLSCREEN OR MANUFACTURER	#304 Stainless
SCREEN SLOT SIZE Slots from 5.3 to 15.8 ft.	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
/DEPTH OF BOTTOM OF WELLSCREEN	16.26 ft.
/DEPTH OF BOTTOM OF BOREHOLE	20.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 7.53 ft. (LENGTH OF RISER PIPE) + 11.13 ft. (LENGTH OF WELLSCREEN) = 18.66 ft. (TOTAL LENGTH)

H&A FORM 9 SEP

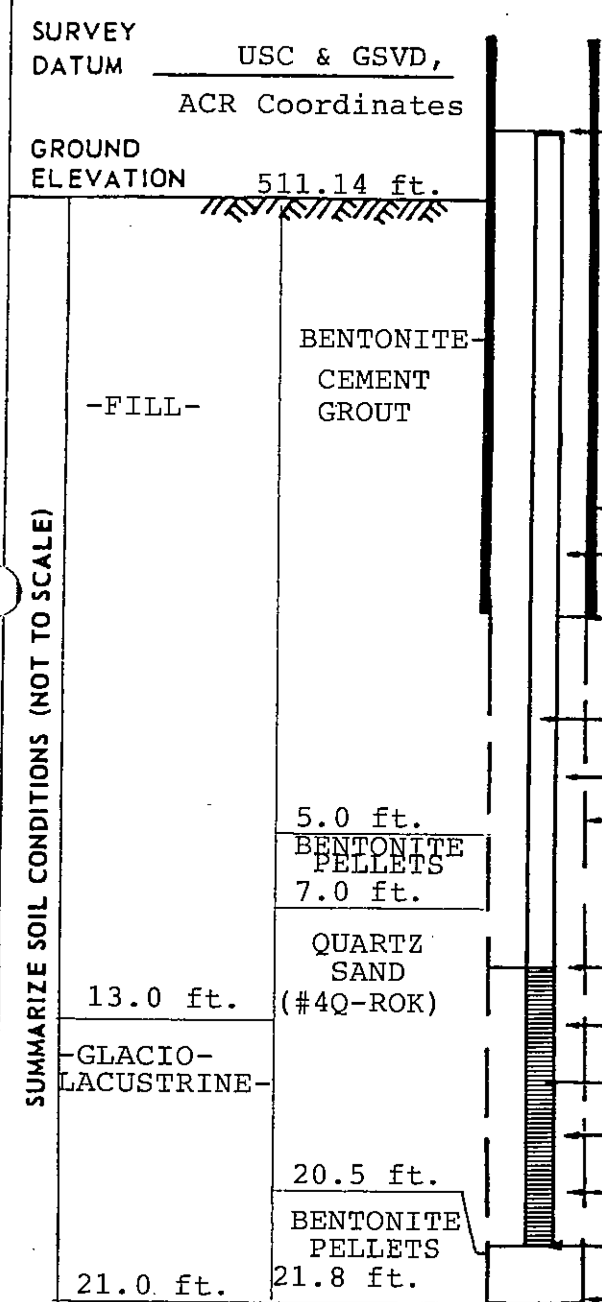
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

OVERBURDEN OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO. 70014-41
LOCATION: ROCHESTER, NEW YORK	WELL NO. OW-105
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO. B105
CONTRACTOR: ROCHESTER DRILLING CO., INC.	LOCATION 51,995.71 N
DRILLER: S. KAHN H&A REPRESENTATIVE: H. THURSTON	57,581.10 E
INSTALLATION DATE 30 AUGUST 1989	SHEET 1 OF 5

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 511.14 ft.



STICKUP ABOVE/ GROUND SURFACE OF CASING	2.79 ft.
STICKUP ABOVE/ GROUND SURFACE OF RISER PIPE.	2.12 ft.
THICKNESS OF SURFACE SEAL	5.0 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	4.25 ft.
/DEPTH OF BOTTOM OF CASING	2.0 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Grout
DIAMETER OF BOREHOLE	10.0 in.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
/DEPTH OF BOTTOM OF RISER	8.1 ft.
TYPE OF WELLSCREEN OR MANUFACTURER	#304 Steel
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
DEPTH OF BOTTOM OF WELLSCREEN	19.2 ft.
/DEPTH OF BOTTOM OF BOREHOLE	21.8 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 10.17 ft. (LENGTH OF RISER PIPE) + 11.13 ft. (LENGTH OF WELLSCREEN) = 21.30 ft (TOTAL LENGTH)

H&A FORM

HALEY & ALDRICH

OVERBURDEN OBSERVATION WELL INSTALLATION REPORT

Well No. OW-316
Boring No. OW-316

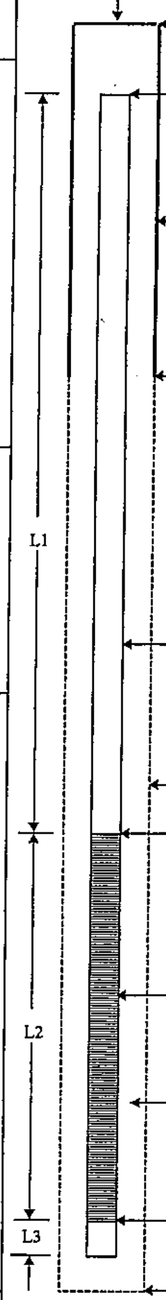
PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	1/12/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 1.0 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS	CEMENT BENTONITE GROUT 3.0 FT.
	BENTONITE 5.0 FT.
	QUARTZ SAND
12.0	12.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	Flush	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	1.0	2.0
Bentonite Grout	3.0	2.0
Quartz Sand	5.0	7.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite/Bentonite Grout	
Diameter of borehole	8.0	in
Depth to top of well screen	7.0	ft
Depth to top of bedrock	NA	ft
Type of well screen	Continuous-wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	12.0	ft
Depth of bottom of borehole	12.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
6.8 ft	+	5 ft	+	ft	=	11.8 ft

COMMENTS:

HALEY & ALDRICH

OVERBURDEN OBSERVATION WELL INSTALLATION REPORT

Well No.	OW-317
Boring No.	OW-317

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	1/6/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN

El. Datum ______

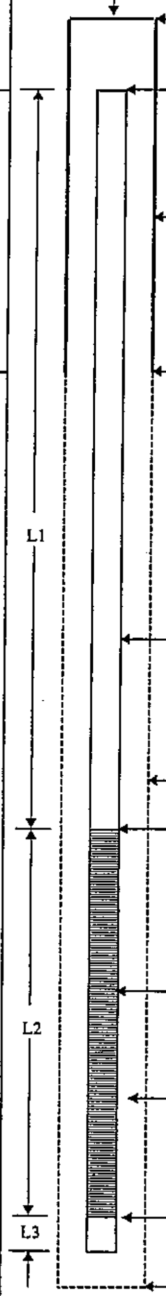
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.6 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS	BENTONITE 3.0 FT.
	QUARTZ SAND
15.0	15.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	Flush	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing	Roadway Box	
Length	1.0	ft
Inside Diameter	6.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	1.0	2.0
Bentonite Grout	--	--
Quartz Sand	3.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	5.0	ft
Depth to top of bedrock	NA	ft
Type of well screen	Continuous-wrap Sainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	15.0	ft
Depth of bottom of borehole	15.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
4.8	+	10 ft	+	ft	=	14.8 ft

COMMENTS:

Form # 3010

HALEY & ALDRICH

OVERBURDEN OBSERVATION WELL INSTALLATION REPORT

Well No. OW-322

Boring No. OW-322

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/19/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft   El. Datum ______

Location SEE PLAN

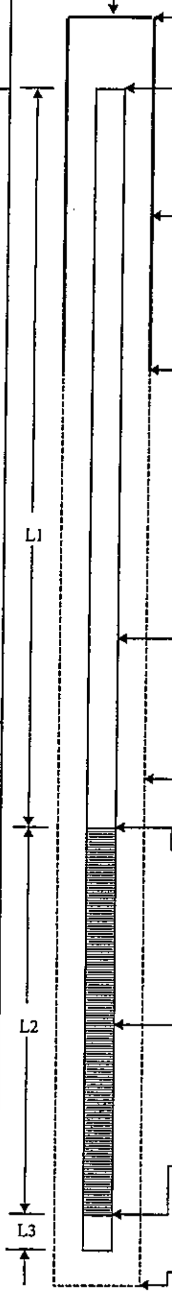
☑ Guard Pipe

☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
PAVEMENT 0.5 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS	BENTONITE 6.0 FT.
	QUARTZ SAND
18.0	18.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Locking Steel Guard Pipe	
Height of top of guard pipe above ground surface	3.0	ft
Height of top of riser pipe above ground surface	2.8	ft
Type of protective casing	Steel Guard Pipe	
Length	5.0	ft
Inside Diameter	6.0	in
Depth of bottom of guard pipe	2.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite Seal	1.0	5.0
Quartz Sand	6.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	8.0	ft
Depth to the top of bedrock	NA	ft
Type of well screen	Continuous-wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	18.0	ft
Depth of bottom of borehole	18.0	ft

(Not to Scale)

Riser Pay Length (L1)	+	Length of screen (L2)	+	Length of silt trap (L3)	=	Pay length
10.8 ft	+	10.0 ft	+	ft	=	20.8 ft

COMMENTS: Rocked out 26.0 to 27.0 ft.

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No.	Boring No.
OW-323	USTB-1/OW-323

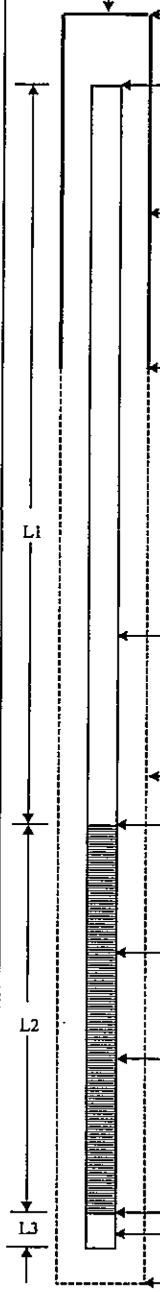
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	10/24/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
PAVEMENT 0.6 FT.	CONCRETE 1.0 FT.
OVERBURDEN SOILS	BENTONITE SEAL 3.0 FT.
	#00N QUARTZ SAND
15.0 FT.	15.0 FT.

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Bolted Steel Cover	
Height/Depth of top of guard pipe/roadway box above/below ground surface	Flush	
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing:	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe	N/A	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	1.0	2.0
Quartz Sand	3.0	12.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Above	
Diameter of borehole	8.0	in
Depth to top of well screen	5.0	ft
Type of screen	Factory Slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	#00N Quartz Sand	
Depth of bottom of well screen	15.0	ft
Bottom of Silt trap	15.0	ft
Depth of bottom of borehole	15.0	ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

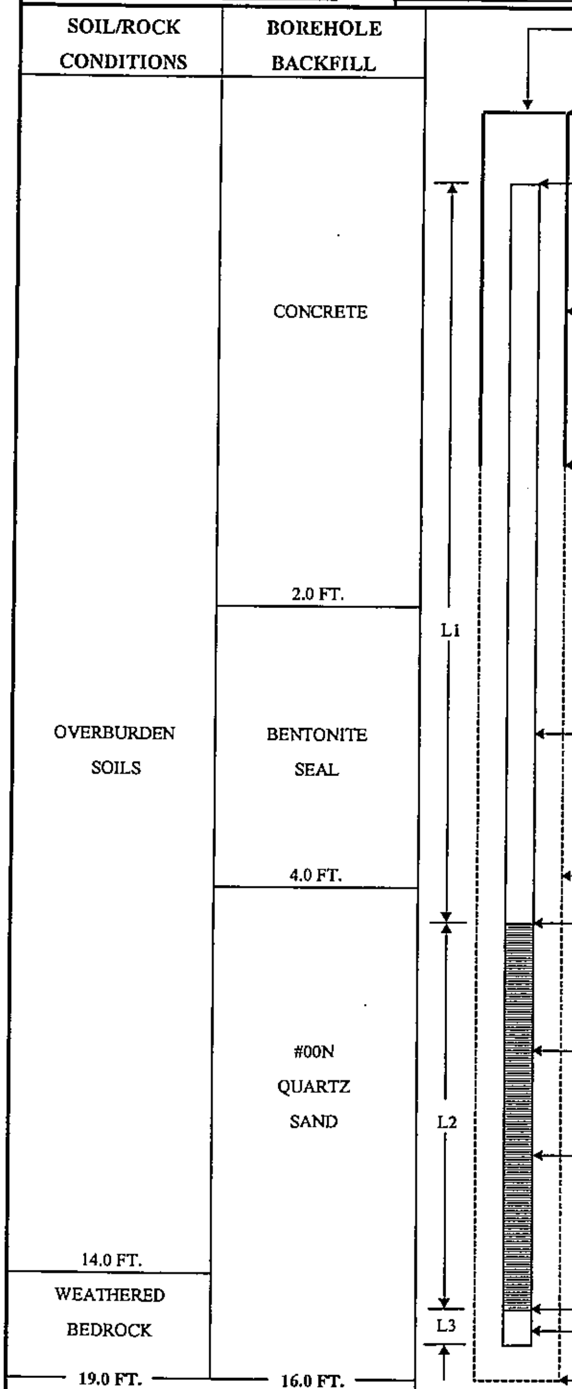
OBSERVATION WELL INSTALLATION REPORT

Well No. **OW-324**
Boring No. **OW-324**

PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	10/25/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location ______
El. Datum ______

☑ Guard Pipe
☐ Roadway Box



(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

Type of protective cover/lock	Locking Protective Cap	
Height of top of guard pipe above ground surface	2.8	ft
Height of top of riser pipe above ground surface	2.5	ft
Type of protective casing:	Steel	
Length	5.0	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe	2.2	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	2.0
Bentonite Seal	2.0	2.0
Quartz Sand	4.0	12.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Above	
Diameter of borehole	8.0	in
Depth to top of well screen	6.0	ft
Type of screen	Factory-Slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	#00N Quartz Sand	
Depth of bottom of well screen	16.0	ft
Bottom of Silt trap	16.0	ft
Depth of bottom of borehole	19.0	ft

(Not to Scale)

8.5 ft	+	10 ft	+	0 ft	=	18.5 ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS: Well filled with native soil cuttings/backfill from 19.0 to 16.0 feet.

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. OW-327
Boring No. STB-37

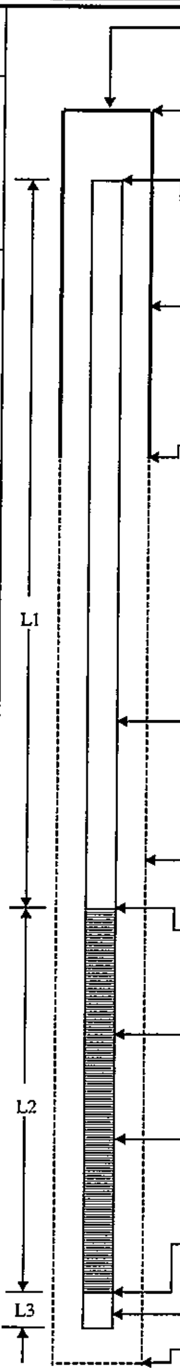
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	D. NOSTRANT
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/23/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. 516.76 ft
El. Datum NGVD
Location 8'N and 15'W of Col. T-37

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
FILL	CONCRETE
	1.0 FT.
4.7 FT.	BENTONITE PELLETS
OVERBURDEN SOILS	5.0 FT.
	#00N QUARTZ SAND
17.0	17.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet



Type of protective cover/lock	Aluminum Lockable Riser Cap	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Flushmount Roadbox	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	1.0	4.0

Type of riser pipe:	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill aronnd riser	Bentonite / Concrete	
Diameter of borehole	8.0	in
Depth to top of well screen	7.0	ft
Type of screen	Continuous-wound Stainless Steel	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	#00N Quartz Sand	
Depth of bottom of well screen	17.0	ft
Bottom of Silt trap	17.0	ft
Depth of bottom of borehole	18.0	ft

(Not to Scale)

___ ft + ___ ft + ___ ft = ___ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

H&A OF NEW YORK
Consulting Geotechnical Engineers Geologists and Hydrogeologists

EXISTING MONITORING WELL EVALUATION FORM

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 2 - Renumbered SR-2
Date Installed: 27 May-4 June 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Rochester Shale

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 514.4
Inner Casing El. (NGVD): 513.9
Outer Casing El. (NGVD): 514.4

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	9.7	None
Nx Core	3	19.7	Water

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	6	NA	0.0	NA
Riser Casing	2	16.8	0.5	17.3
Screen	2	2.0	17.3	19.3

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	1.0	2.5
Backfill	2.5	7.0
Bentonite	7.0	9.7
Conical PVC Plug	9.7	---
Cored Rock Interval	9.7	19.7
Caved Infall Matl.	19.3	19.7

* Depths measured from ground surface.

DRILLING METHOD

Method: Truck Rotary
Fluid: Water
Was Fluid Analyzed: No
Sampling: Split Spoon: 5 ft. Interval
Rock Core: Nx, 10 ft.
Types of Tests Performed on Samples: Visual Classification

CONSTRUCTION MATERIALS

Primary Casing: 2-in. ID PVC
Protective Casing: Steel Roadway Box
Screen: 0.01 in. Slotted PVC
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: No

If no, How does it Disagree: PVC Construction

Condition of Protective Casing: Good

Condition of Seals: Good

Well Depth (Ft): 18.30 ft.
Depth To Water (Ft): 5.30 ft.

RECOMMENDATIONS: Install new protective casing. Redevelop well.

H&A of New York	WELL UPGRADE SUMMARY FORM	File No. 70014-41

WELL DEVELOPMENT

Date Re-Developed: 28 September 1989
H&A Representative: T. Wells
Static Water Level (feet below top of protective casing): 10.84 ft.
Depth to Bottom of Well Prior to Development (feet):
Gallons Removed:
Depth to the Bottom of the Well (feet) After Development:
Comments:

HYDRAULIC CONDUCTIVITY TESTING

Date Tested: 7 November 1989
H&A Representative: T. Wells
Static Water Level (feet below the top of protective casing): 10.94 ft.
Method Used to Perform Test: Rising Head
Method Used to Calculate Hydraulic Conductivity: Hvorslev Method
Hydraulic Conductivity (cm/sec): 2.2 X 10-4
Comments:

PHYSICAL UPGRADE

Date Upgraded: 29 September 1989
H&A Representative: T. Wells
Work Performed: Existing roadway box removed, above ground riser extension and protective casing installed.

Comments: Upgrade performed by Rochester Drilling Company.

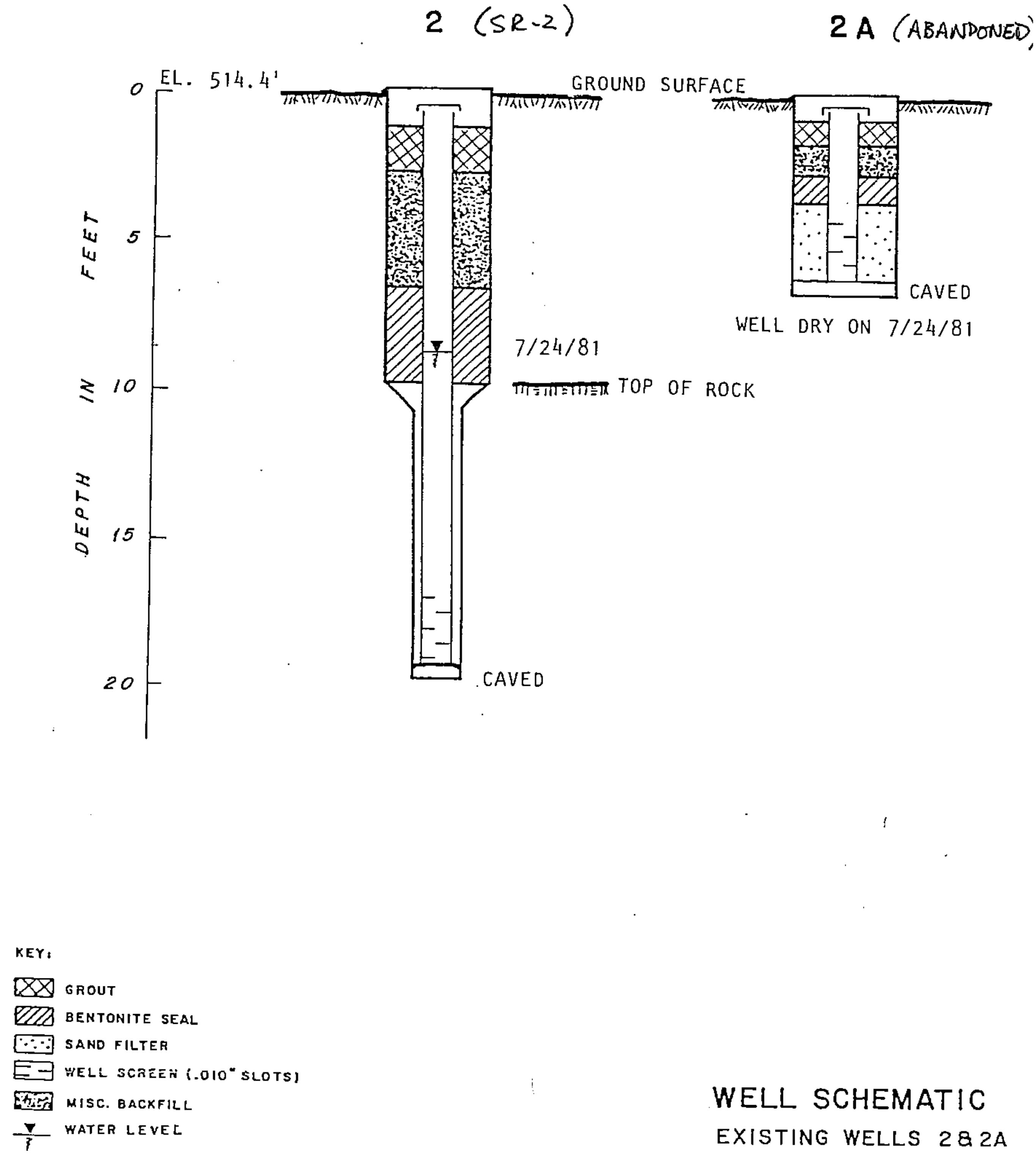
SURVEYING INFORMATION

Date Surveyed: 6 December 1989
Surveyor: Bergmann Associates
Ground Surface Elevation (feet): 513.29 (NGVD)
Top on Protective Casing Elevation (feet): 516.33 (NGVD)
Northing: 50,058.44
Easting: 58,602.59
Comments: AC Rochester coordinate system

REVISIONS BY ______ DATE ______

FILE 00299-076

CHECKED BY ______



WELL SCHEMATIC

EXISTING WELLS 2 & 2A

DAMES & MOORE

H&A OF NEW YORK
Consulting Geotechnical Engineers Geologists and Hydrogeologists

EXISTING MONITORING WELL EVALUATION FORM

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 3 - Renumbered SR-3
Date Installed: 27 May-4 June 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Rochester Shale

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 520.2
Inner Casing El. (NGVD): 519.7
Outer Casing El. (NGVD): 520.2

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	6.7	None
Nx Core	3	16.7	Water
Tricone	6	16.7	Water

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	6	NA	0.0	NA
Riser Casing	2	13.5	0.5	14.0
Screen	2	2.0	14.0	16.0

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	1.0	3.0
Backfill	3.0	4.5
Bentonite	3.5	6.7
Conical PVC Plug	6.7	---
Cored Rock Interval	6.7	16.7
Caved Infall Matl.	16.0	16.7

* Depths measured from ground surface.

DRILLING METHOD

Method: Truck Rotary
Fluid: Water
Was Fluid Analyzed: No
Sampling: Split Spoon: 5 ft. Interval
Rock Core: Nx, 10 ft.
Types of Tests Performed on Samples: Visual Classification

CONSTRUCTION MATERIALS

Primary Casing: 2-in. ID Stainless
Protective Casing: Steel Roadway Box
Screen: 0.01 in. Slotted Stainless
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: No

If no, How does it Disagree:
PVC Construction, well depth

Condition of Protective Casing: Good

Condition of Seals: Good

Well Depth (Ft): 18.20 ft.
Depth To Water (Ft): 7.32 ft.

RECOMMENDATIONS: Install new protective casing. Redevelop well.

H&A of New York	WELL UPGRADE SUMMARY FORM	File No. 70014-41

WELL DEVELOPMENT

Date Re-Developed: 28 September 1989
H&A Representative: T. Wells
Static Water Level (feet below top of protective casing): 10.91 ft.
Depth to Bottom of Well Prior to Development (feet):
Gallons Removed:
Depth to the Bottom of the Well (feet) After Development:
Comments:

HYDRAULIC CONDUCTIVITY TESTING

Date Tested: 30 October 1989
H&A Representative: T. Wells
Static Water Level (feet below the top of protective casing): 10.88 ft.
Method Used to Perform Test: Rising Head
Method Used to Calculate Hydraulic Conductivity: Hvorslev Method
Hydraulic Conductivity (cm/sec): 3.3 X 10-4
Comments:

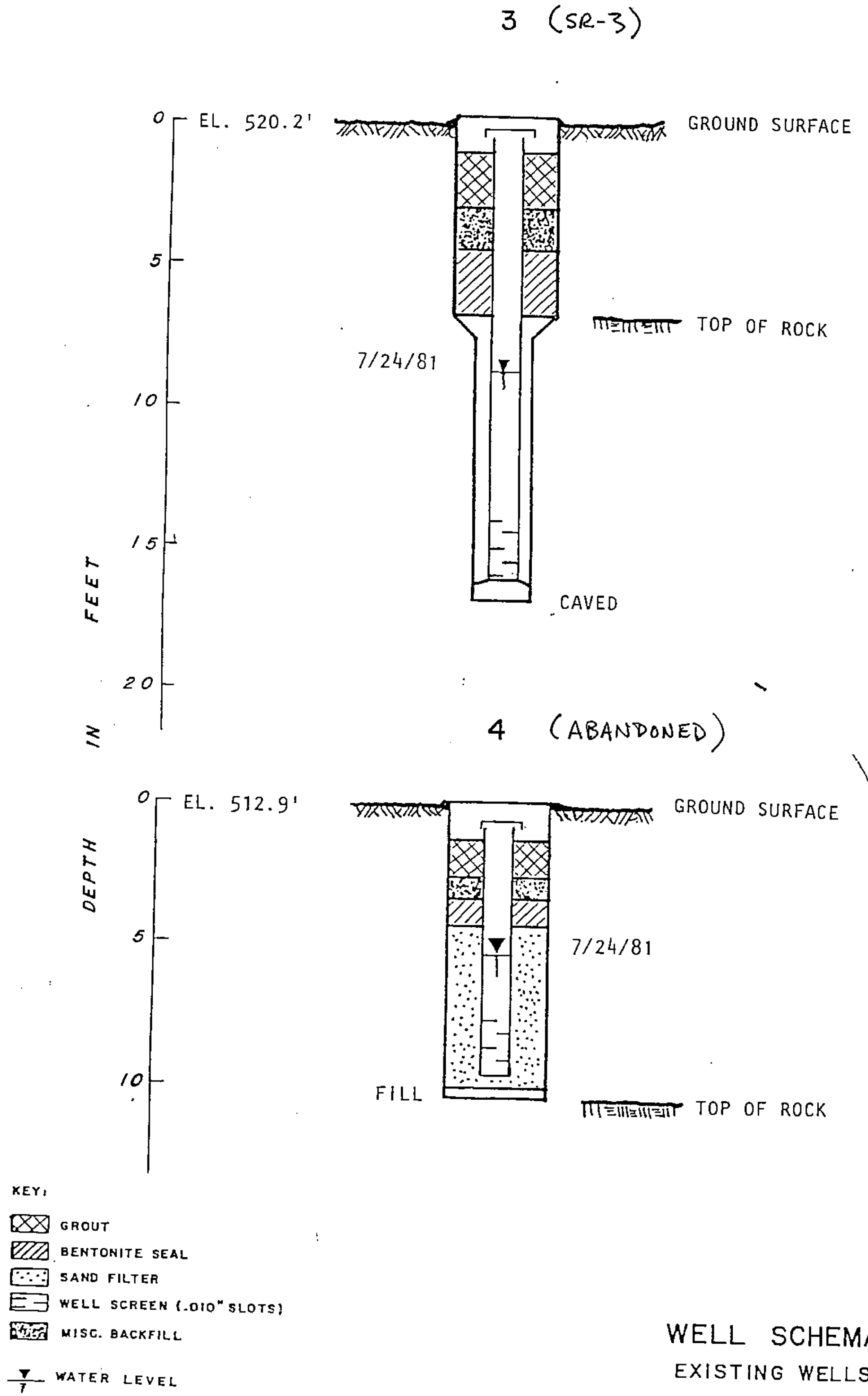
PHYSICAL UPGRADE

Date Upgraded: 6 September 1989
H&A Representative: T. Wells
Work Performed: Existing roadway box removed, above ground riser extension and protective casing installed.

Comments: Upgrade performed by Rochester Drilling Company.

SURVEYING INFORMATION

Date Surveyed: 6 December 1989
Surveyor: Bergmann Associates
Ground Surface Elevation (feet): 519.05 (NGVD)
Top on Protective Casing Elevation (feet): 522.10 (NGVD)
Northing: 50,479.46
Easting: 56,715.04
Comments: AC Rochester coordinate system



WELL SCHEMATIC

EXISTING WELLS 3&4

DAMES & MOORE

REVISIONS BY ______ DATE ______

FILE D-2299-026

CHECKED BY ______

H&A OF NEW YORK
Consulting Geotechnical Engineers Geologists and Hydrogeologists

EXISTING MONITORING WELL EVALUATION FORM

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 8-Renumbered SR-8
Date Installed: October 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Rochester Shale

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 501.8-See Note 2
Inner Casing El. (NGVD): 504.26
Outer Casing El. (NGVD): 504.38

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	11.0	None
Nx Core	3	17.0	Water
Tricone	6	17.0	Water

DRILLING METHOD

Method: Truck Rotary
Fluid: Water
Was Fluid Analyzed: No
Sampling: Split Spoon: 5 ft. Interval
Rock Core: Nx, 6 ft.
Types of Tests Performed on Samples: Visual Classification

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	6	NA	+2.25	NA
Riser Casing	2	17.5	+2.46	15.0
Screen	2	2.0	15.0	17.0

CONSTRUCTION MATERIALS

Primary Casing: 2-in. ID Stainless
Protective Casing: Steel
Screen: 0.01 in. Slotted Stainless
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	0.5	2.0
Backfill	2.0	11.5
Bentonite	11.5	14.0
Sand Filter Pack	14.0	17.0

* Depths measured from ground surface.

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: No

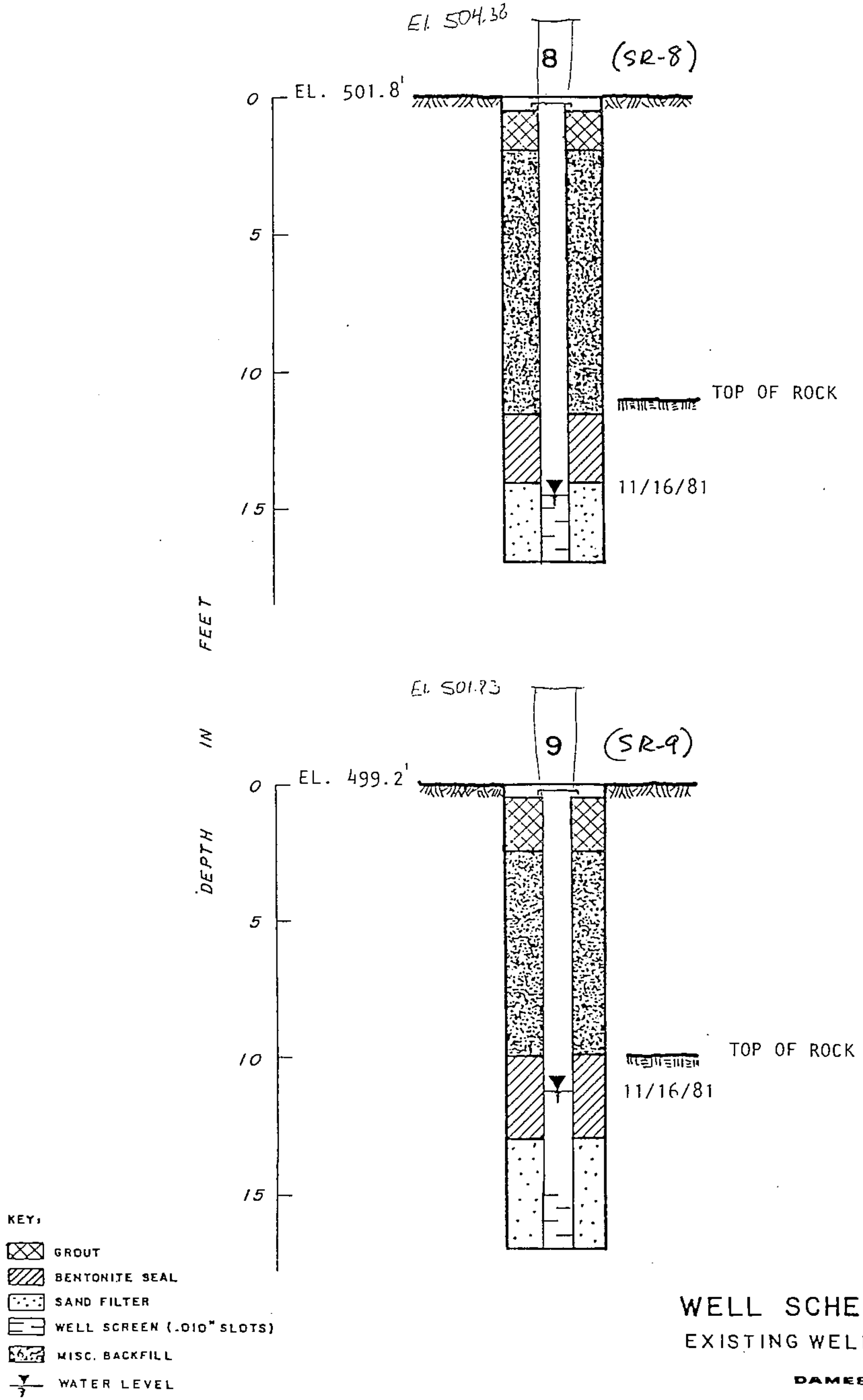
If no, How does it Disagree: Casing Stickup

Condition of Protective Casing: Good

Condition of Seals: Good

Well Depth (Ft): 16.44 ft.
Depth To Water (Ft): 15.44 ft.

Notes: (1) Top of rock encountered at 11.0 ft. (2) Revised location and elevations 6 December 1989: Vertical Datum: USC & GSVD ACR Coordinates: 51,349.29N, 58324.84E Elevations: TOC-502.99 ft., GS-500.51 ft.



WELL SCHEMATIC

EXISTING WELLS 8 & 9

DAMES & MOORE

REVISIONS BY ______ DATE ______

FILE 0 0299-076-0105

BY L.KEEFE DATE 11-12-81 CHECKED BY ______ DATE ______

H&A OF NEW YORK Consulting Geotechnical Engineers Geologists and Hydrogeologists	EXISTING MONITORING WELL EVALUATION FORM Page 1 of 2

Project: AC Rochester Division
Location: Lexington Ave. Rochester, NY
Well Number: 9-Renumbered SR-9
Date Installed: October 1981
Field Rep: Dames & Moore
Contractor: Rochester Drilling Co.
Rig Type: NA
Formation Screened: Rochester Shale

File Number: 70014-41
Date: June 1989
Ground El. (NGVD): 499.2-See Note
Inner Casing El. (NGVD): 501.7
Outer Casing El. (NGVD): 501.8

DRILLING INFORMATION

Bit Type	Hole Dia. (In)	End Depth (Ft)	Fluid Type
Auger	7±	10.0	None
Nx Core	3	17.0	Water
Tricone	6	17.0	Water

PROTECTOR, CASING AND SCREEN RECORD

Type	Dia. (In)	Length (Ft)	Top* (Ft)	Bot* (Ft)
Protective Casing	4	NA	+2.62	NA
Riser Casing	2	17.5	+2.49	15.0
Screen	2	2.0	15.0	17.0

FILTER PACK AND ANNULAR SPACE SEALS

Description	Top* (Ft)	Bottom (Ft)
Cement Grout	0.5	2.5
Backfill	2.5	10.0
Bentonite	10.0	13.0
Sand Filter Pack	13.0	17.0

* Depths measured from ground surface.

DRILLING METHOD

Method: Truck Rotary
Fluid: Water
Was Fluid Analyzed: No
Sampling: Split Spoon: 5 ft. Interval
Rock Core: Nx, 7 ft.
Types of Tests Performed on Samples: Visual Classification

CONSTRUCTION MATERIALS

Primary Casing: 2-in. ID Stainless
Protective Casing: Steel
Screen: 0.01 in. Slotted Stainless
Casing/Screen Connection: NA

Were materials decontaminated prior to installation: NA

WELL DEVELOPMENT

Method: Potable Water Flushing
Development Time: approx. 1 hour

FIELD INSPECTION

Agreement with Reported Data: No

If no, How does it Disagree: Casing Stickup

Condition of Protective Casing: Good, somewhat rusty

Condition of Seals: Good
Well Depth (Ft): 15.87 ft
Depth To Water (Ft): 12.06 ft.

RECOMMENDATIONS: Re-develop well and repeat falling head test.
Note: Revised location and elevations 6 December 1989.
Vertical Datum: USC & GSVD, ACR coordinates: 52,348.84N, 57,719.03E.
Elevations: TOC - 500.32 ft. GS - 497.72 ft.

H&A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

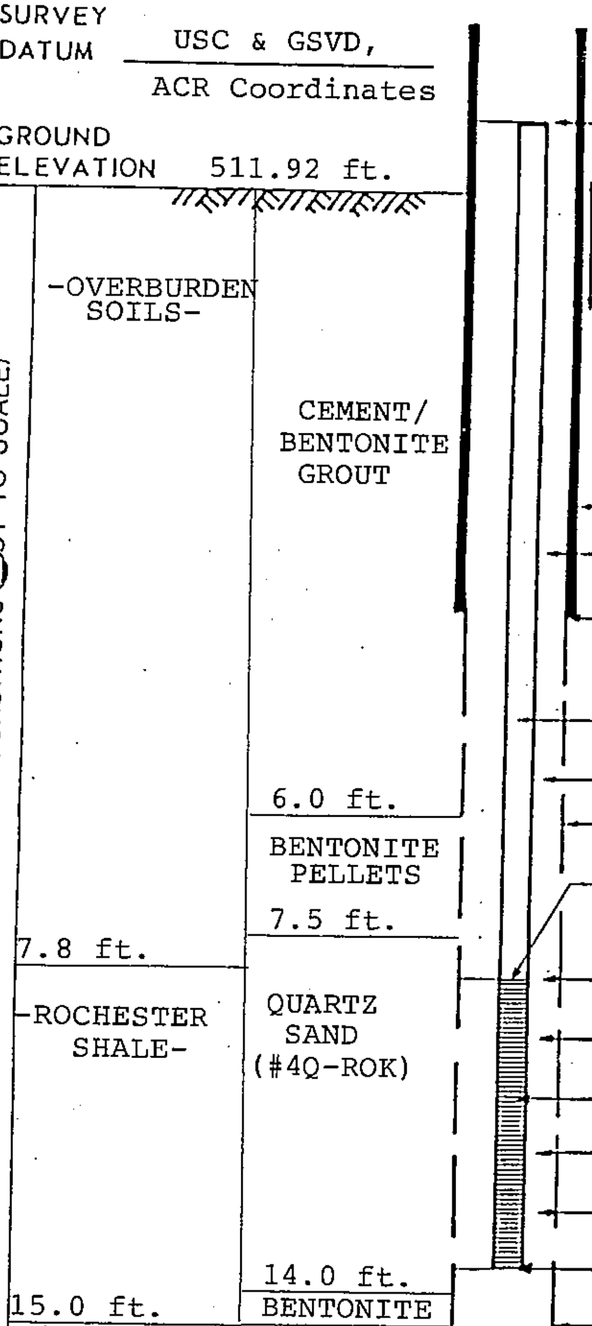
BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON H&A REPRESENTATIVE: J. TALPEY
INSTALLATION DATE 21 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. SR-101
BORING NO. B-101
LOCATION 50,911.03 N
56,730.77 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 511.92 ft.



XXXXXXXXXX STICKUP ABOVE/XXXXX GROUND SURFACE OF CASING XXXXXX XXXXXX (*above nail in grout)	2.42 ft.
XXXXXXXXXX STICKUP ABOVE/XXXXX GROUND SURFACE OF RISER PIPE. *	2.15 ft.
THICKNESS OF SURFACE SEAL	6.0 ft.
TYPE OF SURFACE SEAL	Bentonite-Cement Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	4.25 in.
XXXXXXXXX/DEPTH OF BOTTOM OF CASING	2.4 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Bentonite-Cement Grout
DIAMETER OF BOREHOLE	12.0 in.± (overburden) 6.0 in.± (rock)
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
XXXXXXXXX/DEPTH OF BOTTOM OF RISER	8.0 ft.
TYPE OF WELLSCREEN/RISER	Stainless Steel
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	#4Q-ROK Quartz Sand
XXXXXXXXX/DEPTH OF BOTTOM OF WELLSCREEN	13.5 ft.
XXXXXXXXX/DEPTH OF BOTTOM OF BOREHOLE	15.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 10.17 ft. (LENGTH OF RISER PIPE) + 5.5 ft. (LENGTH OF WELLSCREEN) = 15.7 ft. (TOTAL LENGTH)

H & A FORM 59

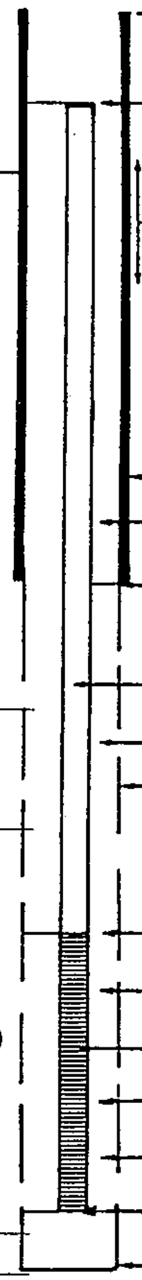
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT:	AC ROCHESTER - LEXINGTON AVE. FACILITY	FILE NO.	70014-41
LOCATION:	ROCHESTER, NEW YORK	WELL NO.	SR-102
CLIENT:	GENERAL MOTORS - AC ROCHESTER DIVISION	BORING NO.	B102B
CONTRACTOR:	ROCHESTER DRILLIGN CO., INC.	LOCATION	51,252.09 N
DRILLER:	D. ROBINSON H&A REPRESENTATIVE: T. WELLS		57,264.11 E
INSTALLATION DATE	18 AUGUST 1989	SHEET	1 OF 2

SURVEY DATUM: USC & GSVD, ACR Coordinates

GROUND ELEVATION: 513.03 ft.



SUMMARIZE SOIL CONDITIONS (NOT TO SCALE)

Soil conditions	Backfill
-FILL-	CEMENT/ BENTONITE GROUT
	18.0 ft.
	BENTONITE PELLETS
	20.2 ft.
-WEATHERED SHALE- 22.2 ft.	QUARTZ SAND (#4 QROK)
-ROCHESTER SHALE-	
	29.4 ft.
	BENTONITE PELLETS
	30.6 ft.

~~ELEVATION OF~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING ~~ELEVATION OF~~	2.88 ft.
~~ELEVATION OF~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF RISER PIPE.	2.38 ft.
THICKNESS OF SURFACE SEAL	18.0 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	5.75 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF CASING	2.4 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Grout
DIAMETER OF BOREHOLE	0-20.4 ft.: 10 in.± 20.4-30.6 ft.: 6 in.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
~~ELEVATION~~/DEPTH OF BOTTOM OF RISER	23.0 ft.
TYPE OF WELLSCREEN OR MANUFACTURER	Stainless Steel
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
~~ELEVATION~~/DEPTH OF BOTTOM OF WELLSCREEN	28.38 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF BOREHOLE	30.6 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 25.59 ft. (LENGTH OF RISER PIPE) + 5.17 ft. (LENGTH OF WELLSCREEN) = 30.76 ft. (TOTAL LENGTH)

H & A FORM 59 SCP

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO. 70014-41
LOCATION: ROCHESTER, NEW YORK	WELL NO. SR-103
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO. B-103-C
CONTRACTOR: ROCHESTER DRILLING CO., INC.	LOCATION 51,693.45 N
DRILLER: D. ROBINSON H&A REPRESENTATIVE: T.WELLS	57,838.16 E
INSTALLATION DATE 14 SEPTEMBER 1989	SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 510.72 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

-FILL-

±20.0 ft.

-GLACIO LACUSTRINE-

±23.0 ft.

-WEATHERED BEDROCK

26.2 ft.

-ROCHESTER SHALE-

BENTONITE CEMENT GROUT

22.6 ft.

BENTONITE PELLETS

24.6 ft.

QUARTZ SAND (#4Q-ROK)

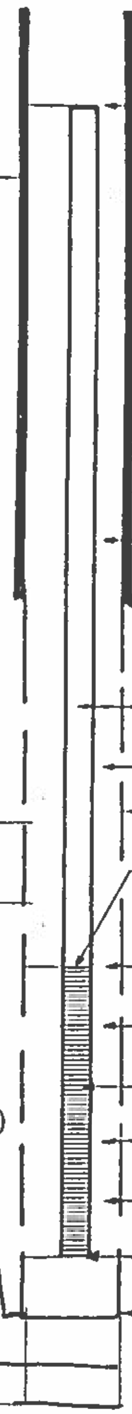
31.6 ft.

BENTONITE PELLETS

32.3 ft.

CAVED MATERIAL

33.1 ft.



~~XXXXXXXXX~~ STICKUP ABOVE/~~XXXXX~~ GROUND SURFACE OF CASING ~~XXXXXX~~ *	3.23 ft.
~~XXXXXX~~ * Above nail in grout at base of casing.	
~~XXXXXXXXX~~ STICKUP ABOVE/~~XXXXX~~ GROUND SURFACE OF RISER PIPE. *	2.95 ft.
THICKNESS OF SURFACE SEAL	22.6 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	3.75 ft.
~~XXXXXXXXX~~/DEPTH OF BOTTOM OF CASING	1.6 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 ft.
TYPE OF BACKFILL AROUND RISER	See Diagram
DIAMETER OF BOREHOLE	0-26.2 ft.: 10 in.± 26.2-33.1 ft: 6 in.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
~~XXXXXXXXX~~/DEPTH OF BOTTOM OF RISER	25.6 ft.
TYPE OF WELLSCREEN/RISER	#304 Stainless Steel
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
~~XXXXXXXXX~~/DEPTH OF BOTTOM OF WELLSCREEN	31.3 ft.
~~XXXXXXXXX~~/DEPTH OF BOTTOM OF BOREHOLE	33.1 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 28.60 ft. (LENGTH OF RISER PIPE) + 5.65 ft. (LENGTH OF WELLSCREEN) = 34.25 ft. (TOTAL LENGTH)

H & A FORM 59 SEP 72

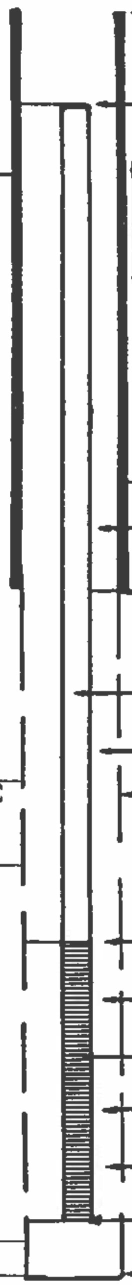
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT:	AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO.	70014-41
LOCATION:	ROCHESTER, NEW YORK	WELL NO.	SR-105
CLIENT:	GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO.	B105
CONTRACTOR:	ROCHESTER DRILLING CO., INC.	LOCATION	51,991.46 N
DRILLER:	D. ROBINSON H&A REPRESENTATIVE: T. WELLS		57,573.38 E
INSTALLATION DATE	29 AUGUST 1989	SHEET	1 OF 2

SURVEY DATUM: USC & GSVD, ACR Coordinates

GROUND ELEVATION: 510.77 ft.



SUMMARIZE SOIL CONDITIONS (NOT TO SCALE)

Soil conditions	Backfill
-FILL-	CEMENT/ BENTONITE GROUT
approx. 12.0 ft.	
-GLACIO-LACUSTRINE-	
22.0 ft.	22.0 ft.
-WEATHERED BEDROCK-	BENTONITE PELLETS
	24.0 ft.
25.5 ft.	
-ROCHESTER SHALE-	QUARTZ SAND (#4Q-ROK)
	32.0 ft.
	BENTONITE PELLETS
33.0 ft.	33.0 ft.

STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING	2.98 ft.
ELEVATION OR STICKUP ABOVE/BELOW GROUND SURFACE OF RISER PIPE.	2.75 ft.
THICKNESS OF SURFACE SEAL	22.0 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	4.25 in.
DEPTH OF BOTTOM OF CASING	1.8 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Grout
DIAMETER OF BOREHOLE	0-25.5 ft: 10 in.± 25.5-33.0 ft: 6 in.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
DEPTH OF BOTTOM OF RISER	25.8 ft.
TYPE OF WELLSCREEN OR MANUFACTURER	Stainless Steel #304
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
DEPTH OF BOTTOM OF WELLSCREEN	31.44 ft.
DEPTH OF BOTTOM OF BOREHOLE	33.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 28.57 ft. (LENGTH OF RISER PIPE) + 5.63 ft. (LENGTH OF WELLSCREEN) = 34.20 ft (TOTAL LENGTH)

H&A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON H&A REPRESENTATIVE: T. WELLS
INSTALLATION DATE 25 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. SR-107
BORING NO. B-107B*
LOCATION 52,049.77 N
57,898.34 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 499.72 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

-FILL-
±10.0 ft.
-WEATHERED BEDROCK-
±15.0 ft.
-ROCHESTER SHALE-
22.0 ft.

BENTONITE-CEMENT GROUT
11.5 ft.
BENTONITE PELLETS
13.0 ft.
QUARTZ SAND (#4Q-ROK)
20.5 ft.
BENTONITE PELLETS
21.0 ft.
CAVED BEDROCK
22.0 ft.

XXXXXXXXXX STICKUP ABOVE/BXXXX GROUND SURFACE OF CASING XXXXXX XXXXXX	2.81 ft.
ELEVATION OR STICKUP ABOVE/BELOW GROUND SURFACE OF RISER PIPE. (ground elev. at nail in grout)	2.48 ft.
THICKNESS OF SURFACE SEAL	11.5 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Steel
INSIDE DIAMETER OF CASING	4.25 in.
XXXXXXXXX DEPTH OF BOTTOM OF CASING	2.0 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Grout
DIAMETER OF BOREHOLE	0-15 ft.: 10 in.± 15-22 ft.: 6 ft.±
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
XXXXXXXXX DEPTH OF BOTTOM OF RISER	14.5 ft.
TYPE OF WELLSCREEN/RISER	#304 Stainless Steel
SCREEN SLOT SIZE (Slots from 14.53 to 19.53 ft.)	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	Quartz Sand
XXXXXXXXX DEPTH OF BOTTOM OF WELLSCREEN	20.15 ft.
XXXXXXXXX DEPTH OF BOTTOM OF BOREHOLE	22.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 16.96 ft. (LENGTH OF RISER PIPE) + 5.67 ft. (LENGTH OF WELLSCREEN) = 22.63 ft. (TOTAL LENGTH)

H & A FORM 59 SEP 72

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON H&A REPRESENTATIVE: J. TALPEY
INSTALLATION DATE 19 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. SR-110
BORING NO. B-110
LOCATION 52,329.21 N
57,341.11 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 498.46 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

Depth	Subsurface conditions	Depth	Backfill
	-FILL-		CEMENT-BENTONITE GROUT
		11.5 ft.	BENTONITE
13.5 ft.	-ROCHESTER SHALE-	13.5 ft.	QUARTZ SAND (#4Q-ROK)
		21.0 ft.	BENTONITE
22.0 ft.			

~~ELEVATION OF TOP OF~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING	2.79 ft.
ELEVATION OR STICKUP ABOVE/BELOW GROUND SURFACE OF RISER PIPE. (ground elev. at nail in grout)	2.40 ft.
THICKNESS OF SURFACE SEAL	11.5 ft.
TYPE OF SURFACE SEAL	Bentonite-Cement Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING (4.8 ft. long)	Steel
INSIDE DIAMETER OF CASING	4.25 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF CASING	2.0 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Bentonite-Cement Grout
DIAMETER OF BOREHOLE	12.0 in.± (overburden) 6.0 in.± (rock)
TYPE OF COUPLING (THREADED, SOLVENT WELDED, WELDED, ETC.)	Threaded
~~ELEVATION~~/DEPTH OF BOTTOM OF RISER	14.7 ft.
TYPE OF WELLSCREEN/RISER	Stainless Steel
SCREEN SLOT SIZE	0.010 in.
DIAMETER OF WELLSCREEN	2.0 in.
TYPE OF BACKFILL AROUND WELLSCREEN	#4 Quartz Sand
~~ELEVATION~~/DEPTH OF BOTTOM OF WELLSCREEN	20.4 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF BOREHOLE	22.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

WELL SUMMARY: 17.2 ft. (LENGTH OF RISER PIPE) + 5.6 ft. (LENGTH OF WELLSCREEN) = 22.8 ft. (TOTAL LENGTH)

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	SHALLOW BEDROCK MONITORING WELL REPORT

PROJECT:	Hydrogeologic Investigation	FILE NO.:	70014-42
LOCATION:	Lexington Avenue Facility - Rochester, New York	WELL NO.:	SR-131
CLIENT:	AC Rochester Division - General Motors Corp.	BORING NO.:	B-131B
CONTRACTOR:	Nothnagle Drilling	LOCATION:	51201.24N 57753.02E
DRILLER:	S. Loranty H&A REPRESENTATIVE: T. Wells		
INSTALLATION DATE:	25 September 1990	SHEET:	1 OF 2

Survey Datum NGVD

Ground Elevation: 512.70 ft.

SUMMARIZE SOIL CONDITIONS

Not to scale

Soil	Depth	Backfill	Depth
-FILL- (very coarse)	14.0 ft.	CEMENT GROUT	2.5 ft.
NATIVE OVERBURDEN SOILS	23.0 ft.	BENTONITE-CEMENT GROUT	20.0 ft.
		BENTONITE PELLETS	21.5 ft.
ROCHESTER SHALE	30.0 ft.	#3 Q QUARTZ SAND	29.0 ft.
		BENTONITE PELLETS	30.0 ft.

Stickup above ground surface of protective casing.	2.30 ft.
Stickup above ground surface of riser pipe.	2.02 ft.
Thickness of Surface Seal	2.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite-Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.0 in.
Depth of Bottom of Protective Casing	2.5 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite-Cement Grout
Diameter of Borehole	0-23 ft. 12 in. + 23-30 ft. 6 in. +
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of slots at 23.28 ft.	23.10 ft.
Type of Wellscreen	304 Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 27.87 ft.	Quartz sand
Depth of Bottom of Wellscreen	28.12 ft.
Depth of Bottom of Borehole	30.0 ft.

Remarks:

Well No. SR-131

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	SHALLOW BEDROCK MONITORING WELL REPORT

PROJECT:	Hydrogeologic Investigation	FILE NO.:	70014-42
LOCATION:	Lexington Avenue Facility - Rochester, New York	WELL NO.:	SR-132
CLIENT:	AC Rochester Division - General Motors Corp.	BORING NO.:	B-132B
CONTRACTOR:	Nothnagle Drilling	LOCATION:	51123.26N
DRILLER:	S. Loranty H&A REPRESENTATIVE: T. Wells		58085.96E
INSTALLATION DATE:	23 August 1990	SHEET:	1 OF 2

Survey Datum NGVD

Ground Elevation: 512.62 ft. * measured at bolt in grout

SUMMARIZE SOIL CONDITIONS In Soil Scale

Soil Conditions	Backfill
-FILL- (to 8.5 ft.)	BENTONITE-CEMENT GROUT (to 18.0 ft.)
-NATIVE SOIL- (8.5 ft. to 22.2 ft.)	BENTONITE PELLETS (18.0 ft. to 20.0 ft.)
-ROCHESTER SHALE- (22.2 ft. to 30.0 ft.)	QUARTZ SAND (#3 Q-ROK) (20.0 ft. to 29.0 ft.)
	BENTONITE PELLETS (29.0 ft. to 30.0 ft.)

Stickup above ground surface of protective casing.	2.93 ft.
Stickup above ground surface of riser pipe.	2.06 ft.
Thickness of Surface Seal	2.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite-Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.0 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite-Cement Grout
Diameter of Borehole	0-22.2 ft. 10 in. 22.2-30.0 ft. 6 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of slots at 23.2 ft.	23.06 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz sand
Depth of Bottom of Wellscreen	27.98 ft.
Depth of Bottom of Borehole	30.0 ft.

Remarks:

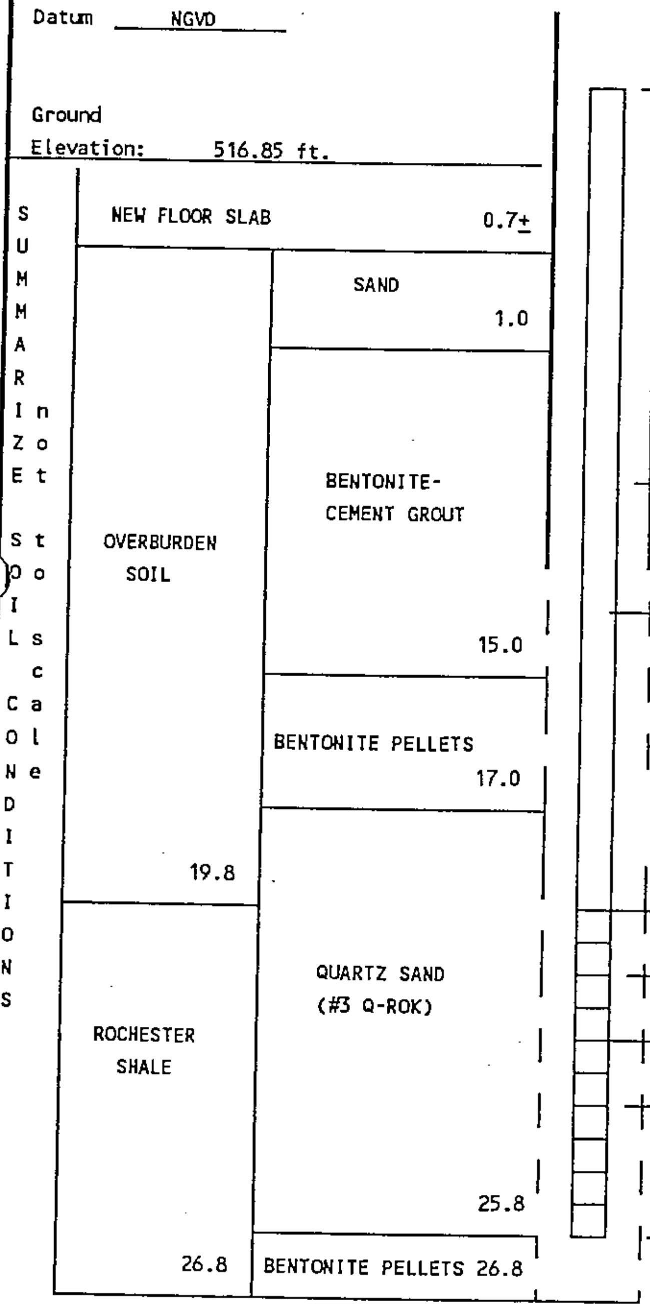
Well No. SR-132

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	SHALLOW BEDROCK MONITORING WELL REPORT

PROJECT:	DEGREASER INVESTIGATION	FILE NO.:	70138-40
LOCATION:	LEXINGTON AVENUE FACILITY - ROCHESTER, NEW YORK	WELL NO.:	SR-216
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	50,788.12 North, 57,187.34 East
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	F.GRATTEN RIG TYPE: Diedrich D-25	SHEET:	1 OF 2
INSTALLATION DATE:	5 SEPTEMBER 1990	INSPECTOR:	T.Wells

Survey Datum NGVD

Ground Elevation: 516.85 ft.



Stickup above/below ground surface of protective casing.	0.00 ft.
Stickup below ground surface of riser pipe.	0.25 ft.
Thickness of Surface Seal	See diagram
Type of Surface Seal [indicated all seals showing depth, thickness and type]	See diagram
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	7.5 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See diagram
Diameter of Borehole	0.0-17.0 ft.:8 in. 17.0-26.8 ft.:4 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser Top of Slots at 18.43 ft.	18.26 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen Bottom of slots at 23.06 ft.	Quartz Sand
Depth of Bottom of Wellscreen	23.1 ft.
Depth of Bottom of Borehole	26.8 ft.

Remarks:

Well No. SR-216

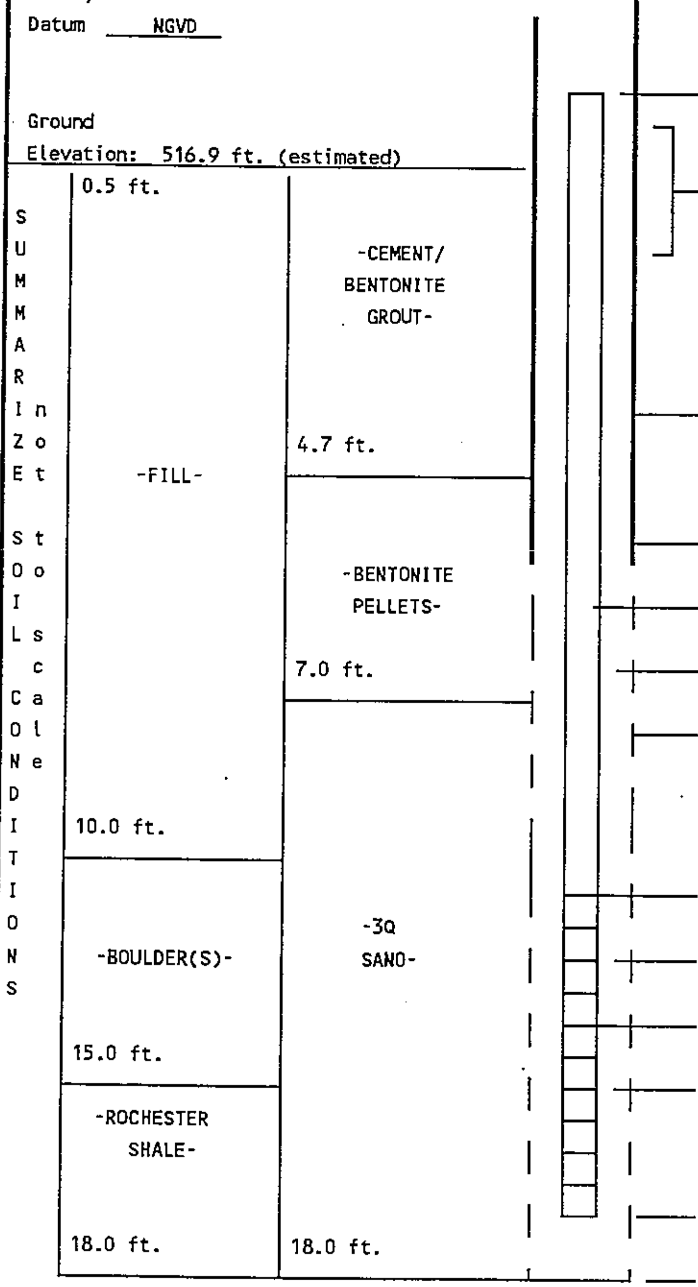
H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

SHALLOW BEDROCK MONITORING WELL REPORT

PROJECT:	DEGREASER INVESTIGATION STUDY AREA 4	FILE NO.:	70138-41
LOCATION:	ROCHESTER, NEW YORK	WELL NO.:	SR-208
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	See Plan
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	F. GRATTAN RIG TYPE: DIOEDRICH D-25	SHEET:	1 OF 2
INSTALLATION DATE:	30 August 1991	INSPECTOR:	J. Talpey/S. Boyle

Survey Datum NGVD

Ground Elevation: 516.9 ft. (estimated)



Depth/Stickup above/below ground surface of protective casing.	0.0 ft.
Depth below ground surface of riser pipe.	0.3 ft.
Thickness of Surface Seal	4.7 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Curb Box
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Cement/Bentonite/ 3Q Sand
Diameter of Borehole	8.0 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	8.0 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	3Q Sand
Depth of Bottom of Wellscreen	18.0 ft.
Depth of Bottom of Borehole	18.5 ft.

Remarks: Possible void noted by driller during placement of filter sand from 10.0 to 12.0 ft. (extra sand required to fill borehole annular space).

Well No. SR-208

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	SHALLOW BEDROCK MONITORING WELL REPORT

PROJECT:	DEGREASER INVESTIGATION	FILE NO.:	70138-40
LOCATION:	LEXINGTON AVENUE FACILITY - ROCHESTER, NEW YORK	WELL NO.:	SR-230
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	6.4 feet northeast of VM-217
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	F.GRATTEN RIG TYPE: Diedrich D-25	SHEET:	1 OF 2
INSTALLATION DATE:	30 OCTOBER 1990	INSPECTOR:	T.Wells

Survey Datum NGVD

Ground Elevation: 516.85 ft.

SUMMARIZE Soil Conditions

Summarize Soil Conditions	Backfill
-CONCRETE SLABS- 2.5 ft.	-BENTONITE CEMENT GROUT- 16.0 ft.
-FILL AND NATIVE SOILS- 16.3 ft.	-BENTONITE PELLETS- 18.0 ft.
-WEATHERED BEDROCK- 20.0 ft.	QUARTZ SAND (#3 Q-ROK) 25.2 ft.
-ROCHESTER SHALE- 26.0 ft.	-BENTONITE PELLETS- 26.0 ft.

Stickup above/below ground surface of protective casing.	0.00 ft.
Stickup below ground surface of riser pipe.	0.55 ft.
Thickness of Surface Seal	16.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Bentonite/Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	7.5 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Grout
Diameter of Borehole	0.0-15.8 ft.:8 in. 15.8-26.0 ft.:4 in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	19.97 ft.
Top of Slots at 20.15 ft.	
Type of Wellscreen	#302 Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Bottom of slots at 24.73 ft.	
Depth of Bottom of Wellscreen	25.15 ft.
Depth of Bottom of Borehole	26.0 ft.

Remarks:

Well No. SR-230

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	OVERBURDEN GROUNDWATER MONITORING WELL REPORT

PROJECT:	DEGREASER INVESTIGATION - STUDY AREA 6	FILE NO.:	70014-049
LOCATION:	ROCHESTER, NEW YORK	WELL NO.:	SR-231
CLIENT:	DELPHI AUTOMOTIVE SYSTEMS	LOCATION:	See Plan
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	S. LORANTY RIG TYPE: GUS PECK MITE-MITE	SHEET:	1 OF 1
INSTALLATION DATE:	8-9 MAY 1995	INSPECTOR:	D. Nostrant

Survey
Datum Plant Floor/NGVD

Ground
Elevation: 516.85 ft.

SUMMARY Soil Conditions / Installation Notes

Soil Conditions	Installation
CONCRETE 0.6 ft.	-VAULT (*)- 2.5 ft.
-FILL- 6.2 ft.	-FILL (*)- 3.0 ft.
	-CEMENT GROUT- 6.0 ft.
-LACUSTRINE- 8.3 ft.	-BENTONITE- 8.0 ft.
-WEATHERED ROCHESTER SHALE- 15.0 ft.	-QUARTZ SAND-
-COMPETENT ROCHESTER SHALE- 20.5 ft.	20.5 ft.

Stickup below ground surface of protective casing.	* See remarks
Stickup below ground surface of riser pipe.	0.20 ft.
Thickness of Surface Seal	3.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement Grout
Type of Protective Casing	Not installed
Inside Diameter of Protective Casing	---
Depth of Bottom of Protective Casing	---
Inside Diameter of Riser Pipe	4.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8.0 +/- in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	10.3 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	4.0 in.
Type of Backfill Around Wellscreen	Quartz Sand
Depth of Bottom of Wellscreen	20.30 ft.
Depth of Bottom of Borehole	20.50 ft.

Remarks: * Wellhead completion performed by Delphi Automotive Systems.
Top of riser modified with piping connection in sub-floor vault.

Well No. SR-231

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	OVERBURDEN GROUNDWATER MONITORING WELL REPORT

PROJECT: LEXINGTON AVENUE - RG&E SUBSTATION
LOCATION: ROCHESTER, NEW YORK
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTY   RIG TYPE: CME-75 TRUCK MOUNT
INSTALLATION DATE: 7 SEPTEMBER 1995

FILE NO.: 70014-049
WELL NO.: SR-234
LOCATION: 49991.2N
58172.5E
SHEET: 1 OF 1
INSPECTOR: D. Nostrant

Survey
Datum NGVD

Ground
Elevation: 515.52 ft.

SUMMARIZE Soil Conditions / In Zone Stratification Scale

Soil	Depth	Backfill	Depth
-FILL-	7.8 ft.	-CEMENT GROUT-	4.0 ft.
-LACUSTRINE-	9.8 ft.	-BENTONITE-	6.0 ft.
-GLACIAL TILL/ WEATHERED BEDROCK-	12.0 ft.	-QUARTZ SAND-	
-ROCHESTER SHALE-			

Stickup above ground surface of protective casing.	0.00 ft.
Depth below ground surface of riser pipe.	0.64 ft.
Thickness of Surface Seal	3.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement Grout
Type of Protective Casing	Roadbox
Inside Diameter of Protective Casing	6.5 in.
Depth of Bottom of Protective Casing	1.4 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Cement Grout
Diameter of Borehole	8.0 +/- in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	8.1 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	00-Quartz Sand
Depth of Bottom of Wellscreen	17.46 ft.
Depth of Bottom of Borehole	18.10 ft.

Remarks:

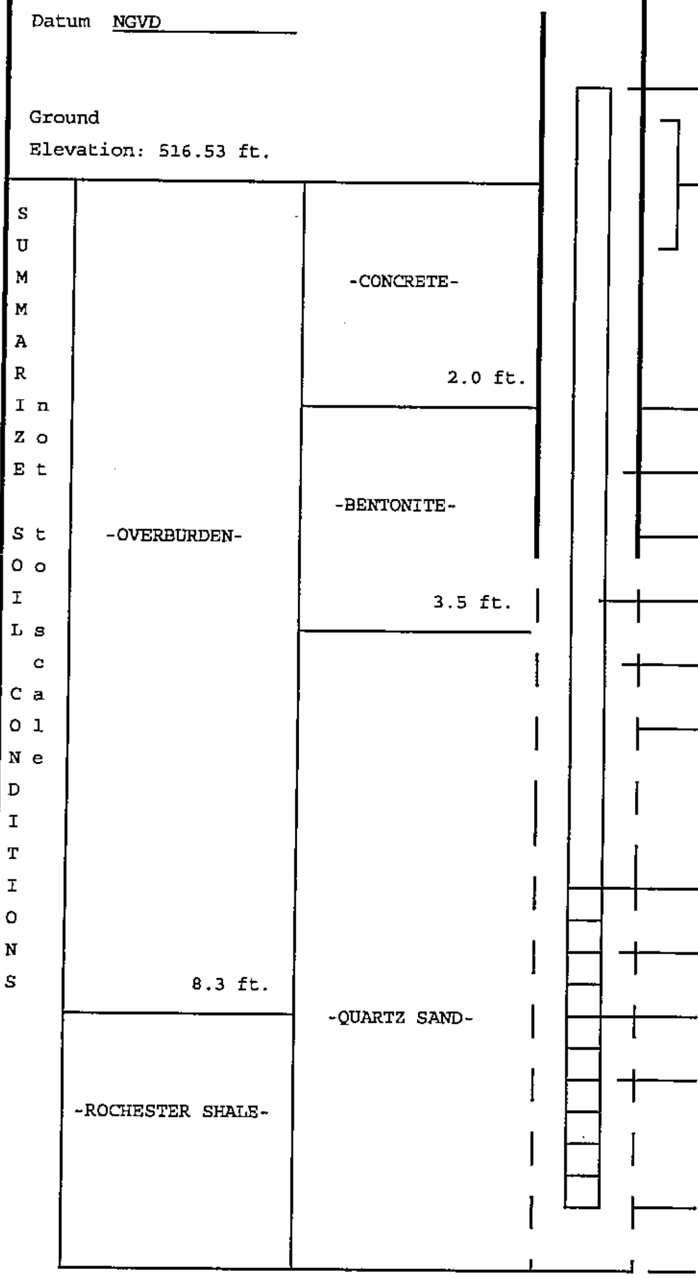
Well No. SR-234

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	OVERBURDEN GROUNDWATER MONITORING WELL REPORT

PROJECT:	LEXINGTON AVENUE - RG&E SUBSTATION	FILE NO.:	70014-049
LOCATION:	ROCHESTER, NEW YORK	WELL NO.:	SR-235
CLIENT:	DELPHI AUTOMOTIVE SYSTEMS	LOCATION:	50090.6N 58138.2E
CONTRACTOR:	NOTHNAGLE DRILLING	SHEET:	1 OF 1
DRILLER:	S. LORANTY RIG TYPE: CME-75 TRUCK MOUNT	INSPECTOR:	D. Nostrant
INSTALLATION DATE:	1 SEPTEMBER 1995		

Survey Datum NGVD

Ground Elevation: 516.53 ft.



Stickup above ground surface of protective casing.	2.39 ft.
Stickup above ground surface of riser pipe.	2.25 ft.
Thickness of Surface Seal	2.3 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Galvanized Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	1.5 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	Bentonite/ Cement Grout
Diameter of Borehole	8.0 +/- in.
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	5.4 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	00-Quartz Sand
Depth of Bottom of Wellscreen	15.4 ft.
Depth of Bottom of Borehole	15.4 ft.

Remarks:

Well No. SR-235

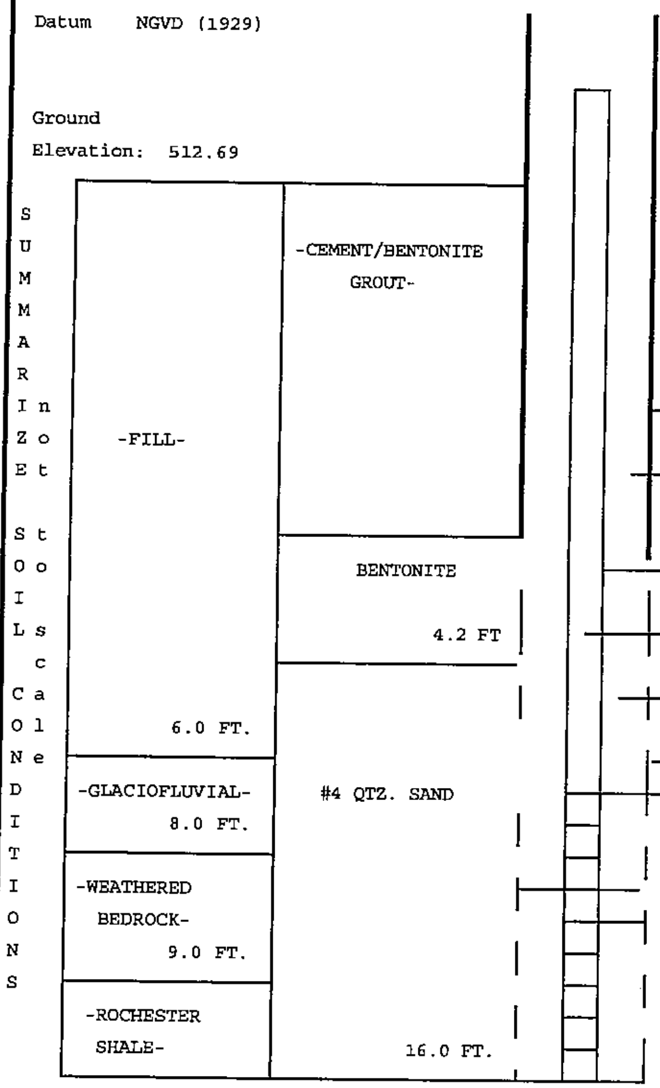
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK OBSERVATION WELL REPORT

PROJECT: BEDROCK WELL INSTALLATION EAST OF PLANT 1
LOCATION: LEXINGTON AVE., ROCHESTER, NEW YORK
CLIENT: DELPHI ENERGY & ENGINE MANAGMENT SYSTEMSF
CONTRACTOR: MAXIM TECHNOLOGIES
DRILLER: R. BROWN RIG TYPE: ACKER SOIL MAX
INSTALLATION DATE: 10/24/97

FILE NO. 70014-050
WELL NO.: SR-236
LOCATION: 50465.6 N, 58091.6 E
ELEVATION: 514.98 (Outer Casing)
SHEET: 1 OF 1
INSPECTOR: N. CASE HOY

Survey Datum NGVD (1929)

Ground Elevation: 512.69



Stickup above ground surface of protective casing.	2.29 ft.
Stickup above ground surface of riser pipe	1.94 ft.
Thickness of Surface Seal	See Left
Type of Surface Seal [indicated all seals showing depth, thickness and type]	See Left
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	4.0 in.
Depth of Bottom of Protective Casing	2.0 ft.
Type of Riser	Stainless Steel
Inside Diameter of Well Casing	2.0 in.
Type of Backfill Around Riser	Cement Grout
Diameter of Borehole	6.0 in.
Depth of Bottom of Riser	6.0 ft.
Depth of Top of Bedrock	9.0 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill around Wellscreen	#4 Qtz Sand
Elevation/Depth of Bottom of Wellscreen	16.0 ft.
Depth of Bottom of Borehole	16.0 ft.

Method and Materials used to grout casings:

Remarks: Top of Outer Casing Elev.: 514.98 ft.
Top of Riser Elev. 514.63 ft.

Well No. SR-236

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-301
Boring No.	SR-301

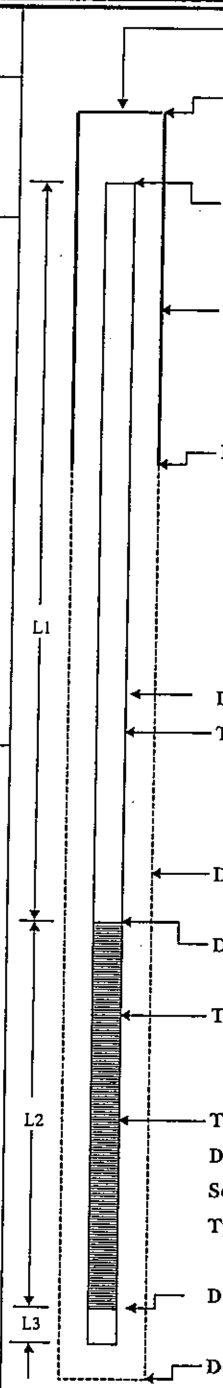
PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/17/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
PAVEMENT/ GRAVEL 0.5 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 12.7 FT.	BENTONITE 10.0 FT.
WEATHERED BEDROCK 15.0 FT.	QUARTZ SAND
ROCHESTER SHALE	
22.0	22.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Locking Steel Guard Pipe
Height of top of guard pipe above ground surface	3.0 ft
Height of top of riser pipe above ground surface	2.8 ft
Type of protective casing	Steel Guard Pipe
Length	5.0 ft
Inside Diameter	6.0 in
Depth of bottom of guard pipe	2.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	9.0
Quartz Sand	10.0	12.0

Depth to the top of bedrock	15.0 ft
Type of riser pipe	Stainless Steel
Inside diameter of riser pipe	2.0 in
Type of backfill around riser	Bentonite
Diameter of borehole	8.0 in
Depth to top of well screen	12.0 ft
Type of core interval	Tri-cone-bit-reamed NX Core
Diameter of core interval	6.0 in
Type of well screen	Continuous-Wrap Stainless Steel
Diameter of well screen	2.0 in
Screen gauge or size of openings	0.010 in
Type of backfill around well screen	Quartz Sand
Depth of bottom of well screen	22.0 ft
Depth of bottom of borehole	22.0 ft

(Not to Scale)

17.8 ft + 7.0 ft + ______ ft = 24.8 ft
Riser Pay Length (L1) | Length of screen (L2) | Length of silt trap (L3) | Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-303
Boring No.	SR-303

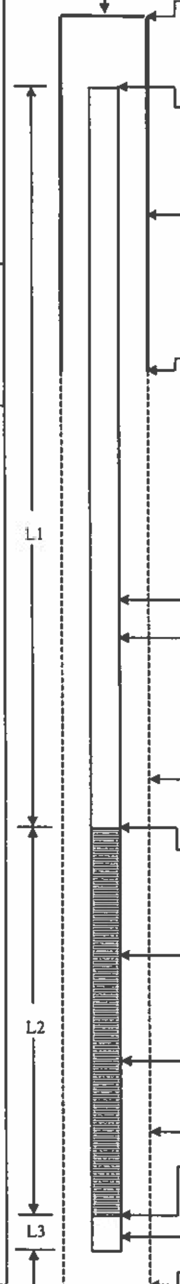
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	10/17/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. 493.98 ft
El. Datum
Location

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS	CONCRETE 2.0 FT.
9.0 FT.	BENTONITE SEAL 4.0 FT.
ROCHESTER SHALE	#00N QUARTZ SAND
16.0 FT.	16.0 FT.

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Bolted Steel Cover	
Height of top of guard pipe above ground surface	Flush	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing:	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe	N/A	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	2.0
Cement Grout	--	--
Bentonite	2.0	2.0
Silica Quartz Sand	4.0	12.0

Depth to the top of bedrock	9.0	ft
Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Above	
Diameter of borehole	8.0	in
Depth to top of well screen	6.0	ft
Type of screen	Factory-slotted PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	#00N Quartz Sand	
Diameter of bedrock corehole	6.0	in
Depth of bottom of well screen	16.0	ft
Bottom of Silt trap	16.0	ft
Depth of bottom of borehole	16.0	ft

5.8 ft + 10 ft + 0 ft = 15.8 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

BEDROCK OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

Well No.	SR-308
Boring No.	SR-308

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/13/2001
DRILLER	S. LORANTY	WATER LEVEL	

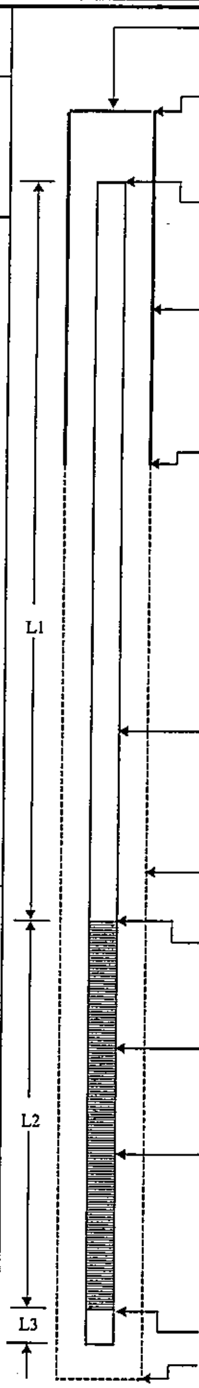
Ground El. ______ ft
El. Datum ______

Location SEE PLAN

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS	CEMENT
	1.0 FT.
	BENTONITE
	6.0 FT.
8.0 FT.	
ROCHESTER SHALE	QUARTZ SAND
18.0	18.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Guard Pipe	
Height of top of guard pipe above ground surface	3.0	ft
Height of top of riser pipe above ground surface	2.8	ft
Type of protective casing	Locking Steel Guard Pipe	
Length	5.0	ft
Inside Diameter	6.0	in
Depth of bottom of guard pipe	2.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	5.0
Quartz Sand	6.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	8.0	ft
Depth to the top of bedrock	8.0	ft
Type of core interval	Tri-cone-bit-reamed NX Core	
Diameter of core interval	6.0	in
Type of well screen	Continuous-Wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	18.0	ft
Depth of bottom of borehole	18.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
11 ft	+	10.0 ft	+	ft	=	21 ft

COMMENTS:

Form # 3010

OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

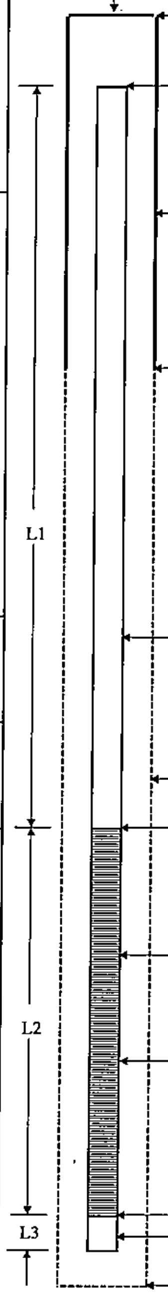
Well No.	SR-309
Boring No.	

PROJECT	Subsurface Investigation	H&A FILE NO.	70014-066
LOCATION	Delphi-Lexington Ave. Facility	PROJECT MGR.	D. Conley
CLIENT	Delphi Automotive Systems	FIELD REP.	D. Nostrant
CONTRACTOR	Nothnagle Drilling	DATE INSTALLED	12/10/2007
DRILLER	S. Loranty	WATER LEVEL	

Ground El.	516.85 ft	Location	11'S, 6'E of Col. R-11	☐ Guard Pipe
El. Datum				☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN	-CONCRETE-
	1.0 ft.
	CEMENT BENTONITE GROUT
	8.0 ft.
	HYDRATED BENTONITE CHIPS
10.4 ft.	11.0 ft.
BEDROCK	00N QUARTZ SAND

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Steel/Padlock	
Height of top of guard pipe/roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	8 in. Steel Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	8.0	3.0
Grout	1.0	7.0

Type of riser pipe:	Stainless Steel	
Inside diameter of riser pipe	20.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0	in
Depth to top of well screen	11.4	ft
Type of screen	Continuous Wound Stainless Steel	
Screen gauge or size of openings	0.10	in
Diameter of screen	2.0	in
Type of backfill around screen	00N Quartz Sand	
Depth of bottom of well screen	21.2	ft
Bottom of Silt trap	21.4	ft
Depth of bottom of borehole	21.4	ft

ft	+	ft	+	ft	=	ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS: Development: Recovered 15 gal. went dry 3x, successive pumpings recover~.25 gal. per attempt (44) total recovery 16 gal. 40 gal. lost during drilling.

Form 2007

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

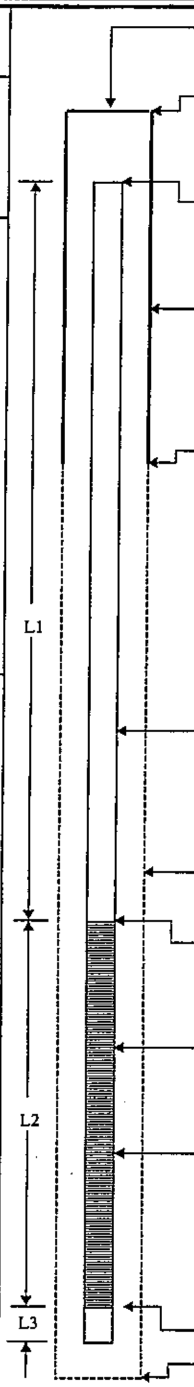
Well No. SR-310
Boring No. SR-310

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/22/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN ☐ Guard Pipe
El. Datum ______ ☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.7 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 11.0 FT.	BENTONITE 7.5 FT.
WEATHERED BEDROCK 12.5 FT.	QUARTZ SAND
ROCHESTER SHALE	
19.5	19.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	6.5
Quartz Sand	7.5	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	9.5	ft
Depth to the top of bedrock	12.5	ft
Type of core interval	Tri-cone-bit-reamed NX Core	
Diameter of core interval	6.0	in
Type of well screen	Continuous-Wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screeo	Quartz Sand	
Depth of bottom of well screen	19.5	ft
Depth of bottom of borehole	19.5	ft

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-311
Boring No.	SR-311

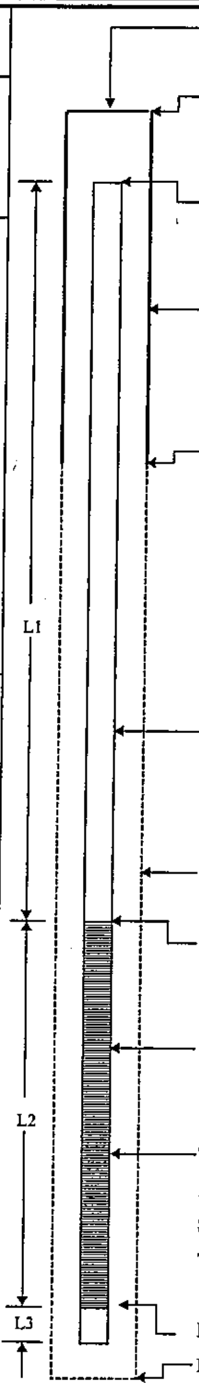
PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/26/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.8 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 12.0 FT.	BENTONITE 11.0 FT.
WEATHERED BEDROCK 16.0 FT.	QUARTZ SAND
ROCHESTER SHALE	
23.0	23.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	10.0
Quartz Sand	11.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	13.0	ft
Depth to the top of bedrock	12.5	ft
Type of core interval	Tri-cone-bit-reamed NX Core	
Diameter of core interval	6.0	in
Type of well screen	Continuous-Wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	23.0	ft
Depth of bottom of borehole	23.0	ft

(Not to Scale)

______ ft + ______ ft + ______ ft = ______ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-312
Boring No.	SR-312

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/27/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN

El. Datum ______

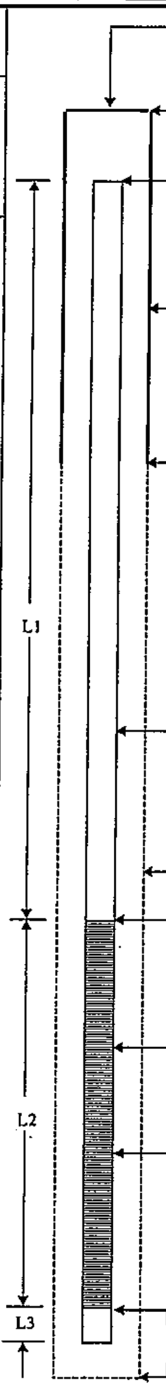
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.6 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS	BENTONITE 10.0 FT.
15.0 FT.	QUARTZ SAND
ROCHESTER SHALE	
22.0	22.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	Flush	ft
Depth of top of riser pipe below ground surface	0.2	ft
Type of protective casing	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	–	--
Bentonite	1.0	9.0
Quartz Sand	10.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	12.0	ft
Depth to the top of bedrock	15.0	ft
Type of core interval	Tri-cone-bit-reamed NX Core	
Diameter of core interval	6.0	in
Type of well screen	Continuous-wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	22.0	ft
Depth of bottom of borehole	22.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
15.0 ft	+	7.0 ft	+	ft	=	22.0 ft

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-313
Boring No.	SR-313

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/27/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN

El. Datum ______

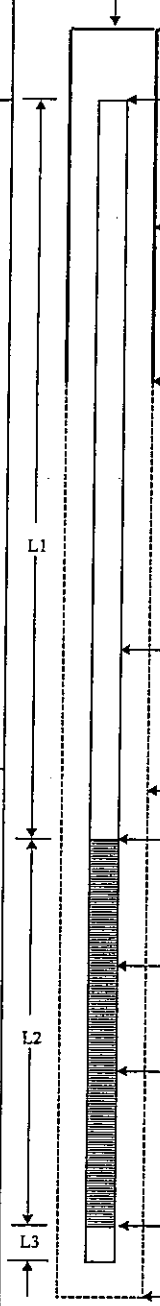
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 1.0 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 13.1 FT.	BENTONITE 10.0 FT.
WEATHERED BEDROCK 16.0 ft.	QUARTZ SAND
ROCHESTER SHALE 20.0	20.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock: Roadway Box

Height of top of roadway box above ground surface: Flush ft

Depth of top of riser pipe below ground surface: 0.2 ft

Type of protective casing: Roadway Box

Length: 1.0 ft

Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	9.0
Quartz Sand	10.0	10.0

Type of riser pipe: Stainless Steel

Inside diameter of riser pipe: 2.0 in

Type of backfill around riser: Bentonite

Diameter of borehole: 8.0 in

Depth to top of well screen: 10.0 ft

Depth to the top of bedrock: 13.1 ft

Type of core interval: Tri-cone-bit-reamed NX Core

Diameter of core interval: 6.0 in

Type of well screen: Continuous-wrap Stainless Steel

Diameter of well screen: 2.0 in

Screen gauge or size of openings: 0.010 in

Type of backfill around well screen: Quartz Sand

Depth of bottom of well screen: 20.0 ft

Depth of bottom of borehole: 20.0 ft

(Not to Scale)

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
16.0 ft	+	4.0 ft	+	ft	=	20.0 ft

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. SR-316
Boring No. SR-316

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	1/12/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ____ ft
El. Datum ____
Location SEE PLAN

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 1.0 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 16.0 FT.	CEMENT BENTONITE GROUT 14.0 FT.
	BENTONITE 16.0 FT.
ROCHESTER SHALE 27.0	QUARTZ SAND 27.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

L1 L2 L3

Type of protective cover/lock: Roadway Box

Height of top of roadway box above ground surface: Flush ft

Depth of top of riser pipe below ground surface: 0.2 ft

Type of protective casing: Roadway Box
Length: 1.0 ft
Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	13.0
Bentonite	14.0	2.0
Quartz Sand	16.0	11.0

Type of riser pipe: Stainless Steel
Inside diameter of riser pipe: 2.0 in
Type of backfill around riser: Bentonite/Cement Grout

Diameter of borehole: 8.0 in

Depth to top of well screen: 17.0 ft
Depth to the top of bedrock: 16.0 ft

Type of core interval: Tri-cone-bit-reamed NX Core
Diameter of core interval: 6.0 in

Type of well screen: Continuous-wrap Stainless Steel
Diameter of well screen: 2.0 in
Screen gauge or size of openings: 0.010 in
Type of backfill around well screen: Quartz Sand

Depth of bottom of well screen: 27.0 ft
Depth of bottom of borehole: 27.0 ft

(Not to Scale)

16.8 ft + 10.0 ft + ____ ft = 26.8 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: Rocked out 26.0 to 27.0 ft.

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	SR-318
Boring No.	SR-318

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/10/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN

El. Datum ______

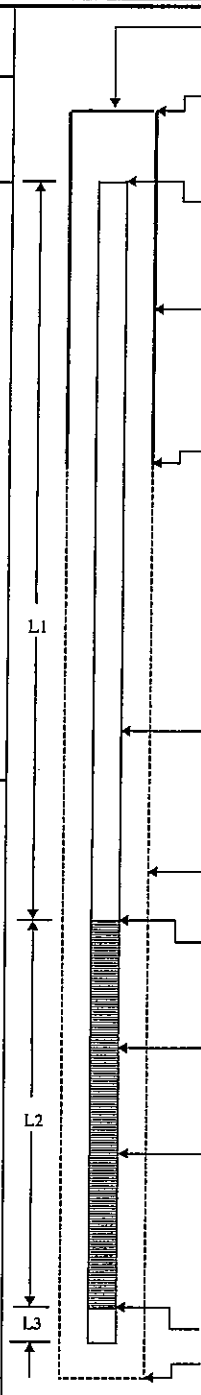
☑ Guard Pipe

☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.5 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 19.7 FT.	BENTONITE 15.0 FT.
WEATHERED BEDROCK 20.0 FT.	
ROCHESTER SHALE	QUARTZ SAND
27.0	27.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Guard Pipe	
Height of top of guard pipe above ground surface	3.0	ft
Height of top of riser pipe above ground surface	2.8	ft
Type of protective casing	Steel	
Length	6.0	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe	3.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	14.0
Quartz Sand	15.0	12.0

Type of riser pipe	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite	
Diameter of borehole	8.0	in
Depth to top of well screen	17.0	ft
Depth to the top of bedrock	20.0	ft
Type of core interval	Tri-cone-bit-reamed NX Core	
Diameter of core interval	6.0	in
Type of well screen	Continuous-wrap Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Type of backfill around well screen	Quartz Sand	
Depth of bottom of well screen	27.0	ft
Depth of bottom of borehole	27.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
23.0 ft	+	7.0 ft	+	ft	=	30.0 ft

COMMENTS: Rocked out 26.0 to 27.0 ft.

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. SR-319
Boring No. SR-319

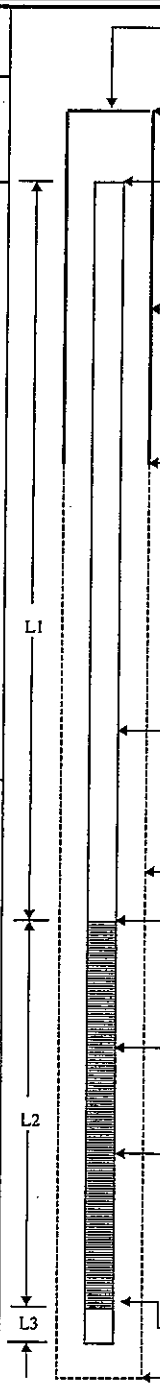
PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	1/21/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE	CEMENT
0.8 FT.	1.0 FT.
OVERBURDEN SOILS	BENTONITE
15.8 FT.	14.5 FT.
WEATHERED BEDROCK	QUARTZ SAND
19.5 FT.	
ROCHESTER SHALE	
26.5	26.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

- Type of protective cover/lock: Roadway Box
- Height of top of roadway box above ground surface: Flush ft
- Depth of top of riser pipe below ground surface: 0.3 ft
- Type of protective casing: Roadway Box
  - Length: 1.0 ft
  - Inside Diameter: 6.0 in
- Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	--	--
Bentonite	1.0	13.5
Quartz Sand	14.5	12.0

- Type of riser pipe: Stainless Steel
  - Inside diameter of riser pipe: 2.0 in
  - Type of backfill around riser: Bentonite
- Diameter of borehole: 8.0 in
- Depth to top of well screen: 16.5 ft
  - Depth to top of bedrock: 19.5 ft
- Type of core interval: Tri-cone-bit-reamed NX Core
  - Diameter of core interval: 6.0 in
- Type of well screen: Continuous-wrap Stainless Steel
- Diameter of well screen: 2.0 in
- Screen gauge or size of openings: 0.010 in
- Type of backfill around well screen: Quartz Sand
- Depth of bottom of well screen: 26.5 ft
- Depth of bottom of borehole: 26.5 ft

19.3 ft + 7.0 ft + ______ ft = 26.3 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: Rocked out 26.0 to 27.0 ft.

Form # 3010

HALEY & ALDRICH

BEROCK OBSERVATION WELL INSTALLATION REPORT

Well No. SR-321
Boring No. SR-321

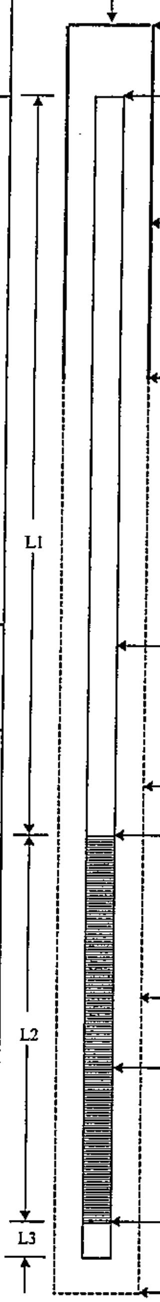
PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/29/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft Location SEE PLAN
El. Datum ______

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CONCRETE 0.6 FT.	CEMENT 1.0 FT.
FILL 18.8 FT.	BENTONITE CEMENT GROUT 12.5 FT.
WEATHERED ROCK 19.5 FT.	BENTONITE 14.5 FT.
BEDROCK	QUARTZ SAND
26.5	26.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock: Roadway Box

Height of top of roadway box above ground surface: Flush ft

Depth of top of riser pipe below ground surface: 0.2 ft

Type of protective casing: Roadway Box
Length: 1.0 ft
Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	11.5
Bentonite	12.5	2.0
Quartz Sand	14.5	12.0

Type of riser pipe: Stainless Steel
Inside diameter of riser pipe: 2.0 in
Type of backfill around riser: Bentonite/Cement Grout

Diameter of borehole: 8.0 in

Depth to top of well screen: 16.5 ft
Depth to the top of bedrock: 19.5 ft

Type of core interval: Tri-cone-bit-reamed NX Core
Diameter of core interval: 4.0 in

Type of well screen: Continuous-wrap Stainless Steel
Diameter of well screen: 2.0 in
Screen gauge or size of openings: 0.010 in
Type of backfill around well screen: Quartz Sand

Depth of bottom of well screen: 26.5 ft
Depth of bottom of borehole: 26.5 ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
19.5 ft	+	7.0 ft	+	ft	=	26.5 ft

COMMENTS: Rocked out 26.0 to 27.0 ft.

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. SR-326
Boring No. SR-326

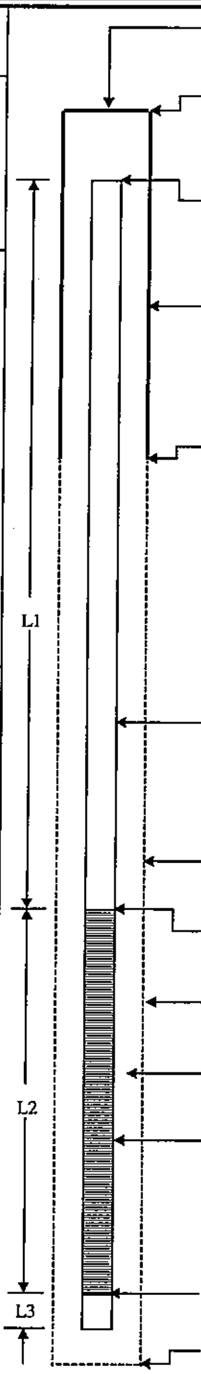
PROJECT	LEXINGTON AVE. FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	D. NOSTRANT
CONTRACTOR	NOTHNAGLE DRILLING INC.	DATE INSTALLED	12/26/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. 516.85 ft
El. Datum NGVD
Location 15'N and 15'E of Col. J-35

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
FILL	CONCRETE
	1.0 FT.
6.5 FT.	CEMENT GROUT
NATIVE SOILS	13.5 FT.
	BENTONITE PELLETS
	16.5 FT.
17.5 FT.	
ROCHESTER SHALE	#00N QUARTZ SAND
27.5	27.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet



Type of protective cover/lock	Bolted Steel / Padlock	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Flushmount Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	1.0	12.5
Bentonite Grout	13.5	3.0

Type of riser pipe:	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite/Grout	
Diameter of overburden borehole	8.0	in
Depth to top of bedrock	17.5	ft
Depth to top of well screen	17.5	ft
Type of core interval	Tri-cone bit reamed	
Diameter of bedrock corehole	4.0	in
Type of backfill around well screen	#00N Quartz Sand	
Type of well screen	Continuous-wound Stainless Steel	
Diameter of well screen	2.0	in
Screen gauge or size of openings	0.010	in
Depth of bottom of well screen	27.5	ft
Depth of bottom of borehole	27.5	ft

(Not to Scale)

_____ ft + _____ ft + _____ ft = _____ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

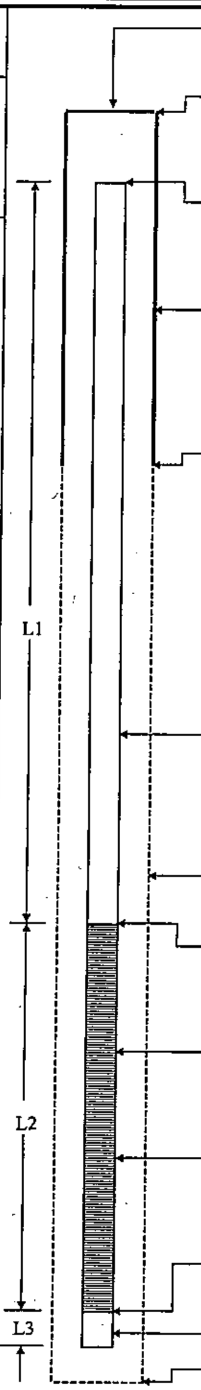
Well No.	Boring No.
SR-402	SR-402

PROJECT	LEXINGTON AVENUE FACILITIES RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	T. BOWN
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/10/2004
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. Not Surveyed ft | Location See Plan | ☑ Guard Pipe
El. Datum | | ☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
FILL	CONCRETE PAD
	0.5 ft
	GROUT
	6.0 ft
	BENTONITE
	8.0 ft
15.5 ft	
ROCHESTER FORMATION	SAND
20	20

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock ____

Height/Depth of top of guard pipe/roadway box above/below ground surface	3.5	ft
Height/Depth of top of riser pipe above/below ground surface	3.2	ft
Type of protective casing:	SQUARE GUARD PIPE	
Length	5.0	ft
Inside Diameter	4.000	in
Depth of bottom of guard pipe/roadway box	1.5	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.3	0.8
Bentonite Seal	6.0	2.0
Sand	8.0	12.0
Grout	0.5	3.5

Type of riser pipe:	STAINLESS STEEL	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser		
Diameter of borehole	8.0	in
Depth to top of well screen	10.0	ft
Type of screen	STAINLESS STEEL	
Screen gauge or size of openings	0.1	in
Diameter of screen	2.0	in
Type of backfill around screen	SAND	
Depth of bottom of well screen	20.0	ft
Bottom of Silt trap	20.0	ft
Depth of bottom of borehole	20.0	ft

15 ft + 20 ft + ____ ft = 35 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form 2007

OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

Well No. SR-503
Boring No.

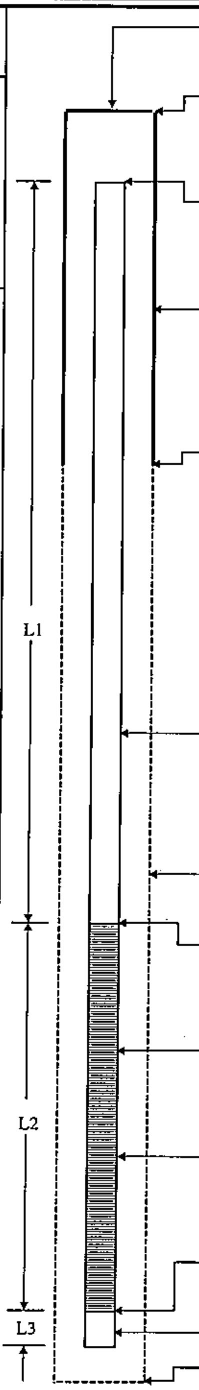
PROJECT	Subsurface Investigation	H&A FILE NO.	70014-066
LOCATION	Delphi-Lexington Ave. Facility	PROJECT MGR.	D. Conley
CLIENT	Delphi Automotive Systems	FIELD REP.	D. Nostrant
CONTRACTOR	Nothnagle Drilling	DATE INSTALLED	12/11/2007
DRILLER	S. Loranty	WATER LEVEL	

Ground El. 516.85 ft
El. Datum
Location

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN	-CONCRETE- (to 1.0 ft.)
	CEMENT BENTONITE GROUT (to 8.0 ft.)
	HYDRATED BENTONITE CHIPS
10.2 ft.	10.6 ft.
BEDROCK	00N QUARTZ SAND

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Steel/Padlock	
Height of top of guard pipe/roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	8 in. Steel Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of guard pipe/roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	8.0	3.0
Grout	1.0	7.0

Type of riser pipe:	Stainless Steel	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	See Diagram	
Diameter of borehole	8.0	in
Depth to top of well screen	11.3	ft
Type of screen	Continuous Wound Stainless Steel	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	00N Quartz Sand	
Depth of bottom of well screen	21.1	ft
Bottom of Silt trap	21.3	ft
Depth of bottom of borehole	21.3	ft

(Not to Scale)

_____ ft + _____ ft + _____ ft = _____ ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: Development: Recovered ~12 gal. went dry 4x, successive pumping recovered 0.1-0.2 gal. per attempt (4x) total recovery 13 gal. 25 gal. lost during drilling.

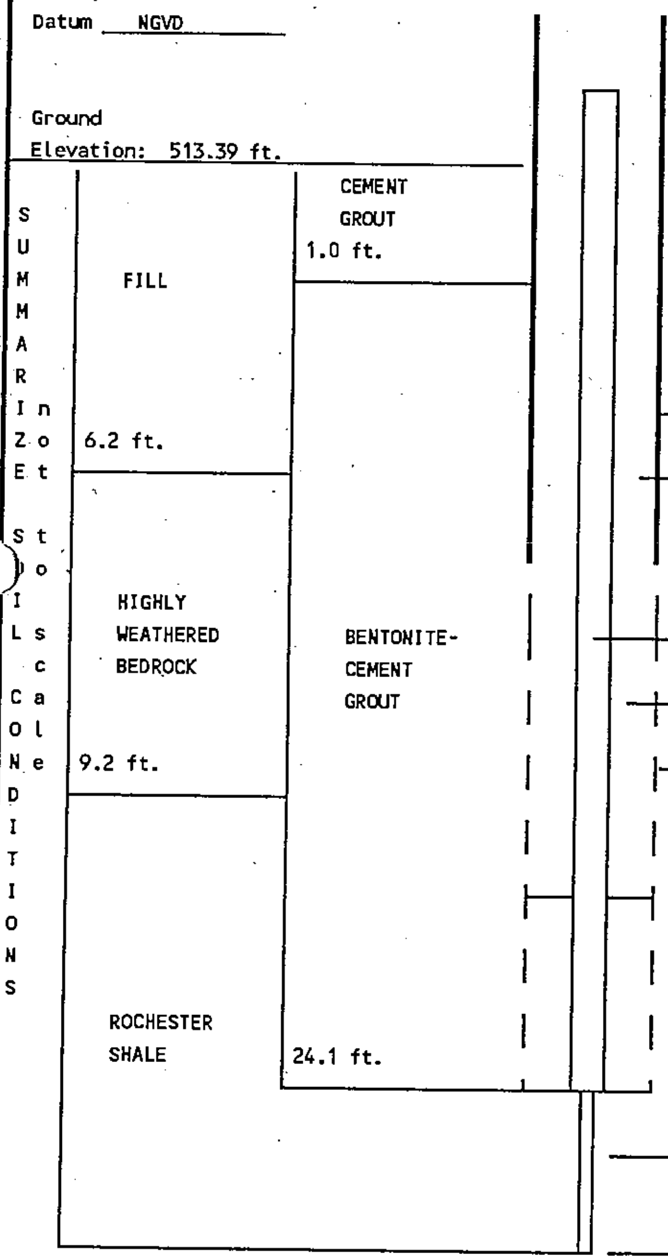
Form 2007

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT:	HYDROGEOLOGIC INVESTIGATION	FILE NO.:	70014-42
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.:	R-2
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	50053.01N 58594.31E
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	S. LORANTY RIG TYPE: CME 75, TRUCK MOUNTED	SHEET:	1 OF 2
INSTALLATION DATE:	2-7 AUGUST 1990	INSPECTOR:	T. WELLS/ W. LANIK

Survey Datum NGVD

Ground Elevation: 513.39 ft.



Stickup above ground surface of protective casing.	3.16 ft.
Stickup above ground surface of well casing.	3.06 ft.
Thickness of Surface Seal	1.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement/Grout
Type of Protective Casing	Steel Protective
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	0.84 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Bentonite Cement Grout
Diameter of Borehole	0-9 ft.: 10 in. 9-24 ft.: 8 in.
Depth of Top of Bedrock	9.2 ft.
Depth of Bottom of Casing	24.21 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	34.18 ft.

Method and Materials used to grout casings:
Well casing: 4.0 in. I.D. black iron pipe, 27.27 ft. length, with threaded casing joint at 20.7 ft. below top of casing, centralizers at 14 ft. and 19 ft. depth, pressure grouted in place.

Remarks:

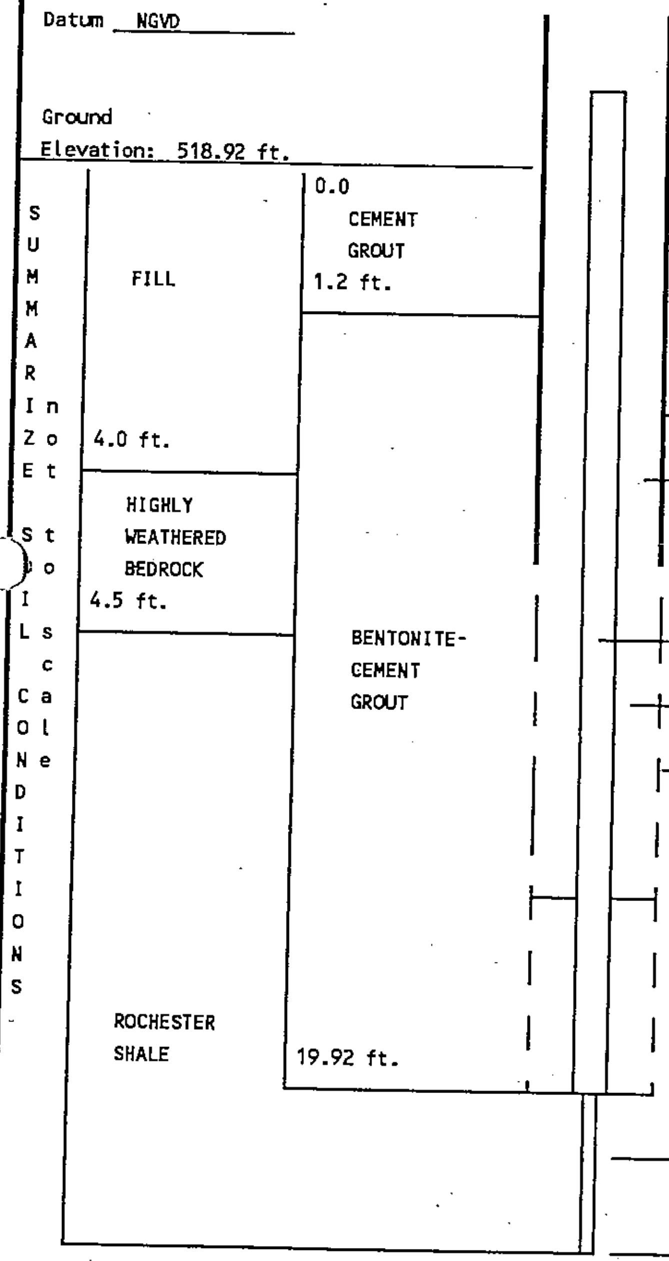
Well No. R-2

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT:	HYDROGEOLOGIC INVESTIGATION	FILE NO.:	70014-42
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.:	R-3
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	50486.63N 56729.57E
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	S. LORANTY RIG TYPE: CME 75, TRUCK MOUNTED	SHEET:	1 OF 2
INSTALLATION DATE:	3-7 AUGUST 1990	INSPECTOR:	W. LANIK

Survey Datum NGVD

Ground Elevation: 518.92 ft.



Stickup above ground surface of protective casing.	2.99 ft.
Stickup above ground surface of well casing.	2.50 ft.
Thickness of Surface Seal	1.2 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement/Grout
Type of Protective Casing	Steel Protective
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	1.01 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Bentonite Cement Grout
Diameter of Borehole	0-4.5 ft.: 10 in. 4.5-19.9 ft.: 8 in.
Depth of Top of Bedrock	4.5 ft.
Depth of Bottom of Casing	19.92 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	29.75 ft.

Method and Materials used to grout casings:
Well casing: 4.0 in. I.D. black iron pipe, 22.42 ft. length, pressure grouted in place.

Remarks:

Well No. R-3

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

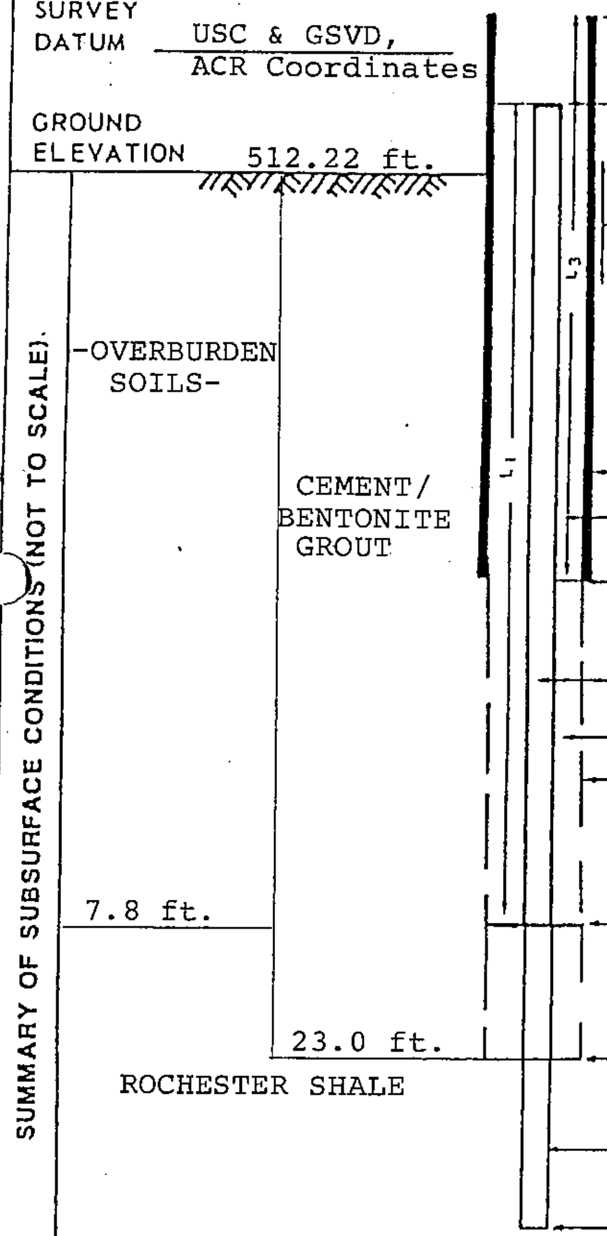
BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON INSPECTOR: J. TALPEY
INSTALLATION DATE 19-22 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. R-101
BORING NO. B101
LOCATION 50,899.62 N
56,727.53 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 512.22 ft.



STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING (*above nail in grout)	2.50 ft. *
STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING *	2.21 ft. *
THICKNESS OF SURFACE SEAL	23.0 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.25 in.
DEPTH OF BOTTOM OF PROTECTIVE CASING	2.3 ft.
INSIDE DIAMETER OF CASING	4.0 in.
TYPE OF BACKFILL AROUND CASING	Bentonite Cement Grout
DIAMETER OF BOREHOLE	12.0 in.± (overburden) 8.0 in. ± (rock)
DEPTH OF TOP OF BEDROCK	7.8 ft.
DEPTH OF BOTTOM OF CASING	23.3 ft.
DIAMETER OF ROCK HOLE	3.0 in.
DEPTH OF BOTTOM OF ROCK HOLE	33.8 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

25.5 ft. CASING LENGTH + 10.5 ft. LENGTH OF ROCK HOLE = 36.0 ft. TOTAL LENGTH

H&A

*-Stickups as measured by H&A of New York: T.O.C.=2.46 ft., T.O.R.=2.17 ft.

H&A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER - LEXINGTON AVE. FACILITY	FILE NO. 70014-41
LOCATION: ROCHESTER, NEW YORK	WELL NO. R 102
CLIENT: GENERAL MOTORS - AC ROCHESTER DIVISION	BORING NO. B 102
CONTRACTOR: ROCHESTER DRILLING CO., INC.	LOCATION 51,245.99 N
DRILLER: D. ROBINSON INSPECTOR: T. WELLS	57,262,59 E
INSTALLATION DATE 17 AUGUST 1989	SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 513.02 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

-FILL-

-GLACIO-LACUSTRINE- 22.8 ft.

WEATHERED SHALE 24.4 ft.

-ROCHESTER SHALE-

CEMENT/ BENTONITE GROUT

STICKUP ABOVE/ GROUND SURFACE OF CASING (Measured at notch filed in N. side of lid.)	3.00 ft*
STICKUP ABOVE/ GROUND SURFACE OF CASING (Measured at notch in N. side of top of casing.)	2.41 ft.
THICKNESS OF SURFACE SEAL	39.5 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.75 in.
DEPTH OF BOTTOM OF PROTECTIVE CASING	1.85 ft.
INSIDE DIAMETER OF CASING (steel)	4.0 in.
TYPE OF BACKFILL AROUND CASING	Grout
DIAMETER OF BOREHOLE	8.0 in.±
DEPTH OF TOP OF BEDROCK	24.4 ft.
DEPTH OF BOTTOM OF CASING	39.5 ft.
DIAMETER OF ROCK HOLE	3.0 in.±
DEPTH OF BOTTOM OF ROCK HOLE	49.5 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

41.9 ft. (CASING LENGTH) + 10.0 ft. (LENGTH OF ROCK HOLE) = 51.9 ft. (TOTAL LENGTH)

H&A

*-Stickups as maeasured by H&A of New York: T.O.C.=2.96 ft.
T.O.R.=2.37 ft.

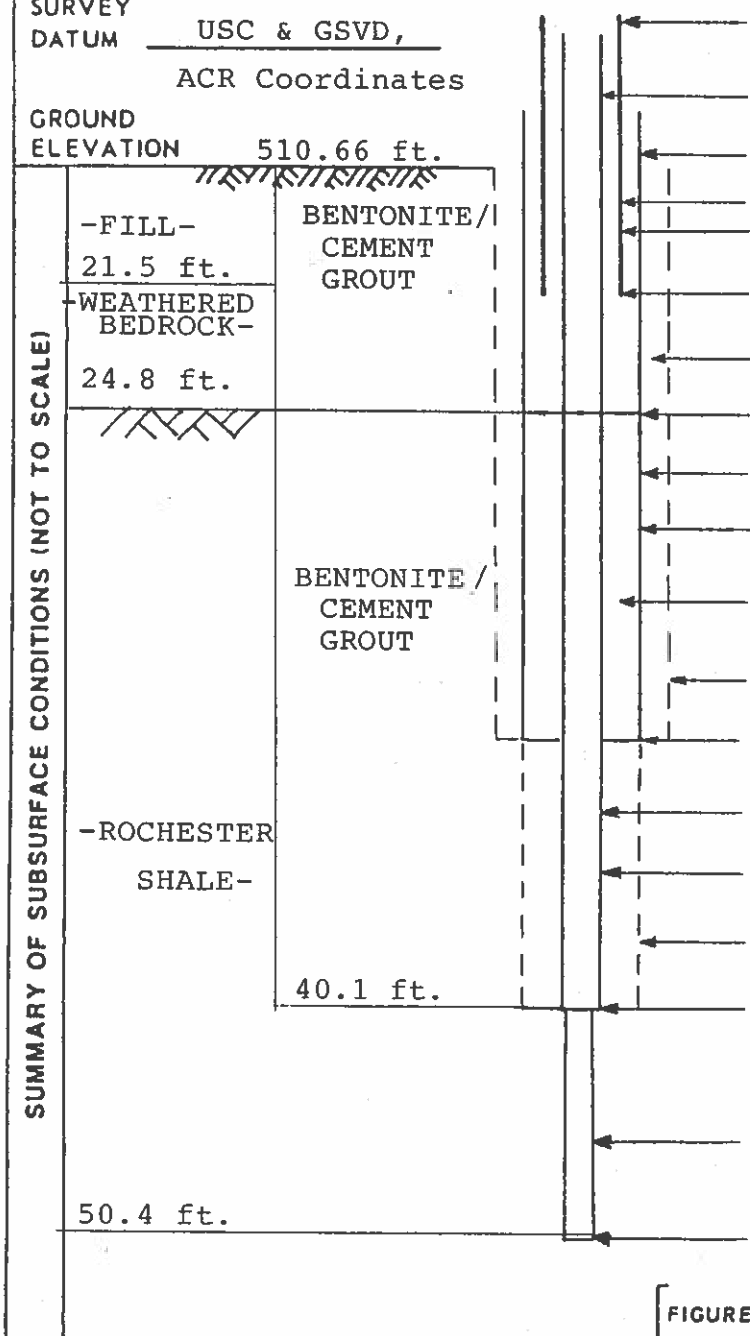
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT:	AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO.	70014-41
LOCATION:	ROCHESTER, NEW YORK	WELL NO.	R-103
CLIENT:	GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO.	B-103
CONTRACTOR:	ROCHESTER DRILLING CO., INC.	LOCATION	51,679.47 N
DRILLER:	D. ROBINSON INSPECTOR: T. WELLS		57,846.58 E
INSTALLATION DATE	6 SEPTEMBER 1989	SHEET 1	OF 2

SURVEY DATUM: USC & GSVD, ACR Coordinates

GROUND ELEVATION: 510.66 ft.



~~ELEVATION OF~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF PROTECTIVE CASING ~~OR ROADWAY BOX~~ (above nail head)	3.30 ft* (3.16 ft)
~~ELEVATION OF~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF INNER CASING. (above nail head)	(2.57 ft)
~~ELEVATION OF~~ STICKUP ~~ABOVE~~/BELOW GROUND SURFACE OF OUTER CASING.	0.1 ft.
TYPE OF PROTECTIVE CASING.	Steel
INSIDE DIAMETER OF PROTECTIVE CASING.	5.75 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING.	1.8 ft.
TYPE OF BACKFILL AROUND OUTER CASING.	Grout
~~ELEVATION~~/DEPTH OF TOP OF BEDROCK.	24.8 ft.
TYPE OF OUTER CASING.	Steel
INSIDE DIAMETER OF OUTER CASING.	8.0 in.
TYPE OF BACKFILL AROUND INNER CASING.	Grout
DIAMETER OF BOREHOLE.	10-14 in
~~ELEVATION~~/DEPTH OF BOTTOM OF OUTER CASING.	25.1 ft.
TYPE OF INNER CASING.	Steel
INSIDE DIAMETER OF INNER CASING.	4.0 in.
DIAMETER OF BOREHOLE.	8.0 in.±
~~ELEVATION~~/DEPTH OF BOTTOM OF INNER CASING.	39.3 ft.
DIAMETER OF ROCK HOLE.	3.0 in.±
~~ELEVATION~~/DEPTH OF BOTTOM OF ROCK HOLE.	50.4 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

OUTER CASING LENGTH		INNER CASING LENGTH		LENGTH OF ROCK HOLE		TOTAL LENGTH
[25.2 ft.]		41.9 ft.	+	11.1 ft.	=	53.0 ft.

*-Surveyed stickup on casing of 3.30 ft. (H&A measurement of stickup = 3.16 ft.)

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

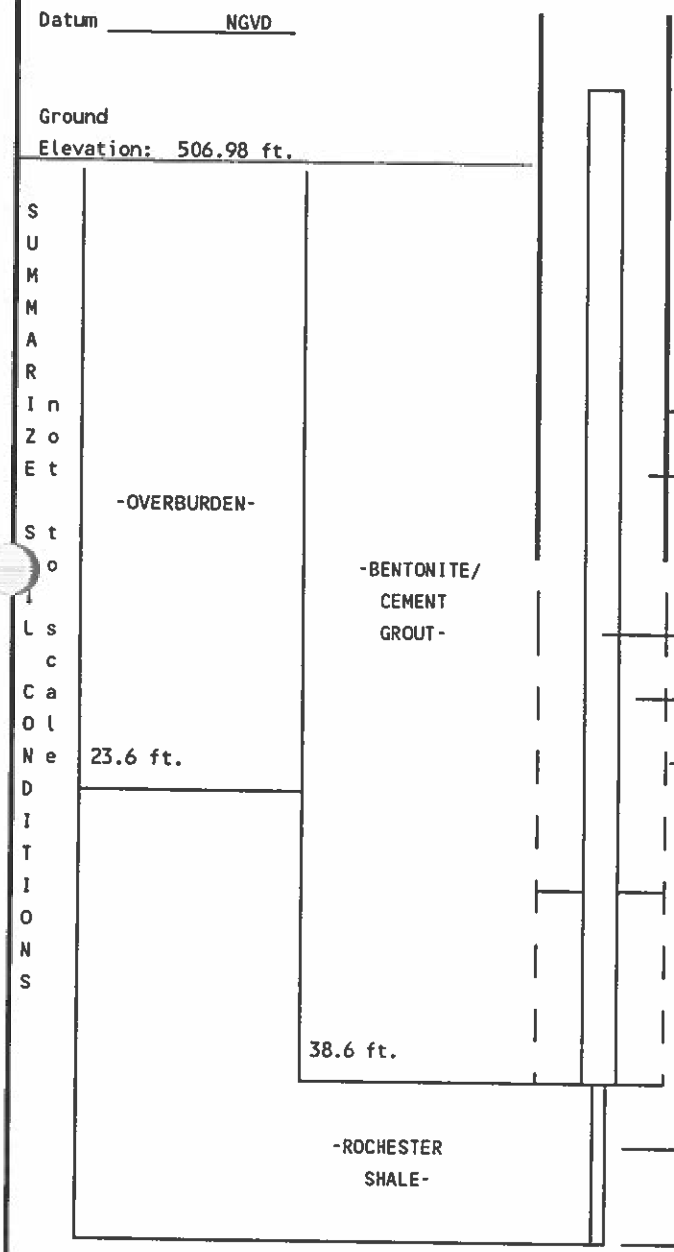
BEDROCK MONITORING WELL REPORT

PROJECT:	MIGRATION CONTROL
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION
CONTRACTOR:	ROCHESTER DRILLING COMPANY
DRILLER:	D. Robinson RIG TYPE: Mobile Drill B-61
INSTALLATION DATE:	8 May 1991

FILE NO.:	70014-43
WELL NO.:	R-105-R
LOCATION:	52076.2N 57602.1E
SHEET:	1 OF 1
INSPECTOR:	T. Wells

Survey Datum NGVD

Ground Elevation: 506.98 ft.



Stickup above ground surface of protective casing.	2.91 ft.
Stickup above ground surface of well casing.	2.40 ft.
Thickness of Surface Seal	3.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	2.0 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Grout
Diameter of Borehole	8.0 in.
Depth of Top of Bedrock	23.6 ft.
Depth of Bottom of Casing	38.6 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	48.6 ft.

Method and Materials used to grout inner casing:
Bentonite-cement grout emplaced with Haliburton - style plug displacement method.

Remarks: Thin walled 8.0-inch black iron pipe used as overburden casing, driven to depth of 23.5 ft. and left in place.

Well No. R-105-R

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

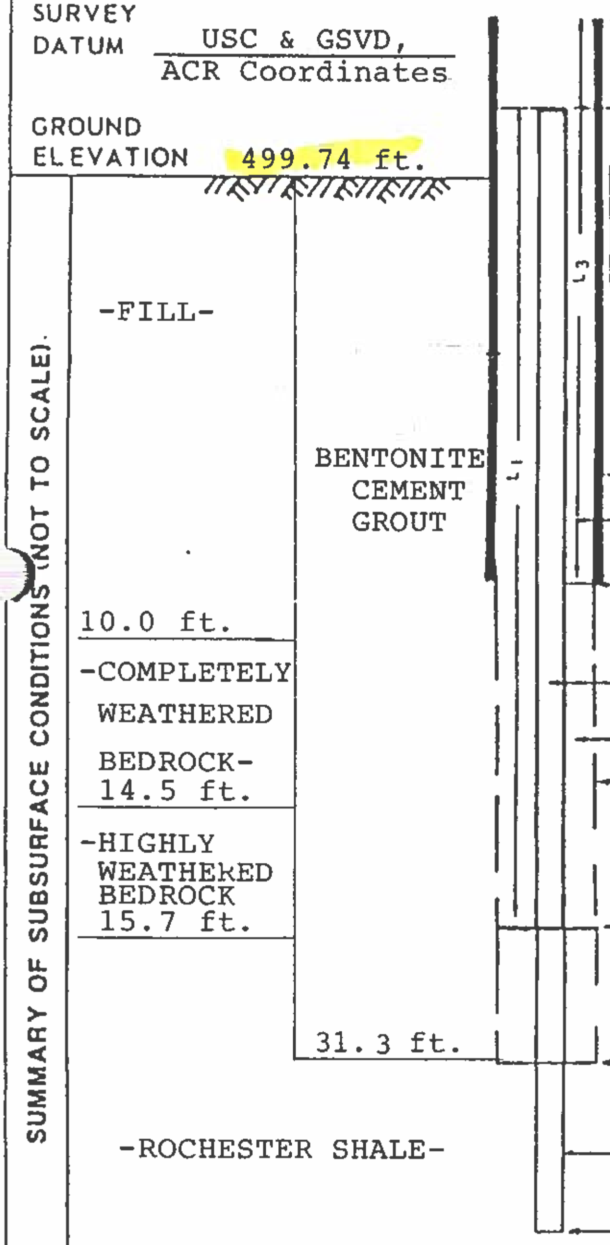
BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON INSPECTOR: T. WELLS
INSTALLATION DATE 8 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. R-107
BORING NO. B-107
LOCATION 52,041.23N
57,903.88E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 499.74 ft.



~~ELEVATION~~ OF STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING ~~OR ROAD-WAY BOX~~	2.99 ft.*
~~ELEVATION~~ OF STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING (to notch in N side of riser from nail in grout)	2.62 ft.*
THICKNESS OF SURFACE SEAL	31.2 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.75 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING	1.9 ft.
INSIDE DIAMETER OF CASING	4.0 in.
TYPE OF BACKFILL AROUND CASING	Grout
DIAMETER OF BOREHOLE	0.0-15.0 ft.: 10 in.± 15.0-31.2 ft.: 8 in.±
~~ELEVATION~~/DEPTH OF TOP OF BEDROCK	15.7 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF CASING	31.3 ft.
DIAMETER OF ROCK HOLE	3.0 in.±
~~ELEVATION~~/DEPTH OF BOTTOM OF ROCK HOLE	41.2 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

33.8 ft. (CASING LENGTH) + 9.9 ft. (LENGTH OF ROCK HOLE) = 43.7 ft. (TOTAL LENGTH)

*-Stickups measured by H&A of New York: T.O.C. = 2.90 ft.
T.O.R. = 2.53 ft.

H & A

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON INSPECTOR: T. WELLS
INSTALLATION DATE 28 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. R-108
BORING NO. B-108
LOCATION 51,339.52 N
58,316.07 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 501.00 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

Depth	Soil / Rock	Backfill
	-FILL-	CEMENT/ BENTONITE GROUT
5.0 ft.	-GLACIAL TILL AND WEATHERED BEDROCK-	
12.0 ft.		
	ROCHESTER SHALE	27.2 ft.

~~ELEVATION OR~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF ~~CASING~~ ~~WAXBOX~~ (*above nail in grout)	2.85 ft.
~~ELEVATION OR~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING *	2.45 ft.
THICKNESS OF SURFACE SEAL	27.15 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.75 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING	2.0 ft.
INSIDE DIAMETER OF CASING	4.0 in.
TYPE OF BACKFILL AROUND CASING	Grout
DIAMETER OF BOREHOLE	0-12 ft.: 10 in.± 12-27 ft.: 8 in.±
~~ELEVATION~~/DEPTH OF TOP OF BEDROCK	12.0 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF CASING	27.15 ft.
DIAMETER OF ROCK HOLE	3.0 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF ROCK HOLE	37.4 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

CASING LENGTH		LENGTH OF ROCK HOLE		TOTAL LENGTH
29.6 ft.	+	10.3 ft.	=	39.9 ft.

H&A

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY
LOCATION: ROCHESTER, NEW YORK
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION
CONTRACTOR: ROCHESTER DRILLING CO., INC.
DRILLER: D. ROBINSON INSPECTOR: T. WELLS
INSTALLATION DATE 13 SEPTEMBER 1989

FILE NO. 70014-41
WELL NO. R-109
BORING NO. B-109
LOCATION 52,358.01 N
57,711.79 E
SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 497.72 ft.

SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

-FILL-
7.8 ft.
-COMP. TO HIGHLY WEATHERED BEDROCK-
13.4 ft.
-ROCHESTER SHALE-

BENTONITE CEMENT GROUT
28.8 ft.

STICKUP ABOVE GROUND SURFACE OF CASING	2.81 ft.
STICKUP ABOVE GROUND SURFACE OF CASING	2.33 ft.
(ground elev. at nail in grout)	
THICKNESS OF SURFACE SEAL	28.8 ft.
TYPE OF SURFACE SEAL	Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.75 in.
DEPTH OF BOTTOM OF PROTECTIVE CASING	2.0 ft.
INSIDE DIAMETER OF CASING	4.0 in.
TYPE OF BACKFILL AROUND CASING	Grout
DIAMETER OF BOREHOLE	0.0-12.5 ft.: 10 in.±
	12.5-39.0 ft.: 8 in.±
DEPTH OF TOP OF BEDROCK	13.4 ft.
DEPTH OF BOTTOM OF CASING	28.7 ft.
DIAMETER OF ROCK HOLE	3.0 in.
DEPTH OF BOTTOM OF ROCK HOLE	39.1 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

30.98 ft.	+	10.4 ft.	=	41.4 ft.
CASING LENGTH		LENGTH OF ROCK HOLE		TOTAL LENGTH

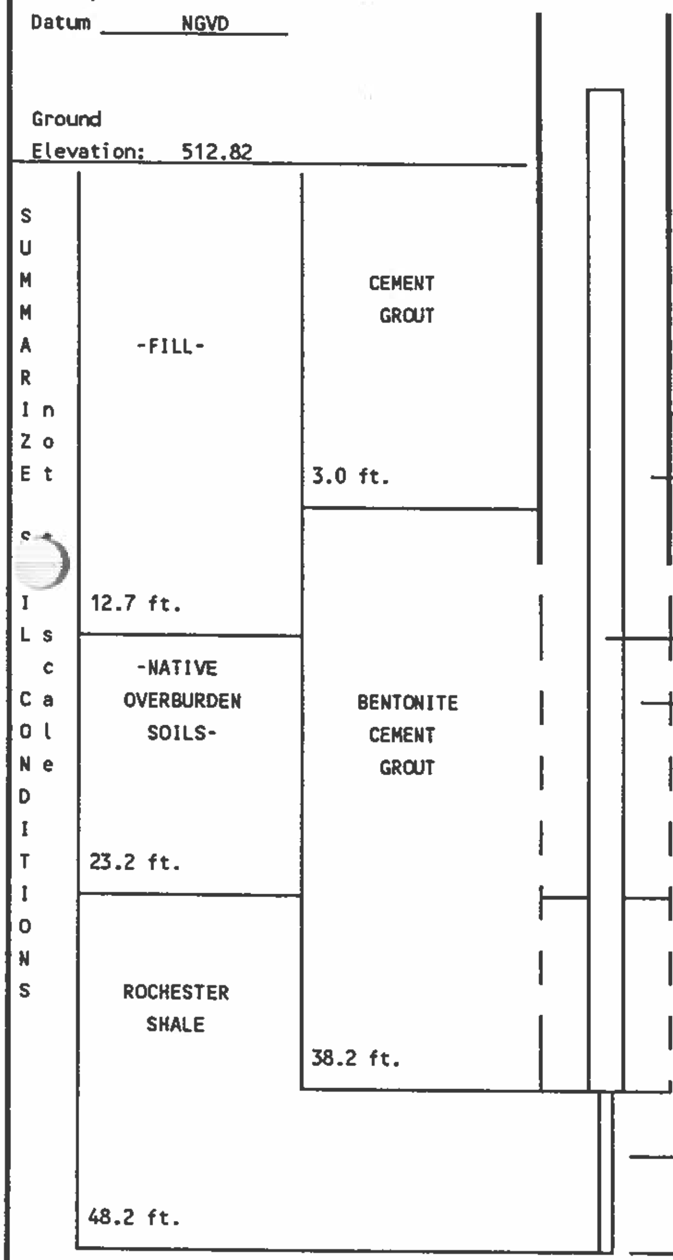
H&A

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT:	Hydrogeologic Investigation	FILE NO.:	70014-42
LOCATION:	Lexington Avenue Facility, Rochester, New York	WELL NO.:	R-131
CLIENT:	AC Rochester Division - General Motors Corp.	LOCATION:	51191.38N 57750.18E
CONTRACTOR:	Nothnagle Drilling	SHEET:	1 OF 1
DRILLER:	S. Loranty RIG TYPE: CME 75, Truck Mounted	INSPECTOR:	T. Wells
INSTALLATION DATE:	24 September 1990		

Survey Datum NGVD

Ground Elevation: 512.82



Stickup above ground surface of protective casing.	2.82 ft.
Stickup above ground surface of well casing.	1.84 ft.
Thickness of Surface Seal	3.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	2.5 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Grout
Diameter of Borehole	0-23 ft. = 12 in. 23-38.1 ft. = 8 in.
Depth of Top of Bedrock	23.2 ft.
Depth of Bottom of Casing	38.2 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	48.2 ft.

Method and Materials used to grout casings: 40.03 ft. length of black iron pipe, threaded at 20.9 ft. below TOC, pressure grouted in place on 27 August 1990 to depth of 38.3 ft. below ground surface.

Remarks:

Well No. R-131

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

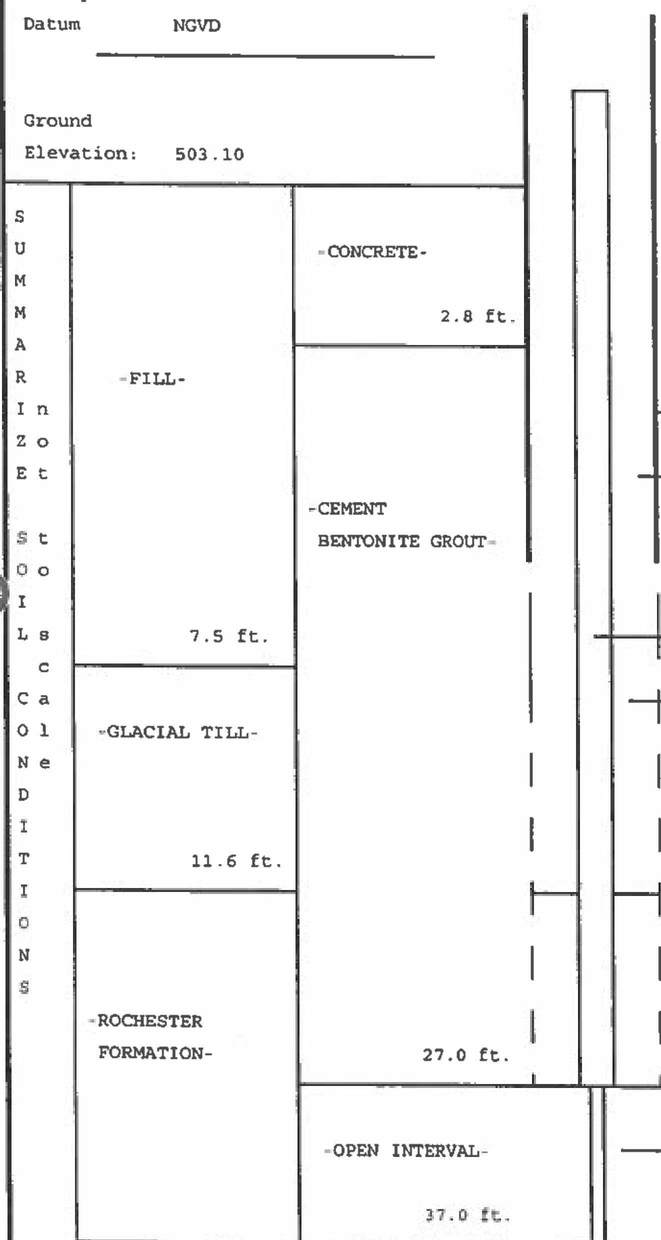
BEDROCK MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: MARCOR ENVIRONMENTAL
DRILLER: K. MARCELLUS   RIG TYPE: CANTERRA CT 350 TRUCK MOUNT
INSTALLATION DATE: 03-11 DECEMBER 1998

FILE NO.: 70014-051
WELL NO.: R-239
LOCATION: N: 51096.7
E: 58448.4
SHEET: 1 OF 1
INSPECTOR: D. NOSTRANT

Survey Datum NGVD

Ground Elevation: 503.10



Stickup above ground surface of protective casing.	2.3 ft.
Stickup above ground surface of well casing.	1.4 ft.
Thickness of Surface Seal	2.8 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Steel Pipe
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	2.7. ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement-Bentonite Grout
Diameter of Borehole	10-14 in +/-
Depth of Top of Bedrock	11.6 ft.
Elevation/Depth of Bottom of Casing	27.0 ft.
Diameter of Open Rock Hole	3-7/8 in.
Depth of Bottom of Open Rock Hole	37.0 ft.

Method and Materials used to grout casings:

Remarks: Protective Casing Elevation - 505.39
Inner Casing Elevation - 504.80

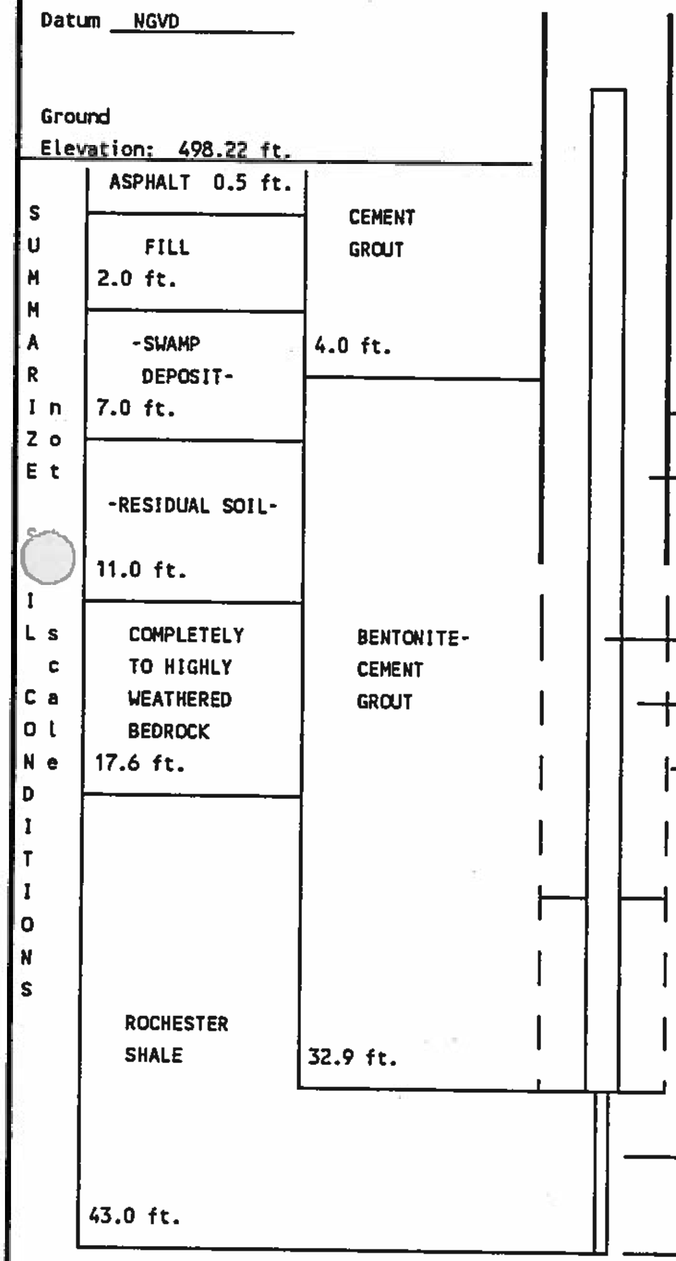
Well No. R-239

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT:	HYDROGEOLOGIC INVESTIGATION	FILE NO.:	70014-42
LOCATION:	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.:	R-106
CLIENT:	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION:	51941.68N 57182.87E
CONTRACTOR:	NOTHNAGLE DRILLING		
DRILLER:	S. LORANTY RIG TYPE: CME 75, TRUCK MOUNTED	SHEET:	1 OF 2
INSTALLATION DATE:	9-13 AUGUST 1990	INSPECTOR:	T. WELLS/W. LANIK

Survey Datum NGVD

Ground Elevation: 498.22 ft.



Depth/Stickup above/below ground surface of protective casing.	2.68 ft.
Depth/Stickup above/below ground surface of well casing.	2.53 ft.
Thickness of Surface Seal	4.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Grout
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	1.4 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Bentonite-cement grout
Diameter of Borehole, 0-17.6 ft.:	10 in.
17.6-32.9 ft.:	8 in.
Depth of Top of Bedrock	17.6 ft.
Elevation/Depth of Bottom of Casing	32.9 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	43.0 ft.

Method and Materials used to grout casings:
45 ft. of black iron pipe (4.0-in.), threaded joint at 15.45 ft. from bottom - pressure grouted in place.

Remarks:

Well No. R-106

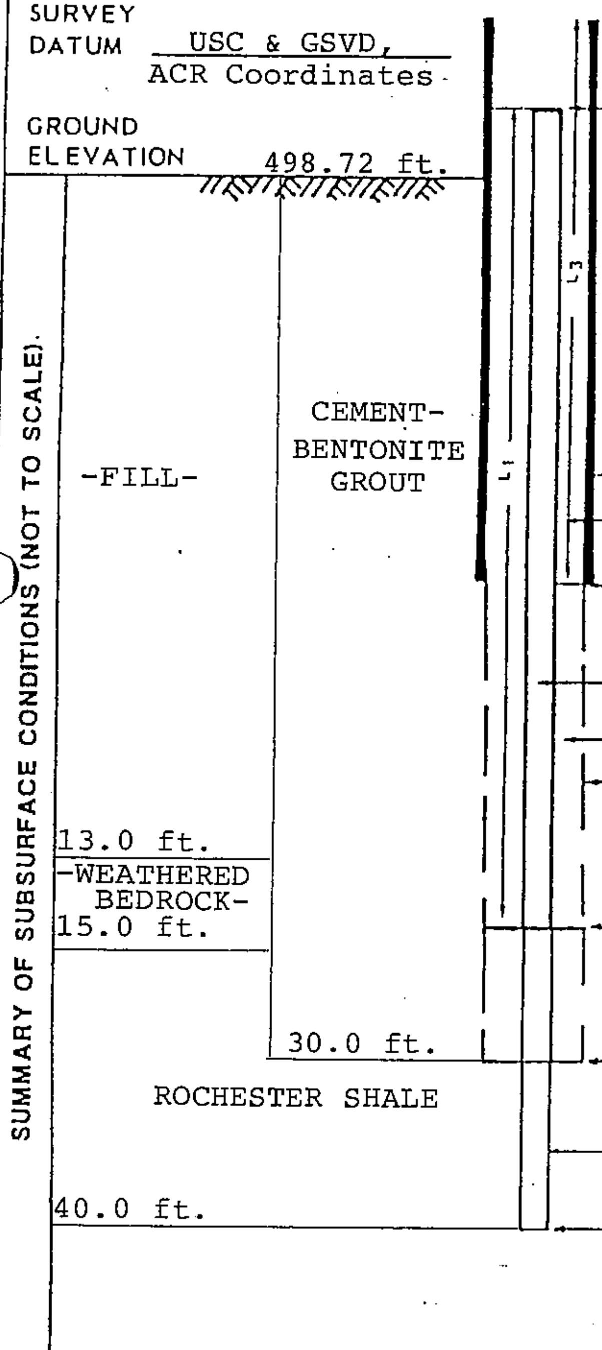
H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

BEDROCK OBSERVATION WELL REPORT

PROJECT: AC ROCHESTER-LEXINGTON AVE. FACILITY	FILE NO. 70014-41
LOCATION: ROCHESTER, NEW YORK	WELL NO. R-110
CLIENT: GENERAL MOTORS-AC ROCHESTER DIVISION	BORING NO. B-110
CONTRACTOR: ROCHESTER DRILLING CO., INC.	LOCATION 52,333.23 N
DRILLER: D. ROBINSON INSPECTOR: T.WELLS/J. TALPEY	57,348.06 E
INSTALLATION DATE 15-20 SEPTEMBER 1989	SHEET 1 OF 2

SURVEY DATUM USC & GSVD, ACR Coordinates

GROUND ELEVATION 498.72 ft.



~~ELEVATION~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING ~~OR ELEV. W/ROX~~	3.12 ft.
~~ELEVATION~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF CASING	2.63 ft.
(ground elev. at nail in grout)	
THICKNESS OF SURFACE SEAL	30.0 ft.
TYPE OF SURFACE SEAL	Cement Grout
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF PROTECTIVE CASING	Steel
INSIDE DIAMETER OF PROTECTIVE CASING	5.75 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING	1.6 ft.
INSIDE DIAMETER OF CASING	4.0 in.
TYPE OF BACKFILL AROUND CASING	Bentonite-Cement Grout
DIAMETER OF BOREHOLE	12 in.± (overburden) 8 in.± (rock)
~~ELEVATION~~/DEPTH OF TOP OF BEDROCK	15.0 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF CASING	29.9 ft.
DIAMETER OF ROCK HOLE	3.0 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF ROCK HOLE	40.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

32.5 ft. CASING LENGTH + 10.1 ft. LENGTH OF ROCK HOLE = 42.6 ft. TOTAL LENGTH

H & A

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

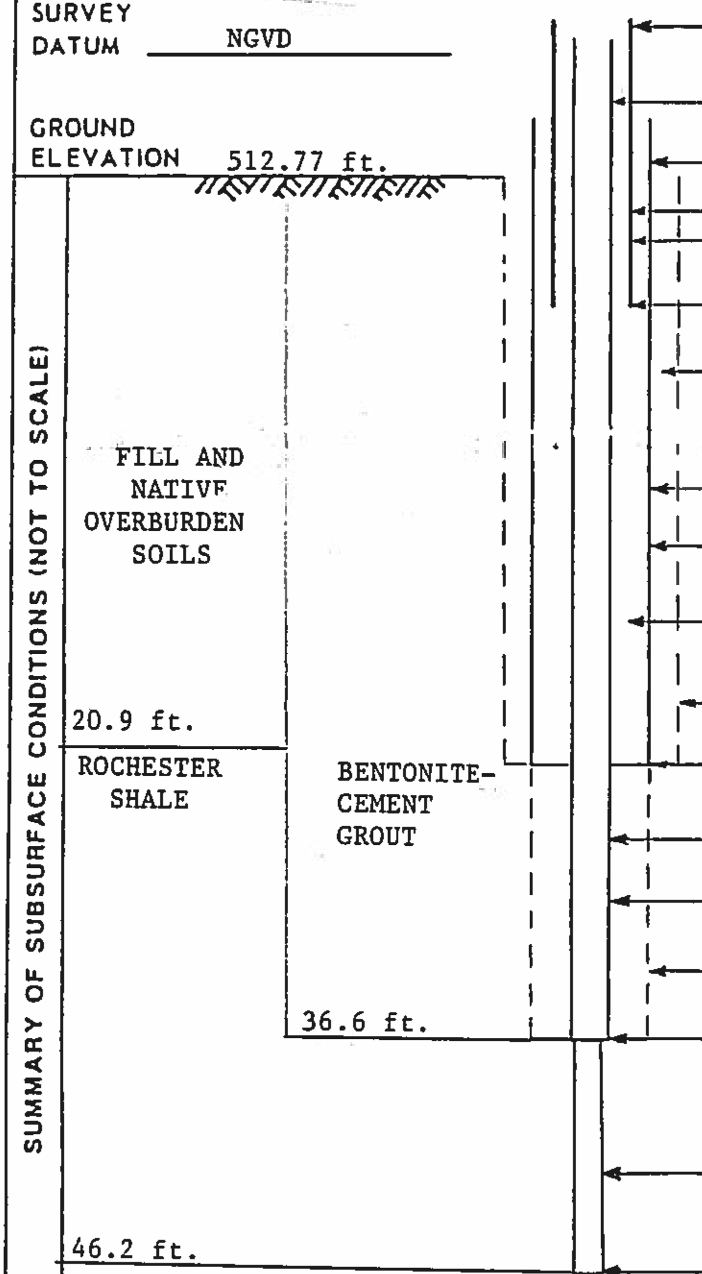
BEDROCK OBSERVATION WELL REPORT

PROJECT: Hydrogeologic Investigation
LOCATION: Lexington Avenue Facility - Rochester, NY
CLIENT: AC Rochester Division-General Motors Corporation
CONTRACTOR: Nothnagle Drilling
DRILLER: S. Loranty INSPECTOR: T. Wells
INSTALLATION DATE 21 August 1990

FILE NO. 70014-42
WELL NO. R-132
BORING NO. B132-A
LOCATION 51092.62N
58080.42E
SHEET 1 OF 2

SURVEY DATUM NGVD

GROUND ELEVATION 512.77 ft.



SUMMARY OF SUBSURFACE CONDITIONS (NOT TO SCALE)

~~ELEVATION OR~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF PROTECTIVE CASING	2.98 ft.
~~ELEVATION OR~~ STICKUP ABOVE/~~BELOW~~ GROUND SURFACE OF INNER CASING.	2.79 ft.
~~ELEVATION OR~~ STICKUP ~~ABOVE~~/BELOW GROUND SURFACE OF OUTER CASING.	-1.03 ft.
TYPE OF PROTECTIVE CASING.	Steel
INSIDE DIAMETER OF PROTECTIVE CASING.	6.0 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING.	2.0 ft.
TYPE OF BACKFILL AROUND OUTER CASING.	None
~~ELEVATION~~/DEPTH OF TOP OF BEDROCK.	20.9 ft.
TYPE OF OUTER CASING.	Black Iron
INSIDE DIAMETER OF OUTER CASING.	8.0 in.
TYPE OF BACKFILL AROUND INNER CASING.	Bentonite-Cement Grout
DIAMETER OF BOREHOLE: 0-7 ft.:	12 in.
7-20.9 ft.:	10 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF OUTER CASING.	20.9 ft.
TYPE OF INNER CASING.	Black Iron
INSIDE DIAMETER OF INNER CASING.	4.0 in.
DIAMETER OF BOREHOLE.	8.0 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF INNER CASING.	36.6 ft.
DIAMETER OF ROCK HOLE.	3.0 in.
~~ELEVATION~~/DEPTH OF BOTTOM OF ROCK HOLE.	46.2 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

[19.9 ft. OUTER CASING LENGTH] 39.4 ft. INNER CASING LENGTH + 9.6 ft. LENGTH OF ROCK HOLE = 49.0 ft. TOTAL LENGTH

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

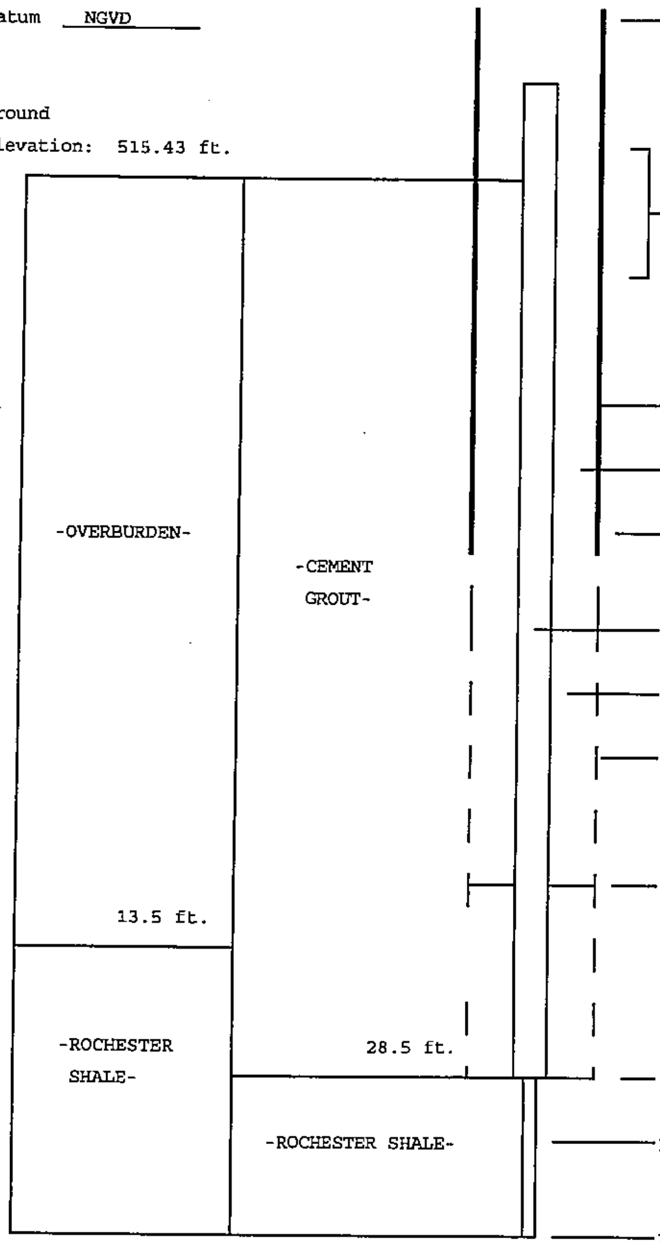
PROJECT:	LEXINGTON AVENUE - RG&E SUBSTATION	FILE NO.:	70014-049
LOCATION:	ROCHESTER, NEW YORK	WELL NO.:	R-234
CLIENT:	DELPHI AUTOMOTIVE SYSTEMS	LOCATION:	49988.9N
CONTRACTOR:	NOTHNAGLE DRILLING		58183.5E
DRILLER:	S. LORANTY RIG TYPE: CME-75 TRUCK MOUNT	SHEET:	1 OF 1
INSTALLATION DATE:	6 SEPTEMBER 1995	INSPECTOR:	D. NOSTRANT

Survey Datum NGVD

Ground Elevation: 515.43 ft.

SUMMARIZE SOIL CONDITIONS

Not to scale



Stickup above ground surface of protective casing.	0.00 ft.
Depth below ground surface of well casing.	0.41 ft.
Thickness of Surface Seal	2.2 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement Grout
Type of Protective Casing	Roadbox
Inside Diameter of Protective Casing	11.5 in.
Depth of Bottom of Protective Casing	1.4 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement Grout
Diameter of Borehole	10.0 in. +/-
Depth of Top of Bedrock	13.5 ft.
Elevation/Depth of Bottom of Casing	28.5 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	38.5 ft.

Method and Materials used to grout casings:

Remarks:

Well No. R-234

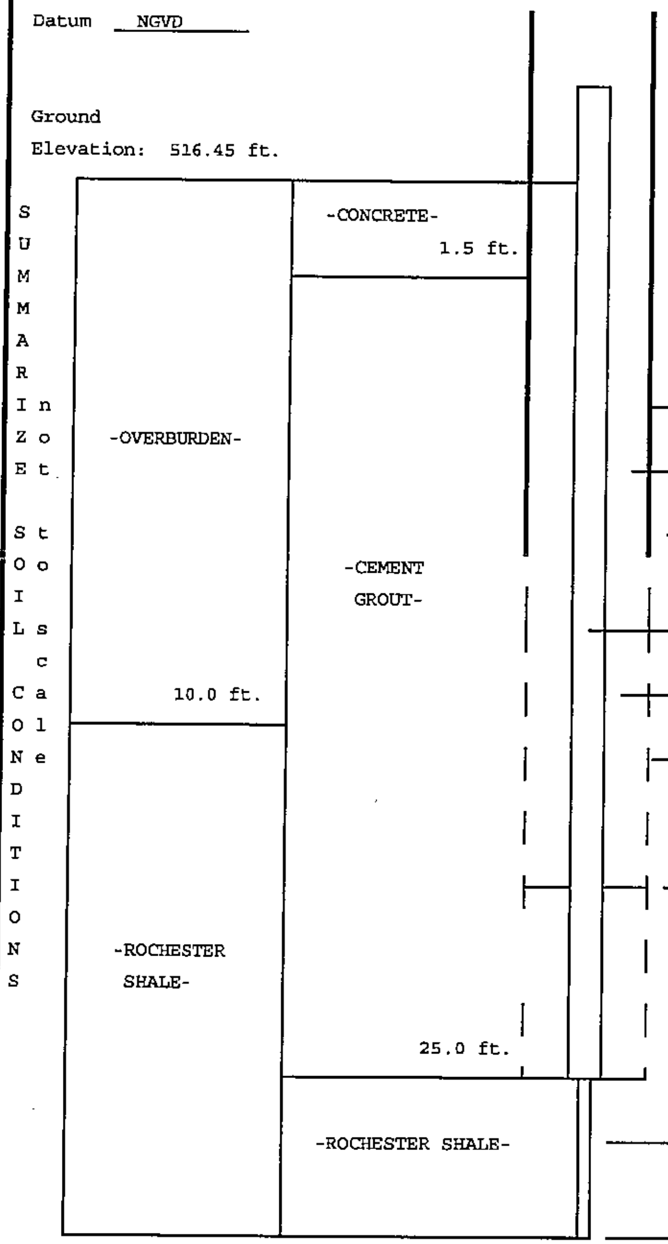
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT: LEXINGTON AVENUE - RG&E SUBSTATION
LOCATION: ROCHESTER, NEW YORK
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: NOTHNAGLE DRILLING
DRILLER: S. LORANTY   RIG TYPE: CME-75 TRUCK MOUNT
INSTALLATION DATE: 1 SEPTEMBER 1995

FILE NO.: 70014-049
WELL NO.: R-235
LOCATION: 50087.7 N
58183.3 E
SHEET: 1 OF 1
INSPECTOR: D. NOSTRANT

Survey
Datum NGVD

Ground
Elevation: 516.45 ft.



Stickup above ground surface of protective casing.	2.44 ft.
Stickup above ground surface of well casing.	2.22 ft.
Thickness of Surface Seal	1.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Galvanized Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	1.8 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement Grout
Diameter of Borehole	10.0 in. +/-
Depth of Top of Bedrock	10.0 ft.
Elevation/Depth of Bottom of Casing	25.0 ft.
Diameter of Open Rock Hole	3.0 in.
Depth of Bottom of Open Rock Hole	35.04 ft.

Method and Materials used to grout casings:

Remarks:

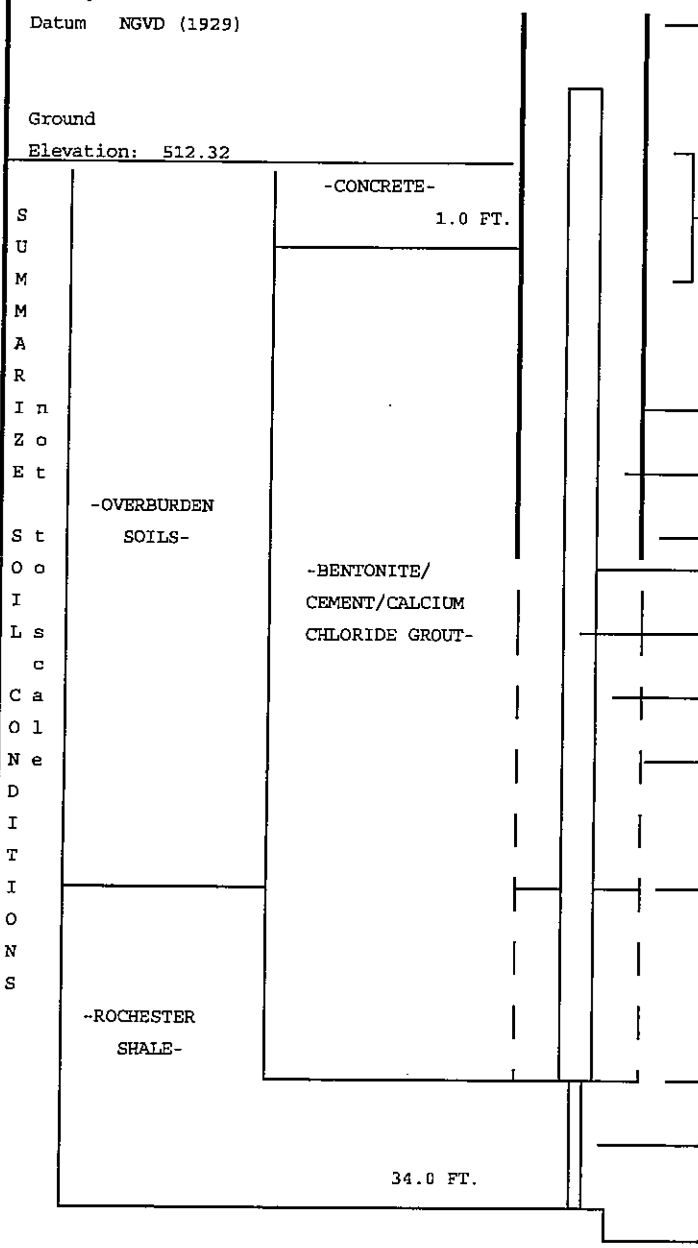
Well No. R-235

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

BEDROCK OBSERVATION WELL REPORT

PROJECT: BEDROCK WELL INSTALLATION EAST OF PLANT 1
LOCATION: LEXINGTON, AVE., ROCHESTER, NEW YORK
CLIENT: DELPHI ENERGY & ENGINE MANAGEMENT SYSTEMS
CONTRACTOR: MAXIM TECHNOLOGIES
DRILLER: R. BROWN   RIG TYPE: ACKER SOIL MAX
INSTALLATION DATE: 10/24/97

FILE NO.: 70014-050
WELL NO.: R-236
LOCATION: 50486.0 N, 58094.9 E
ELEVATION: 514.96 (Outer Casing)
SHEET: 1 OF 1
INSPECTOR: N. CASE HOY



Stickup above ground surface of protective casing.	2.64 ft.
Stickup above ground surface of well casing.	1.66 ft.
Thickness of Surface Seal	1 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	3.2 ft.
Type of Well casing	Steel (Black Iron)
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Grout
Diameter of Borehole	8.0 in.
Depth of Top of Bedrock	9.0 ft.
Elevation/Depth of Bottom of Casing	24.0 ft.
Diameter of Open Rock Hole	NX (2 5/8 in)
Depth of Bottom of Open Rock Hole	34.0 ft.

Method and Materials used to grout casings:

Remarks: Top of inner casing elevation: 513.98 ft.

Well No. R-236

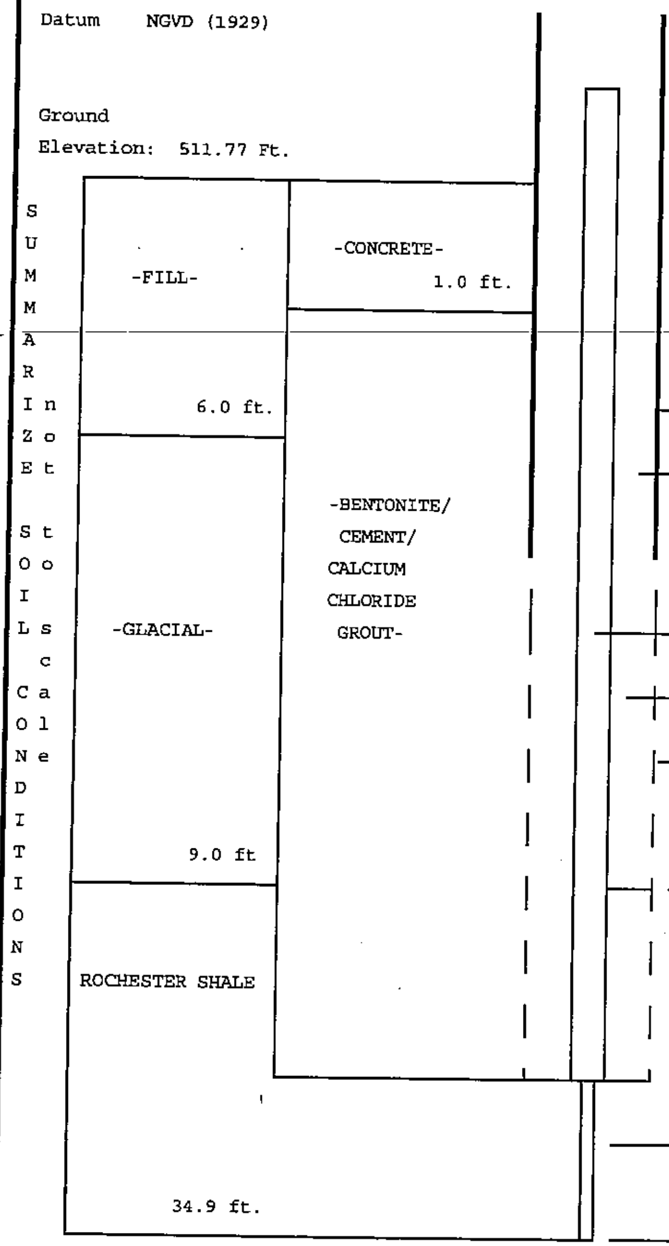
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK OBSERVATION WELL REPORT

PROJECT: BEDROCK WELL INSTALLATION EAST OF PLANT 1
LOCATION: LEXINGTON AVE., ROCHESTER, NEW YORK
CLIENT: DELPHI ENERGY & ENGINE MANAGEMENT SYSTEMS
CONTRACTOR: MAXIM TECHNOLOGIES
DRILLER: R. BROWN RIG TYPE: ACKER SOIL MAX
INSTALLATION DATE: 10/24/97

FILE NO.: 70014-050
WELL NO.: R-237
LOCATION: 50381.9 N, 58202.0 E
ELEVATION: 514.20 (Outer Casing)
SHEET: 1 OF 1
INSPECTOR: N. CASE HOY

Survey Datum NGVD (1929)

Ground Elevation: 511.77 Ft.



Stickup above ground surface of protective casing.	2.43 ft.
Stickup above ground surface of well casing.	2.08 ft.
Thickness of Surface Seal	1 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Cement
Type of Protective Casing	Steel
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	1.5 ft.
Type of Well Casing	Steel (Black Iron)
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Bentonite/Cement/ Calcium Chloride Grout
Diameter of Borehole	8.0 in.
Depth of Top of Bedrock	9.5 ft.
Elevation/Depth of Bottom of Casing	25.0 ft.
Diameter of Open Rock Hole	NX (2 5/8 in)
Depth of Bottom of Open Rock Hole	34.9 ft.

Method and Materials used to grout casings:

Remarks: Top of inner casing elev.: 513.85 ft.

Well No. R-237

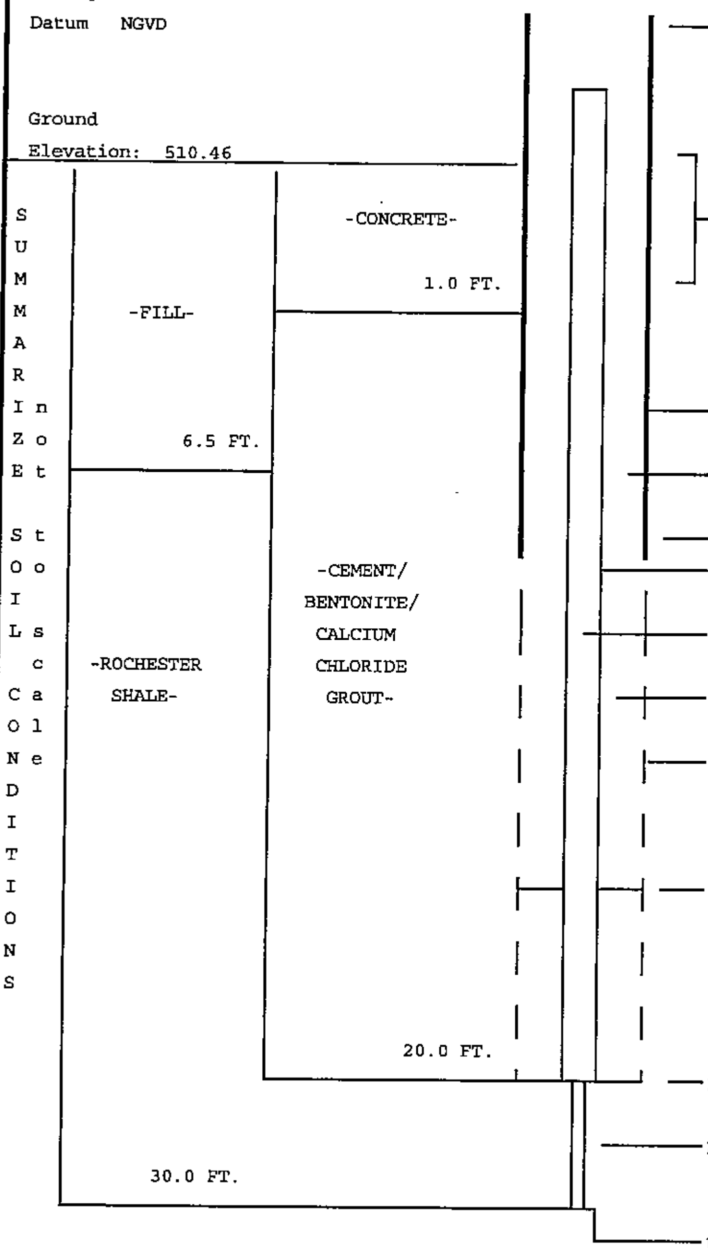
H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK OBSERVATION WELL REPORT

PROJECT: BEDROCK WELL INSTALLATION EAST OF PLANT 1
LOCATION: LEXINGTON AVE., ROCHESTER, NEW YORK
CLIENT: DELPHI ENERGY & ENGINE MANAGEMENT SYSTEMS
CONTRACTOR: MAXIM TECHNOLGIES
DRILLER: R. BROWN RIG TYPE: ACKER SOIL MAX
INSTALLATION DATE: 10/27/97

FILE NO.: 70014-050
WELL NO.: R-238
LOCATION: 50350.9 N, 58478.8 E
ELEVATION: 510.46 (Outer Casing)
SHEET: 1 OF 1
INSPECTOR: N. Case Hoy

Survey
Datum NGVD

Ground
Elevation: 510.46



Depth/Stickup above/below ground surface of protective casing.	0.0 ft.
Depth below ground surface of well casing.	0.18 ft.
Thickness of Surface Seal	1 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Road box
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.2 ft.
Type of Well Casing	Steel (Black Iron)
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Grout
Diameter of Borehole	8.0 in.
Depth of Top of Bedrock	6.5 ft.
Elevation/Depth of Bottom of Casing	20.0
Diameter of Open Rock Hole	NX (2 5/8 in)
Depth of Bottom of Open Rock Hole	29.5 ft.

Method and Materials used to grout casings:

Remarks: Top of inner casing elevation: 510.28 ft.

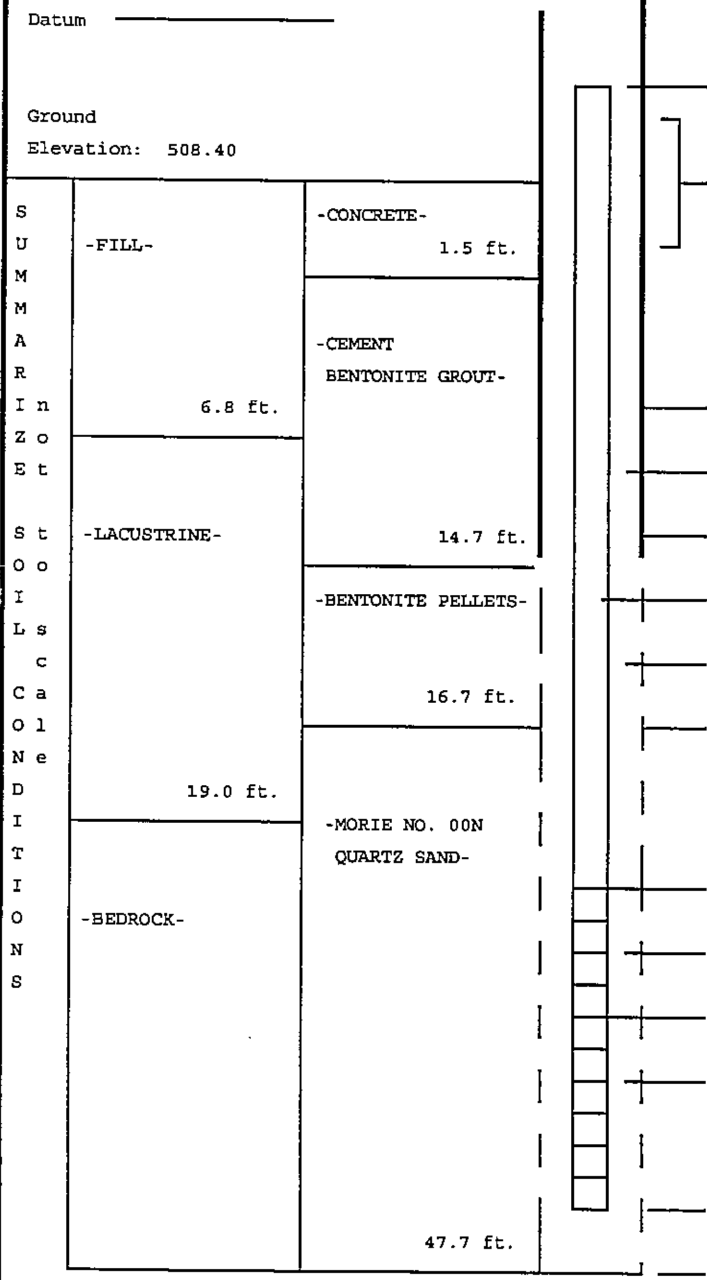
Well No. R-238

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK GROUNDWATER MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS LOCATION: LEXINGTON AVENUE, ROCHESTER, NY CLIENT: DELPHI AUTOMOTIVE SYSTEMS CONTRACTOR: MARCOR ENVIRONMENTAL DRILLER: K. MARCELLUS RIG TYPE: CANTERRA CT-350 TRUCK MOUNT INSTALLATION DATE: 07-09 DECEMBER 1998	FILE NO.: 70014-051 WELL NO.: R-240 LOCATION: N: 51560.7 E: 57970.5 SHEET: 1 OF 1 INSPECTOR: D. NOSTRANT

Survey Datum NGVD

Ground Elevation: 508.40



Stickup above ground surface of protective casing.	2.3 ft.
Stickup above ground surface of riser pipe.	2.1 ft.
Thickness of Surface Seal	1.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	See Diagram
Type of Protective Casing	Steel Pipe
Inside Diameter of Protective Casing	4.0 in.
Depth of Bottom of Protective Casing	2.7 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	8.0 in +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	17.7 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Morie No. 00N Quartz Sand
Depth of Bottom of Wellscreen	47.5 ft.
Depth of Bottom of Borehole	48.0 ft.

Remarks: Protective Casing Elevation - 510.66
Inner Riser Elevation - 510.54

Well No. R-240

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: MARCOR ENVIRONMENTAL
DRILLER: K. MARCELLUS   RIG TYPE: CANTERRA CT 350 TRUCK MOUNT
INSTALLATION DATE: 09-14 DECEMBER 1998

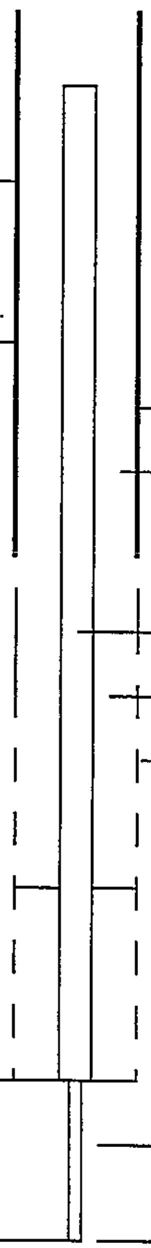
FILE NO.: 70014-051
WELL NO.: R-241
LOCATION: N: 50467.4
E: 58648.2
SHEET: 1 OF 1
INSPECTOR: D. NOSTRANT

Survey Datum: NGVD

Ground Elevation: 509.71

SUMMARIZE SOIL CONDITIONS / Install Zone Tools Scale

Soil conditions	Installation	Depth
Augers advanced to top of bedrock without sampling.	-CONCRETE-	2.5 ft.
-OVERBURDEN- (10.6 ft.)	-CEMENT BENTONITE GROUT-	25.6 ft.
-ROCHESTER FORMATION-	-OPEN INTERVAL-	35.3 ft.



Item	Value
Stickup above ground surface of protective casing.	2.8 ft.
Stickup above ground surface of well casing.	2.7 ft.
Thickness of Surface Seal	2.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Steel Pipe
Inside Diameter of Protective Casing	6.0 in.
Depth of Bottom of Protective Casing	2.3 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement-Bentonite Grout
Diameter of Borehole	14.0 in. +/-
Depth of Top of Bedrock	10.6 ft.
Elevation/Depth of Bottom of Casing	25.6 ft.
Diameter of Open Rock Hole	3-7/8 in.
Depth of Bottom of Open Rock Hole	35.3 ft.

Method and Materials used to grout casings:

Remarks: Protective Casing Elevation - 512.50
Inner Riser Elevation - 512.44

Well No. R-241

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

BEDROCK MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: MARCOR ENVIRONMENTAL
DRILLER: K. MARCELLUS
RIG TYPE: CANTERRA CT 350 TRUCK MOUNT
INSTALLATION DATE: 12/15/98, 2/16/99

FILE NO.: 70014-051
WELL NO.: R-242
LOCATION: N: 49997.4
E: 58140.5
SHEET: 1 OF 1
INSPECTOR: D. NOSTRANT

Survey Datum: NGVD

Ground Elevation: 515.44

SUMMARIZE SOIL CONDITIONS / In Zone Stoscale (sic as printed: "In Zo Et St Oo Ls c Ca Ol Ne")

Augers advanced to top of bedrock without sampling.

-OVERBURDEN-
12.0 ft.

-ROCHESTER FORMATION-

-CONCRETE-
1.2 ft.

-CEMENT BENTONITE GROUT-
23.0 ft.

-OPEN INTERVAL-
28.5 ft.

Stickup above ground surface of protective casing.	0.0 ft.
Stickup above ground surface of well casing.	0.4 ft.
Thickness of Surface Seal	1.2 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Flushmount Roadbox
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement-Bentonite Grout
Diameter of Borehole	10-14 in. +/-
Depth of Top of Bedrock	12.0 ft.
Elevation/Depth of Bottom of Casing	23.0 ft.
Diameter of Open Rock Hole	3-7/8 in.
Depth of Bottom of Open Rock Hole	28.5 ft.

Method and Materials used to grout casings:

Remarks: Protective Casing Elevation - 515.44
Inner Riser Elevation - 515.00

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

BEDROCK MONITORING WELL REPORT

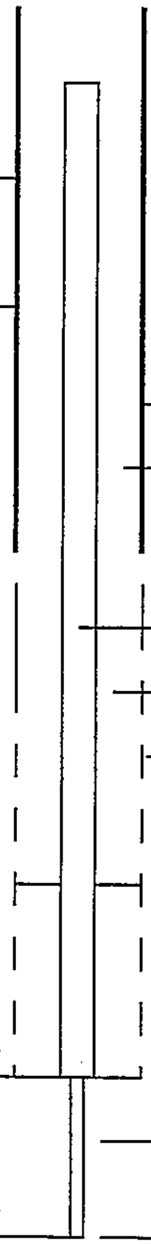
PROJECT: 1998 EXPLORATIONS	FILE NO.: 70014-051
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY	WELL NO.: R-243
CLIENT: DELPHI AUTOMOTIVE SYSTEMS	LOCATION: N: 49946.6
CONTRACTOR: MARCOR ENVIRONMENTAL	E: 58401.0
DRILLER: K. MARCELLUS RIG TYPE: CANTERRA CT 350 TRUCK MOUNT	SHEET: 1 OF 1
INSTALLATION DATE: 17-22 DECEMBER 1998	INSPECTOR: D. NOSTRANT

Survey Datum NGVD

Ground Elevation: 514.45

SUMMARY OF SOIL CONDITIONS / Not to Scale

Augers advanced to top of bedrock without sampling.	-CONCRETE-	3.5 ft.
-OVERBURDEN- 9.0 ft.	-CEMENT BENTONITE GROUT-	
-ROCHESTER FORMATION-		25.0 ft.
	-OPEN INTERVAL-	34.3 ft.



Depth below ground surface of protective casing.	0.0 ft.
Depth below ground surface of well casing.	0.60 ft.
Thickness of Surface Seal	3.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Flushmount Roadbox
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement-Bentonite Grout
Diameter of Borehole	10-14 in. +/-
Depth of Top of Bedrock	9.0 ft.
Elevation/Depth of Bottom of Casing	25.0 ft.
Diameter of Open Rock Hole	3-7/8 in.
Depth of Bottom of Open Rock Hole	34.3 ft.

Method and Materials used to grout casings:

Remarks: Protective Casing Elevation - 514.45
Inner Riser Elevation - 513.88

Well No. R-243

H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

BEDROCK MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY
CLIENT: DELPHI AUTOMOTIVE SYSTEMS
CONTRACTOR: MARCOR ENVIRONMENTAL
DRILLER: K. MARCELLUS RIG TYPE: CANTERRA CT 350 TRUCK MOUNT
INSTALLATION DATE: 18-22 DECEMBER 1998

FILE NO.: 70014-051
WELL NO.: R-244
LOCATION: N: 49997.3
E: 58428.7
SHEET: 1 OF 1
INSPECTOR: D. NOSTRANT

Survey Datum NGVD

Ground Elevation: 514.33

SUMMARIZE SOIL CONDITIONS

In Zone of Soil Scale

Soil conditions	Well construction
Augers advanced to top of bedrock without sampling.	-CONCRETE- 3.0 ft.
-OVERBURDEN- 9.5 ft.	-CEMENT BENTONITE GROUT-
-ROCHESTER FORMATION-	25.0 ft.
	-OPEN INTERVAL- 35.40 ft.

Depth below ground surface of protective casing.	0.0 ft.
Depth/Stickup above/below ground surface of well casing.	0.3 ft.
Thickness of Surface Seal	3.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Concrete
Type of Protective Casing	Flushmount Roadbox
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Well Casing	4.0 in.
Type of Backfill Around Casing	Cement-Bentonite Grout
Diameter of Borehole	10-14 in. +/-
Depth of Top of Bedrock	9.5 ft.
Elevation/Depth of Bottom of Casing	25.0 ft.
Diameter of Open Rock Hole	3-7/8 in.
Depth of Bottom of Open Rock Hole	35.40 ft.

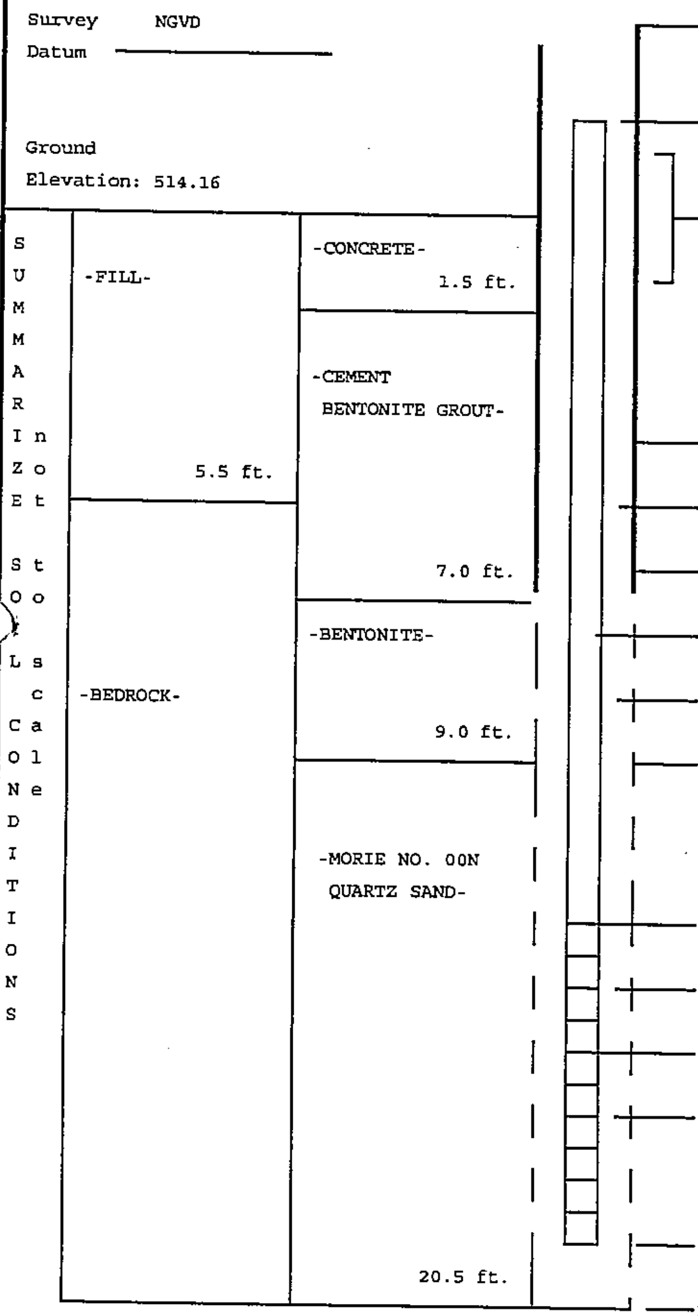
Method and Materials used to grout casings:

Remarks: Protective Casing Elevation - 514.33
Inner Casing Elevation - 514.03

Well No. R-244

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK GROUNDWATER MONITORING WELL REPORT

PROJECT: 1998 EXPLORATIONS	FILE NO.: 70014-051
LOCATION: LEXINGTON AVENUE, ROCHESTER, NY	WELL NO.: R-245
CLIENT: DELPHI AUTOMOTIVE SYSTEMS	LOCATION: N: 49978.2
CONTRACTOR: MARCOR ENVIRONMENTAL	E: 58404.6
DRILLER: K. MARCELLUS RIG TYPE: CANTERRA CT-350 TRUCK MOUNT	SHEET: 1 OF 1
INSTALLATION DATE: 23 DECEMBER 1998	INSPECTOR: D. NOSTRANT



Depth below ground surface of protective casing.	0.0 ft.
Depth below ground surface of riser pipe.	0.4 ft.
Thickness of Surface Seal	1.5 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	See Diagram
Type of Protective Casing	Flushmount Roadbox
Inside Diameter of Protective Casing	8.0 in.
Depth of Bottom of Protective Casing	1.0 ft.
Inside Diameter of Riser Pipe	2.0 in.
Type of Backfill Around Riser	See Diagram
Diameter of Borehole	6-1/4 in. +/-
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	10.5 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.010 in.
Diameter of Wellscreen	2.0 in.
Type of Backfill Around Wellscreen	Morie No. 00N Quartz Sand
Depth of Bottom of Wellscreen	20.5 ft.
Depth of Bottom of Borehole	20.5 ft.

Remarks: Protective Casing Elevation - 514.16
Inner Casing Elevation - 513.77

Well No. R-245

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. R-301

Boring No. R-301

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/17/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft

El. Datum ______

Location: SEE PLAN

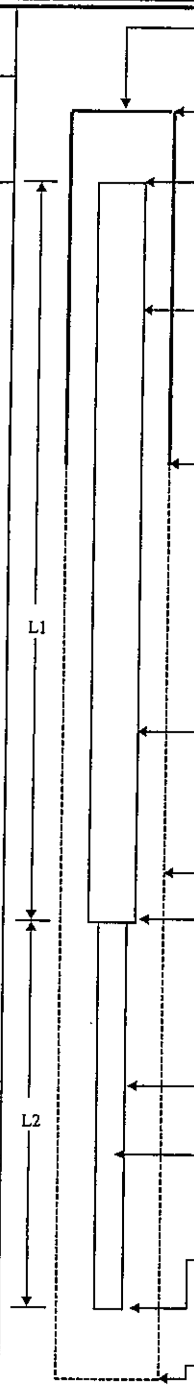
☑ Guard Pipe

☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
PAVEMENT 0.5 FT.	CEMENT 1.0 FT.
OVERBURDEN SOILS 12.7 FT.	CEMENT BENTONITE GROUT 30.0 FT.
WEATHERED BEDROCK 15.0 FT.	
ROCHESTER SHALE 40.0 FT	OPEN INTERVAL 40.0 FT

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Locking Cap	
Height of top of guard pipe above ground surface	NA	ft
Height of top of riser pipe above ground surface	3.0	ft
Type of protective casing	Steel Casing Riser	
Length	33.0	ft
Inside Diameter	4.0	in
Depth of bottom of roadway box	NA	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	29.0
Bentonite	--	--
Quartz Sand	--	--

Type of casing pipe	Steel	
Inside diameter of casing pipe	4.0	in
Type of backfill around riser	Cement Bentonite Grout	
Diameter of borehole	8.0	in
Depth to bottom of casing	30.0	ft
Depth to the top of bedrock	15.0	ft
Type of open core interval	NX Core	
Diameter of open core interval	3.0	in
Depth of bottom of open core interval	40.0	ft
Depth of bottom of test borehole	40.0	ft

33 ft (Casing Length (L1)) + 10 ft (Cored Interval (L2)) = 43.0 ft (Pay length)

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. R-303

Boring No. R-303

PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	10/17/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. 494.27 ft

El. Datum

Location SEE PLAN

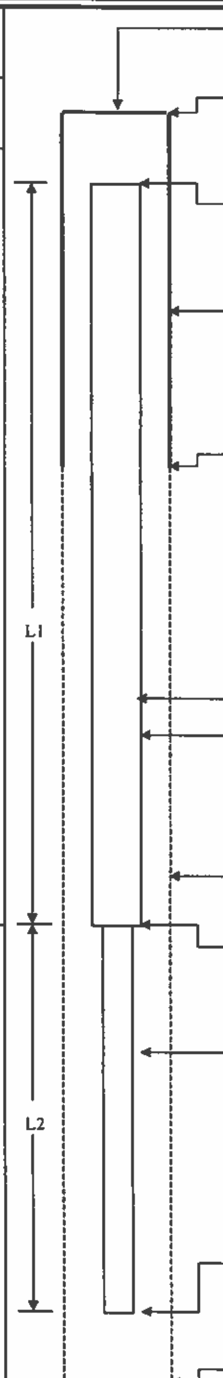
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS (to 9.0 FT.)	CEMENT (to 1.0 FT.)
ROCHESTER SHALE (9.0 FT. to 34.0 FT.)	CEMENT-BENTONITE GROUT (1.0 FT. to 24.0 FT.)
	OPEN ROCK INTERVAL (24.0 FT. to 34.0 FT.)

34.0 FT. (Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Bolted Steel Cover	
Depth of top of guard pipe/roadway box below ground surface	Flush	ft
Depth of top of riser casing below ground surface	0.2	ft
Type of protective casing:	Roadway Box	
Length	1.0	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	23.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock	9.0	ft
Type of riser casing:	Steel	
Inside diameter of riser casing	4.0	in
Type of backfill around riser	Cement Grout	
Diameter of borehole	8.0	in
Depth to top of open core interval/bottom of riser casing	24.0	ft
Type of open core interval	NX Core reamed to 4 in.	
Diameter of open core interval	4.0	in
Depth of bottom of open core interval	34.0	ft
Depth of bottom of test borehole	34.0	ft

(Not to Scale)

24 ft + 10 ft = 34 ft

Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	R-305
Boring No.	R-305

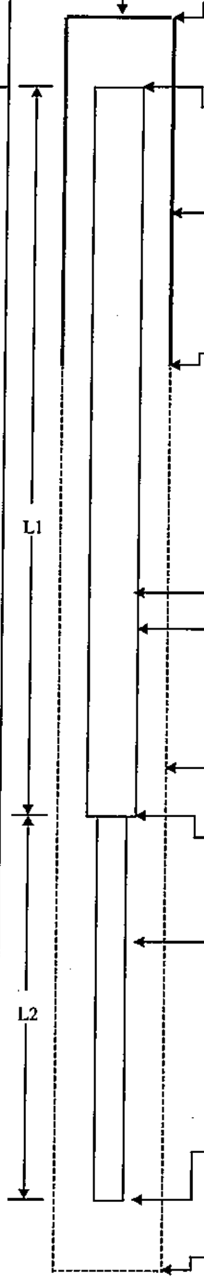
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	12/19/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El.	504.9 ft	Location	N - 50395.9
El. Datum	NGVD		E - 58936.6

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS	CONCRETE
	1.0 FT.
3.5 FT.	CEMENT GROUT
	18.5 FT.
ROCHESTER SHALE	OPEN BEDROCK INTERVAL
28.5	28.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet



(Not to Scale)

Type of protective cover/lock	Protective Casing	
Height of top of guard pipe above ground surface	2.5	ft
Height of top of riser casing above ground surface	2.5	ft
Type of protective casing:	Steel Casing	
Length	30.5	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe box	18.5	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	17.5
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock	3.5	ft
Type of riser casing:	Steel	
Inside diameter of riser casing	4.0	in
Type of backfill around riser	Cement Grout	
Diameter of borehole	8.0	in
Depth to top of open core interval/bottom of riser casing	18.5	ft
Type of open core interval	NX Core reamed to 4 in.	
Diameter of open core interval	4.0	in
Depth of bottom of open core interval	28.5	ft
Depth of bottom of test borehole	28.5	ft

20.5 ft + 10.0 ft = 30.5 ft
Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	R-306
Boring No.	R-306

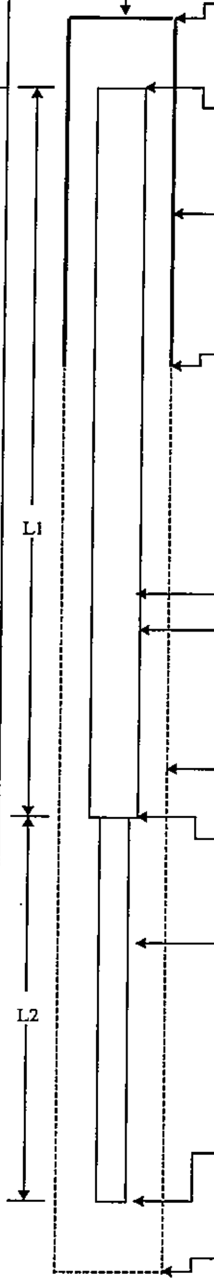
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	12/13/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El.	513.6 ft	Location	N - 50046.7	☑ Guard Pipe
El. Datum	NGVD		E - 58746.7	☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS	CONCRETE
	1.0 FT.
9.0 FT.	CEMENT GROUT
	24.0 FT.
ROCHESTER SHALE	OPEN BEDROCK INTERVAL
34.0	34.0

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet



Type of protective cover/lock: Protective Casing

Height of top of guard pipe above ground surface: 3.0 ft

Height of top of riser casing above ground surface: 2.5 ft

Type of protective casing: Steel Casing

Length: 26.5 ft

Inside Diameter: 4.0 in

Depth of bottom of guard pipe box: 24.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	23.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock: 9.0 ft

Type of riser casing: Steel

Inside diameter of riser casing: 4.0 in

Type of backfill around riser: Cement Grout

Diameter of borehole: 8.0 in

Depth to top of open core interval/bottom of riser casing: 24.0 ft

Type of open core interval: NX Core reamed to 4 in.

Diameter of open core interval: 4.0 in

Depth of bottom of open core interval: 34.0 ft

Depth of bottom of test borehole: 34.0 ft

(Not to Scale)

26.5 ft + 10 ft = 36.5 ft

Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	R-307
Boring No.	R-307

PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	10/23/2002
DRILLER	S. LORANTY	WATER LEVEL	

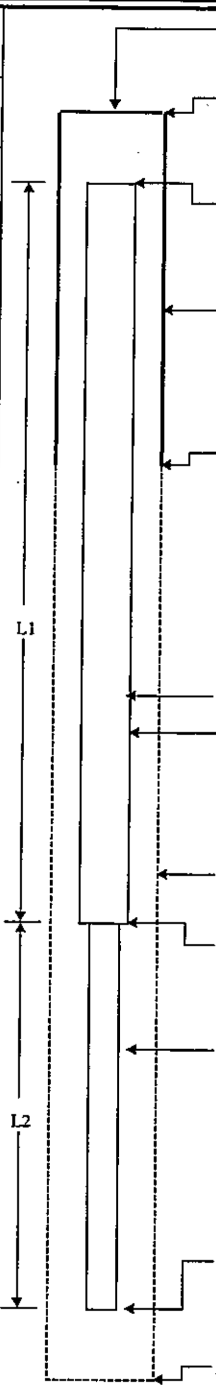
Ground El. ______ ft   Location SEE PLAN   ☐ Guard Pipe

El. Datum ______   ☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS (to 6.1 FT.)	CEMENT (to 1.0 FT.)
WEATHERED BEDROCK (6.1 FT. to 7.0 FT.)	CEMENT-BENTONITE GROUT (1.0 FT. to 22.0 FT.)
ROCHESTER SHALE (7.0 FT. to 32.0 FT.)	OPEN ROCK INTERVAL (22.0 FT. to 32.0 FT.)
32.0 FT.	32.0 FT.

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock: Bolted Steel Cover

Depth of top of guard pipe/roadway box below ground surface: Flush ft

Depth of top of riser casing below ground surface: 0.2 ft

Type of protective casing: Roadway Box

Length: 1.0 ft

Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	22.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock: 7.0 ft

Type of riser casing: Steel

Inside diameter of riser casing: 4.0 in

Type of backfill around riser: Cement Grout

Diameter of borehole: 8.0 in

Depth to top of open core interval/bottom of riser casing: 22.0 ft

Type of open core interval: NX Core reamed to 4.0

Diameter of open core interval: 4.0 in

Depth of bottom of open core interval: 32.0 ft

Depth of bottom of test borehole: 32.0 ft

22 ft (Casing Length (L1)) + 10 ft (Screened Interval (L2)) = 32 ft (Pay length)

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	R-308
Boring No.	R-308

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/13/2001
DRILLER	S. LORANTY	WATER LEVEL	

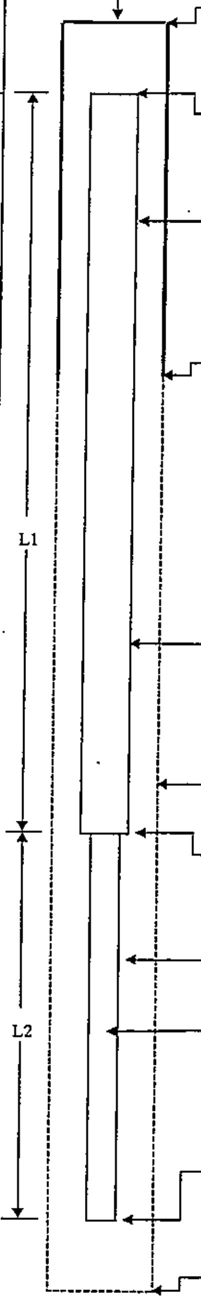
Ground El. ______ ft
El. Datum ______
Location: SEE PLAN

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS (to 7.5 FT.)	CEMENT (to 1.0 FT.)
ROCHESTER SHALE (to 33.5)	CEMENT BENTONITE GROUT (to 23.5 FT.)
	OPEN INTERVAL (to 33.5)

33.5 (Bottom of Exploration) 33.5

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Item	Value
Type of protective cover/lock	Locking Cap
Height of top of guard pipe above ground surface	NA ft
Height of top of riser pipe above ground surface	3.0 ft
Type of protective casing	Steel Casing Riser
Length	26.5 ft
Inside Diameter	4.0 in
Depth of bottom of roadway box	23.5 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	22.5
Bentonite	--	--
Quartz Sand	--	--

Item	Value
Type of casing pipe	Steel
Inside diameter of casing pipe	4.0 in
Type of backfill around riser	Cement Bentonite Grout
Diameter of borehole	8.0 in
Depth to bottom of casing	7.5 ft
Depth to the top of bedrock	23.5 ft
Type of open core interval	NX Core
Diameter of open core interval	3.0 in
Depth of bottom of open core interval	33.5 ft
Depth of bottom of test borehole	33.5 ft

26.5 ft + 10 ft = 36.5 ft
Casing Length (L1) + Cored Interval (L2) = Pay length

COMMENTS:

Form # 3010

BEDROCK OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

Well No.	R-309
Boring No.	R-309

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	1/4/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______

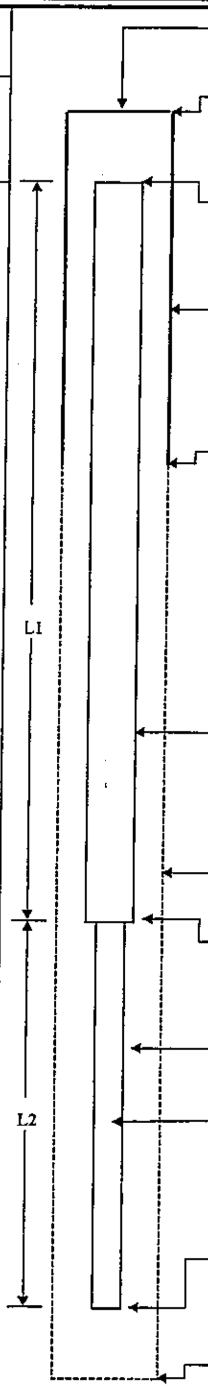
Location SEE PLAN

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS	CEMENT
	1.0 FT.
10.5 FT.	CEMENT BENTONITE GROUT
ROCHESTER SHALE	
	25.5 FT.
	OPEN INTERVAL
35.5	35.5

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock: Roadway Box

Height of top of roadway box above ground surface: Flush ft

Depth of top of riser pipe below ground surface: 0.2 ft

Type of protective casing: Roadway Box

Length: 1.0 ft

Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	24.5
Bentonite	--	--
Quartz Sand	--	--

Type of casing pipe: Steel

Inside diameter of casing pipe: 4.0 in

Type of backfill around riser: Cement Bentonite Grout

Diameter of borehole: 8.0 in

Depth to bottom of casing: 25.5 ft

Depth to the top of bedrock: 10.5 ft

Type of open core interval: NX Core

Diameter of open core interval: 3.0 in

Depth of bottom of open core interval: 35.5 ft

Depth of bottom of test borehole: 35.5 ft

(Not to Scale)

25.5 ft + 10 ft = 35.5 ft

Casing Length (L1) + Cored Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. R-401
Boring No. R-401

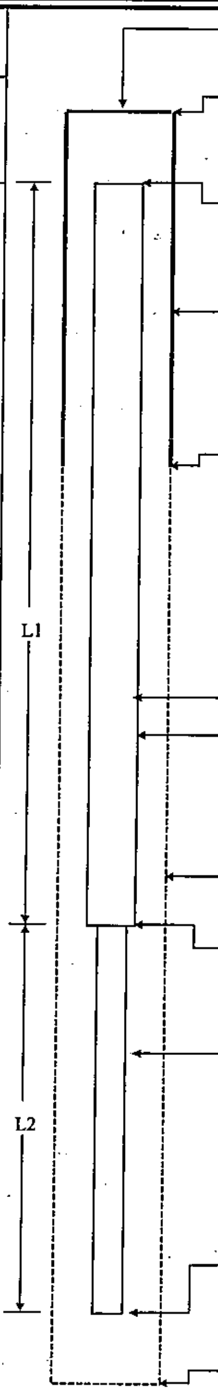
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	**H&A FILE NO.**	70014-054
LOCATION	ROCHESTER, NEW YORK	**PROJECT MGR.**	T. WELLS
CLIENT	DELPHI CORPORATION	**FIELD REP.**	T. BOWN
CONTRACTOR	NOTHANGLE DRILLING	**DATE INSTALLED**	12/7/2004
DRILLER	S. LORANTY	**WATER LEVEL**	

Ground El. Not Surveyed ft **Location** See Plan
El. Datum

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	CONCRETE 1.0 FT.
OVERBURDEN SOILS	
12.5 FT	CEMENT GROUT
	23
ROCHESTER FORMATION	OPEN BEDROCK INTERVAL
33	33

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	4-inch J-PLUG	
Height of top of guard pipe above ground surface	0.2	ft
Height of top of riser casing above ground surface	-0.6	ft
Type of protective casing:	Steel Casing	
Length	22.5	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe box	23.0	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	23.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock	12.5	ft
Type of riser casing:	Steel	
Inside diameter of riser casing	4.0	in
Type of backfill around riser	Cement Grout	
Diameter of borehole	8.0	in
Depth to top of open core interval/bottom of riser casing	18.5	ft
Type of open core interval	NX Core reamed to 4 in.	
Diameter of open core interval	4.0	in
Depth of bottom of open core interval	33.0	ft
Depth of bottom of test borehole	33.0	ft

20.5 ft + 10.0 ft = 30.5 ft
Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. R-402
Boring No. R-402

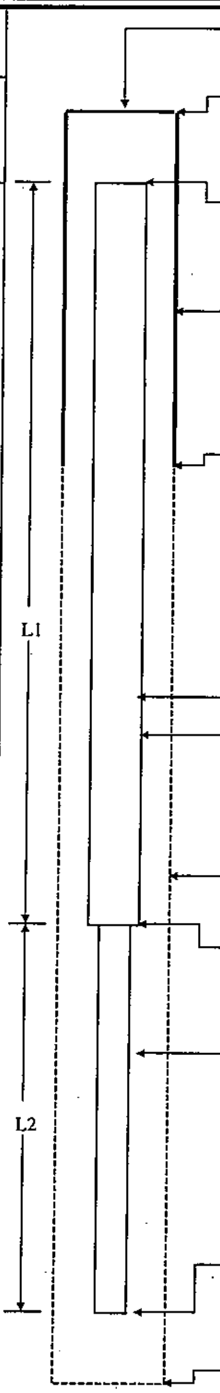
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	T. BOWN
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	12/13/2004
DRILLER	S. LORANTY	WATER LEVEL	23.11 ft

Ground El. Not Surveyed ft
El. Datum
Location See Plan

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN	CONCRETE
19.0 ft	CEMENT GROUT
	28.0 ft.
ROCHESTER FORMATION	OPEN BEDROCK INTERVAL
40	40

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock: Protective Casing

Height of top of guard pipe above ground surface: 3.5 ft

Height of top of riser casing above ground surface: 3.1 ft

Type of protective casing: Steel Casing
Length: 30.5 ft
Inside Diameter: 4.0 in

Depth of bottom of guard pipe box: 28.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.3	0.5
Cement Grout	-0.2	27.8
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock: 19.0 ft

Type of riser casing: Steel
Inside diameter of riser casing: 4.0 in
Type of backfill around riser: Cement Grout

Diameter of borehole: 8.0 in

Depth to top of open core interval/bottom of riser casing: 28.0 ft

Type of open core interval: NX Core reamed to 4 in.
Diameter of open core interval: 4.0 in

Depth of bottom of open core interval: 40.0 ft

Depth of bottom of test borehole: 40.0 ft

(Not to Scale)

30.5 ft (Casing Length (L1)) + 12.0 ft (Screened Interval (L2)) = 42.5 ft (Pay length)

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No.	R-403
Boring No.	R-403

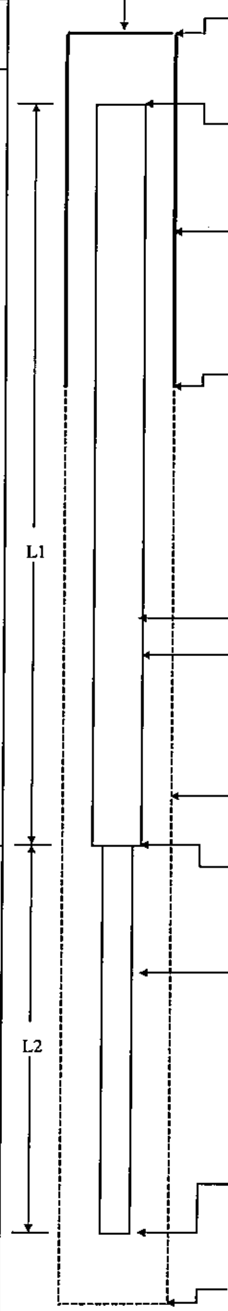
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	**H&A FILE NO.**	70014-054
LOCATION	ROCHESTER, NEW YORK	**PROJECT MGR.**	D. CONLEY
CLIENT	DELPHI CORPORATION	**FIELD REP.**	D. NOSTRANT
CONTRACTOR	NOTHANGLE DRILLING	**DATE INSTALLED**	3/27/2007
DRILLER	N. SHORT	**WATER LEVEL**	

Ground El. ______ ft **Location** ______ ☐ **Guard Pipe**

El. Datum NGVD ☑ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
OVERBURDEN SOILS Not determined	CEMENT 1.0 FT.
WEATHERED BEDROCK 9.3 FT.	CEMENT-BENTONITE GROUT 22.0 FT.
ROCHESTER SHALE	OPEN ROCK INTERVAL
32.0	32.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock Bolted Steel Cover

Depth of top of guard pipe/roadway box below ground surface Flush ft

Depth of top of riser casing below ground surface 0.2 ft

Type of protective casing: Roadway Box

Length 1.0 ft

Inside Diameter 8.0 in

Depth of bottom of roadway box 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	22.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock 9.3 ft

Type of riser casing: Steel

Inside diameter of riser casing 4.0 in

Type of backfill around riser Cement Grout

Diameter of borehole 8.0 in

Depth to top of open core interval/bottom of riser casing 22.0 ft

Type of open core interval NX Core

Diameter of open core interval 3 in

Depth of bottom of open core interval 32.0 ft

Depth of bottom of test borehole 32.0 ft

(Not to Scale)

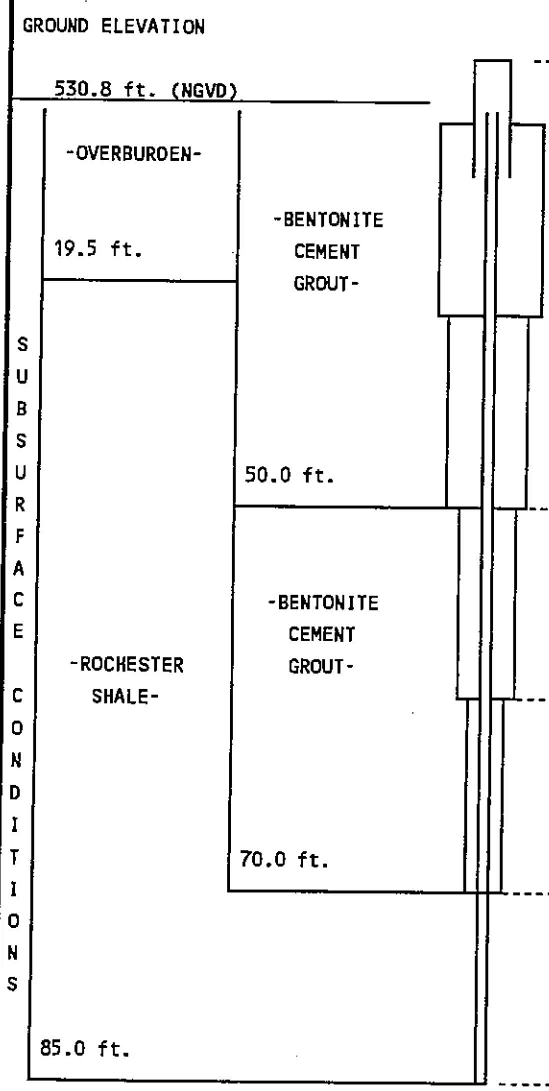
22 ft + 10 ft = 32 ft
Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

H & A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL INSTALLATION REPORT

PROJECT	MIGRATION CONTROL	FILE NO.	70014-43
LOCATION	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.	DR-11
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION	49563.78N 57131.47E
CONTRACTOR	NOTHNAGLE DRILLING		
DRILLER	S. Loranty RIG TYPE CME-75, Truck-Mounted	SHEET NO.	1 OF 2
INSTALLATION DATE	19 February 1992	INSPECTOR	R. Frank



PROTECTIVE CASING: TYPE Steel Box
HEIGHT 2.7 ft.
DIAMETER 6.0 in.
BOTTOM DEPTH 0.0 ft.

STICKUP OF TOP OF INNER CASING +2.2 ft.

OUTER CASING: BOTTOM DEPTH ____
CASING TYPE None
CASING DIAMETER ____
BOREHOLE DIAMETER ____

INTERMEDIATE CASING NO. 1: BOTTOM DEPTH 50.0 ft.
CASING TYPE Black Iron
CASING DIAMETER 8.0 in.
BOREHOLE DIAMETER 12.0 in.

INTERMEDIATE CASING NO 2: BOTTOM DEPTH ____
CASING TYPE None
CASING DIAMETER ____
BOREHOLE DIAMETER ____

INNER CASING: BOTTOM DEPTH 70.0 ft.
CASING TYPE Black Iron
CASING DIAMETER 4.0 in.
BOREHOLE DIAMETER 8.0 in.

DEPTH TO BOTTOM OF ROCK HOLE 85.0 in.
BOREHOLE DIAMETER 3.0 in.

NOTES:

1. ALL DEPTHS EXPRESSED IN FT.
2. ALL CASING DIAMETERS ARE INSIDE-DIAMETER, EXPRESSED IN INCHES.

METHOD AND MATERIALS USED TO GROUT CASINGS: Tremie method used to grout 8-in. casing.
Pressure grout method used for 4-in. casing.

REMARKS: Monitoring interval 70.0 - 85.0 ft.
Top of casing elevation: 533.49 ft.

WELL NO. DR11

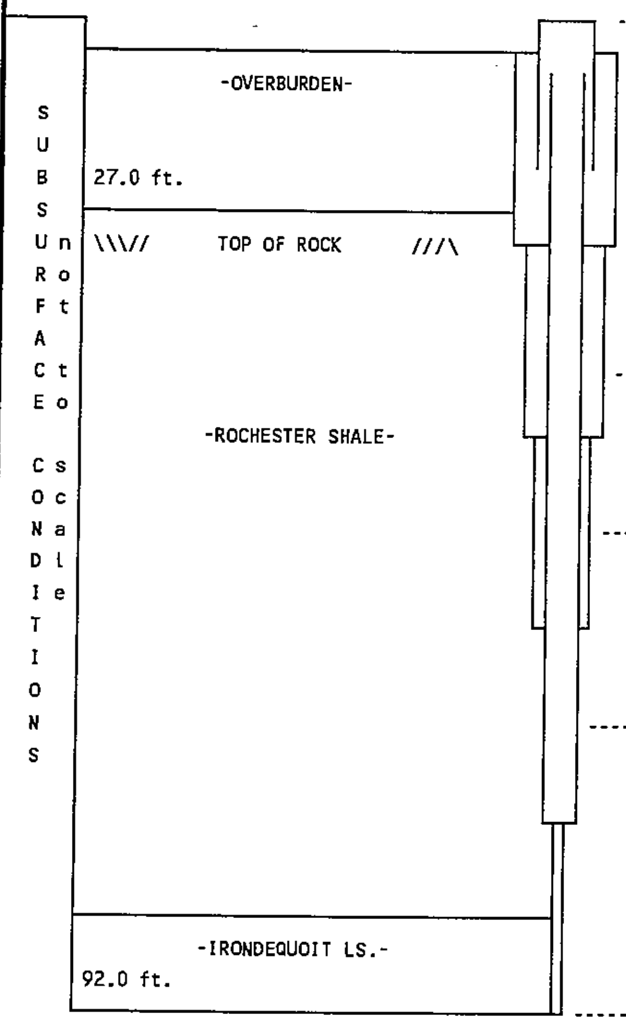
H & A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

DEEP BEDROCK MONITORING WELL INSTALLATION REPORT

PROJECT	MIGRATION CONTROL	FILE NO.	70014-43
LOCATION	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.	DR-103
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION	51728.3N 57817.6E
CONTRACTOR	ROCHESTER DRILLING COMPANY		
DRILLER	D. Robinson RIG TYPE Mobile Drill B-61	SHEET NO.	1 OF 1
INSTALLATION DATE	1 May 1991	INSPECTOR	T. Wells

GROUND SURFACE ELEVATION 510.7 ft.
OUTER CASING TOP ELEVATION 513.87 ft.

SURVEY DATUM NGVD



PROTECTIVE CASING:
- TYPE Steel
- HEIGHT 3.21 ft.
- DIAMETER 6.0 in.
- BOTTOM DEPTH 1.0 ft.

DEPTH TO TOP OF INNER CASING 2.68 ft.

OUTER CASING:
- BOTTOM DEPTH 27.0 ft.
- CASING TYPE Black Iron
- CASING DIAMETER 12 in.
- BOREHOLE DIAMETER 16 in. +

INTERMEDIATE CASING NO. 1:
- BOTTOM DEPTH 57.0 ft.
- CASING TYPE Black Iron
- CASING DIAMETER 8.0 in.
- BOREHOLE DIAMETER 12 in.

INTERMEDIATE CASING NO. 2:
- BOTTOM DEPTH
- CASING TYPE None
- CASING DIAMETER
- BOREHOLE DIAMETER

INNER CASING:
- BOTTOM DEPTH 76.7 ft.
- CASING TYPE Black Iron
- CASING DIAMETER 4.0 in.
- BOREHOLE DIAMETER 8 in.

DEPTH TO BOTTOM OF ROCK HOLE 92.0 ft.
BOREHOLE DIAMETER 3.0 in.

NOTES:

1. ALL DEPTHS EXPRESSED IN FT.
2. ALL CASING DIAMETERS ARE INSIDE-DIAMETER, EXPRESSED IN INCHES.

METHOD AND MATERIALS USED TO GROUT CASINGS:

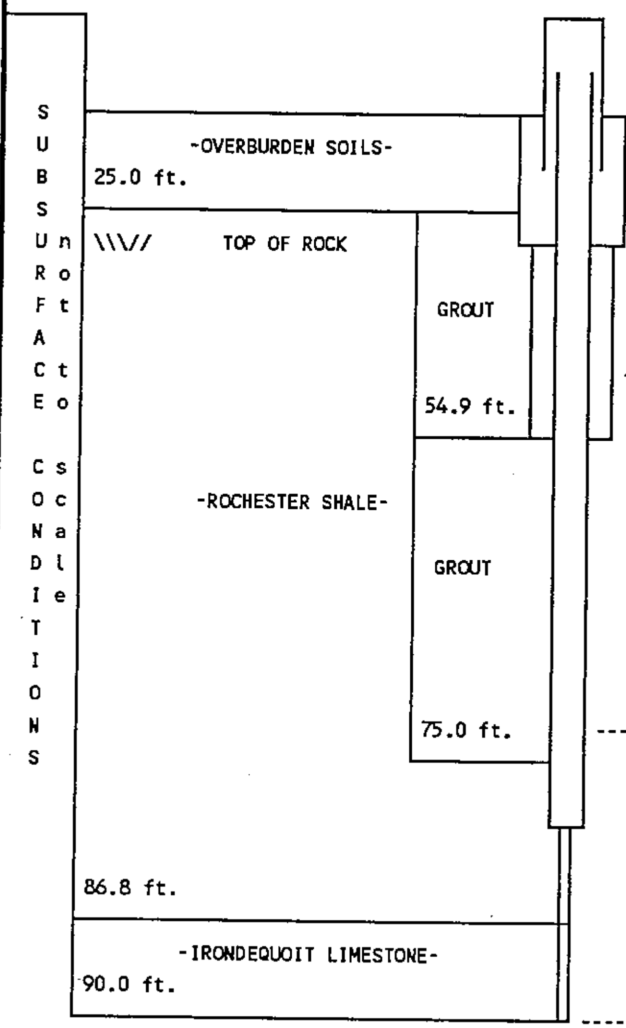
Outer casing driven to 27.0 ft.; grout seal emplaced at surface.
Intermediate casing grouted in place with tremie hose and bentonite-cement grout. Inner casing grouted in place with Haliburton single plug method and bentonite-cement grout.

WELL NO. DR-103

H & A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL INSTALLATION REPORT

PROJECT	Hydrogeologic Investigation	FILE NO.	70014-42
LOCATION	Lexington Avenue Facility - Rochester, New York	WELL NO.	DR-105
CLIENT	AC Rochester Division - General Motors Corporation	LOCATION	51999.59N 57565.83E
CONTRACTOR	Nothnagle Drilling		
DRILLER	S. Loranty RIG TYPE Reedrill SK35 and CME-75	SHEET NO.	1 OF 2
INSTALLATION DATE	2 October 1990	INSPECTOR	T. Wells

GROUND SURFACE ELEVATION 510.98 ft.
INNER CASING TOP ELEVATION 513.91 ft.



PROTECTIVE CASING:
- TYPE: Steel
- HEIGHT: 2.94 ft.
- DIAMETER: 6 in.
- BOTTOM DEPTH: 2.1 ft.

STICK-UP TO TOP OF INNER CASING: 2.93 ft.

OUTER CASING:
- BOTTOM DEPTH: 25.0 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 11.75 in.
- BOREHOLE DIAMETER: 14 in. +

INTERMEDIATE CASING
- BOTTOM DEPTH: 54.9 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 8.25 in.
- BOREHOLE DIAMETER: 11. in. +

INNER CASING:
- BOTTOM DEPTH: 75.0 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 4.0 in.
- BOREHOLE DIAMETER: 8 in.

DEPTH TO BOTTOM OF ROCK HOLE: 90.0 ft.
BOREHOLE DIAMETER: 3.0 in.

NOTES:
1. ALL DEPTHS EXPRESSED IN FT.
2. ALL CASING DIAMETERS ARE INSIDE-DIAMETER, EXPRESSED IN INCHES.
3. NX CORE PIECE, 0.6 FT. LONG, AT BOTTOM OF ROCK HOLE (not recovered in core barrel).

METHOD AND MATERIALS USED TO GROUT CASINGS:

Outer casing advanced through open hole to 24.0 ft., air-hammer-driven to 25.0 ft. Intermediate casing pressure-grouted to 54.9 ft. with bentonite-cement grout; casing joints are welded. Inner casing pressure-grouted (bentonite-cement grout) to 75.0 ft.; threaded casing joints at 0.0, 20.3, 41.5 and 59.2 ft.

WELL NO. DR-105

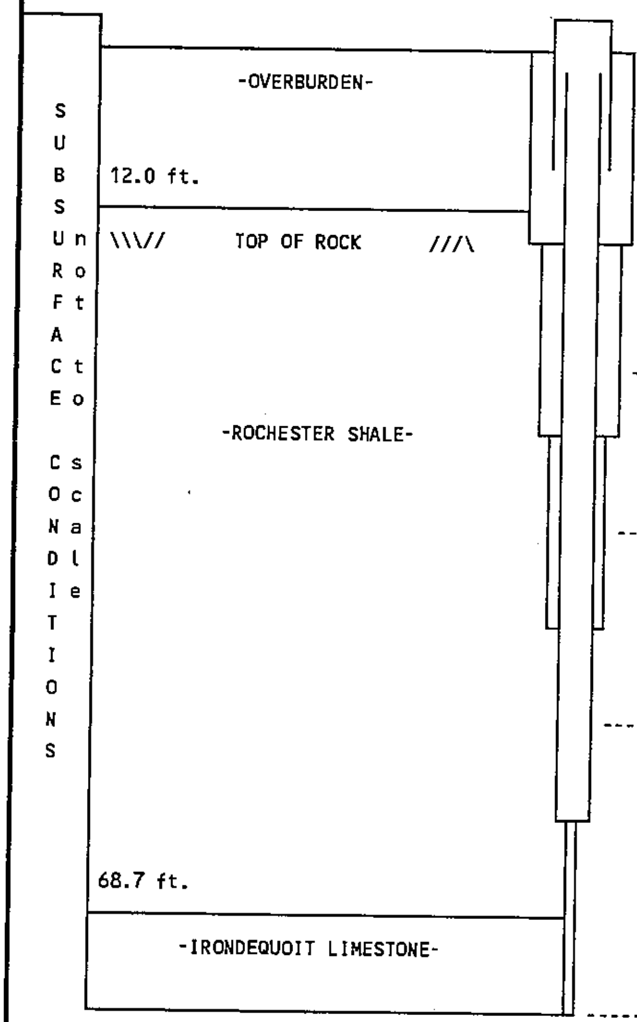
H & A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

DEEP BEDROCK MONITORING WELL INSTALLATION REPORT

PROJECT	MIGRATION CONTROL	FILE NO.	70014-43
LOCATION	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK	WELL NO.	DR-109
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION	LOCATION	52308.5N 57741.2E
CONTRACTOR	ROCHESTER DRILLING COMPANY		
DRILLER	D. Robinson RIG TYPE Mobile Drill B-61	SHEET NO.	1 OF 1
INSTALLATION DATE	16 April 1991	INSPECTOR	T. Wells

GROUND SURFACE ELEVATION 498.1 ft.
OUTER CASING TOP ELEVATION 500.93 ft.

SURVEY DATUM NGVD



PROTECTIVE CASING:
- TYPE: Steel
- HEIGHT: 2.85 ft.
- DIAMETER: 6.0 in.
- BOTTOM DEPTH: 2.0 ft.

STICK-UP ON TOP OF INNER CASING: 1.50 ft.

OUTER CASING:
- BOTTOM DEPTH: 12.0 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 12 in.
- BOREHOLE DIAMETER: 16 in. +

INTERMEDIATE CASING NO. 1:
- BOTTOM DEPTH: 42.0 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 8.0 in.
- BOREHOLE DIAMETER: 12 in.

INTERMEDIATE CASING NO. 2:
- BOTTOM DEPTH:
- CASING TYPE: None
- CASING DIAMETER:
- BOREHOLE DIAMETER:

INNER CASING:
- BOTTOM DEPTH: 62.0 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 4.0 in.
- BOREHOLE DIAMETER: 8 in.

DEPTH TO BOTTOM OF ROCK HOLE: 72.8 ft.
BOREHOLE DIAMETER: 3.0 in.

NOTES:
1. ALL DEPTHS EXPRESSED IN FT.
2. ALL CASING DIAMETERS ARE INSIDE-DIAMETER, EXPRESSED IN INCHES.

METHOD AND MATERIALS USED TO GROUT CASINGS:

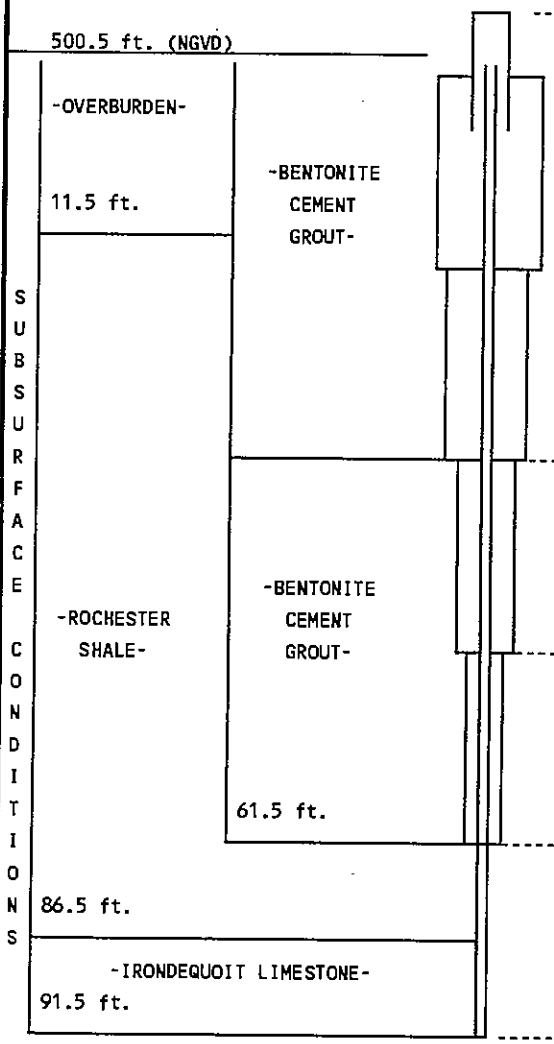
Outer casing: casing driven to toal depth, grout seal emplaced at surface only.
Intermediate casing: Bentonite-cement grout emplaced with tremie pipe.
Inner casing: Bentonite-cement grout emplaced with Haliburton-style plug displacement method.

WELL NO. DR-109

H & A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL INSTALLATION REPORT

PROJECT	MIGRATION CONTROL		FILE NO.	70014-43
LOCATION	LEXINGTON AVENUE FACILITY, ROCHESTER, NEW YORK		WELL NO.	DR-108
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORPORATION		LOCATION	51352.79N 58323.49E
CONTRACTOR	NOTHNAGLE DRILLING			
DRILLER	S. Loranty	RIG TYPE CME-75, Truck-Mounted	SHEET NO.	1 OF 2
INSTALLATION DATE	13 February 1992		INSPECTOR	R. Frank

GROUND ELEVATION



PROTECTIVE CASING:
- TYPE: Steel Box
- HEIGHT: 2.7 ft.
- DIAMETER: 6 in.
- BOTTOM DEPTH: 0.0 ft.

DEPTH TO TOP OF INNER CASING: +2.3 ft.

OUTER CASING:
- BOTTOM DEPTH:
- CASING TYPE: None
- CASING DIAMETER:
- BOREHOLE DIAMETER:

INTERMEDIATE CASING NO. 1:
- BOTTOM DEPTH: 41.5 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 8.0 in.
- BOREHOLE DIAMETER: 12.0 in.

INTERMEDIATE CASING NO 2:
- BOTTOM DEPTH:
- CASING TYPE: None
- CASING DIAMETER:
- BOREHOLE DIAMETER:

INNER CASING:
- BOTTOM DEPTH: 61.5 ft.
- CASING TYPE: Black Iron
- CASING DIAMETER: 4.0 in.
- BOREHOLE DIAMETER: 8.0 in.

DEPTH TO BOTTOM OF ROCK HOLE: 91.5 ft.
BOREHOLE DIAMETER: 3.0 in.

NOTES:
1. ALL DEPTHS EXPRESSED IN FT.
2. ALL CASING DIAMETERS ARE INSIDE-DIAMETER, EXPRESSED IN INCHES.

METHOD AND MATERIALS USED TO GROUT CASINGS: Tremie method to grout in 8-in. casing.
Pressure grout method used for 4-in. casing.

REMARKS: Monitoring interval 61.5 - 91.5 ft.
Top of casing elevation: 503.17 ft.

WELL NO. DR108

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. DR-132
Boring No. DR-132

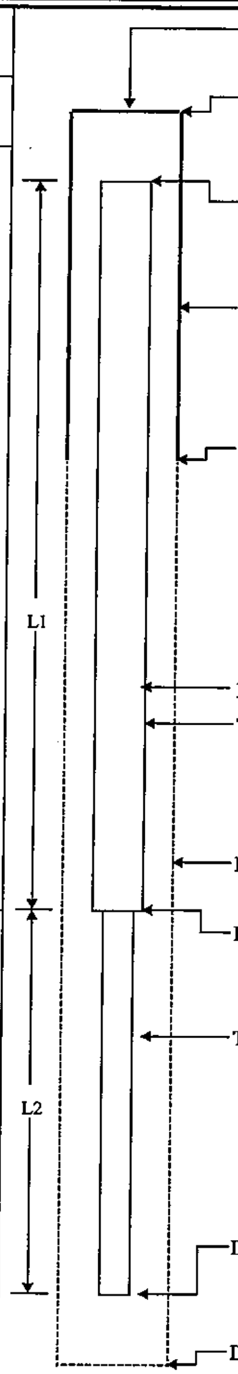
PROJECT	LEXINGTON AVENUE FACILITY RI/FS	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI CORPORATION	FIELD REP.	S. AMROZOWICZ
CONTRACTOR	NOTHANGLE DRILLING	DATE INSTALLED	12/11/2002
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. 512.0 ft
El. Datum NGVD
Location N - 51129.8 E - 58086.8

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	CONCRETE 1.0 FT.
OVERBURDEN SOILS	
22.0 FT.B49	CEMENT GROUT
ROCHESTER SHALE	
	62.0 FT.
	OPEN BEDROCK INTERVAL
72.0	72.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet



Type of protective cover/lock: Locking cover

Height of top of guard pipe above ground surface: 3.0 ft

Height of top of riser casing above ground surface: 2.5 ft

Type of protective casing: HSA Casing
Length: 52.0 ft
Inside Diameter: 8.0 in

Depth of bottom of roadway box: 1.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Cement Grout	1.0	61.0
Bentonite	--	--
Silica Quartz Sand	--	--

Depth to the top of bedrock: 22.0 ft

Type of riser casing: Steel
Inside diameter of riser casing: 4.0 in
Type of backfill around riser: Cement Grout

Diameter of borehole: 10.0 in

Depth to top of open core interval/bottom of riser casing: 62.0 ft

Type of open core interval: NX Core reamed to 4 in.
Diameter of open core interval: 4.0 in

Depth of bottom of open core interval: 72.0 ft

Depth of bottom of test borehole: 72.0 ft

(Not to Scale)

64.5 ft + 10 ft = 74.5 ft
Casing Length (L1) + Screened Interval (L2) = Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

BEDROCK OBSERVATION WELL INSTALLATION REPORT

Well No. DR-315
Boring No. DR-315

PROJECT	LEXINGTON AVE. FACILITY RI/FS INVESTIGATION	H&A FILE NO.	70014-054
LOCATION	ROCHESTER, NEW YORK	PROJECT MGR.	T. WELLS
CLIENT	DELPHI AUTOMOTIVE SYSTEMS	FIELD REP.	D. NOSTRANT
CONTRACTOR	NOTHNAGLE DRILLING	DATE INSTALLED	12/4/2001
DRILLER	S. LORANTY	WATER LEVEL	

Ground El. ______ ft
El. Datum ______
Location SEE PLAN

☑ Guard Pipe
☐ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
PAVEMENT 0.5 FT.	CEMENT 0.5 FT.
OVERBURDEN SOILS 20.4 FT.	CEMENT BENTONITE GROUT 35.4 FT.
ROCHESTER SHALE	OPEN INTERVAL
45.4 (Bottom of Exploration)	

(Numbers refer to depth from ground surface in feet)

L1, L2

- Type of protective cover/lock: Locking Cap
- Height of top of inner casing above ground surface: 2.1 ft
- Height of top of outer casing above ground surface: 1.7 ft
- Type of outer protective casing: Steel Casing Riser
  - Length: 56.7 ft
  - Inside Diameter: 8.0 in
- Depth of bottom of outer protective casing: 55.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.5
Cement Grout	0.5	64.5
Bentonite	--	--
Quartz Sand	--	--

- Type of inner casing pipe: Steel
- Inside diameter of inner casing pipe: 4.0 in
- Type of backfill around inner riser: Cement Bentonite Grout
- Diameter of borehole: 10.0 in
- Depth to bottom of inner casing: 65.0 ft
- Depth to the top of bedrock: 20.4 ft
- Type of open core interval: NX Core
- Diameter of open core interval: 3.0 in
- Depth of bottom of open core interval: 80.0 ft
- Depth of bottom of test borehole: 80.0 ft

(Not to Scale)

______ ft + ______ ft = ______ ft
Casing Length (L1) + Cored Interval (L2) = Pay length

COMMENTS:

Form # 3010

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

PROJECT:	Hydrogeologic Investigation	FILE NO.:	70014-42
LOCATION:	Lexington Avenue, Rochester, New York	WELL NO.:	Well Z
CLIENT:	AC Rochester	LOCATION:	51,619.48N 57,442.66E
		SHEET:	1 OF 2
		INSPECTOR:	---

Survey Datum: NGVD

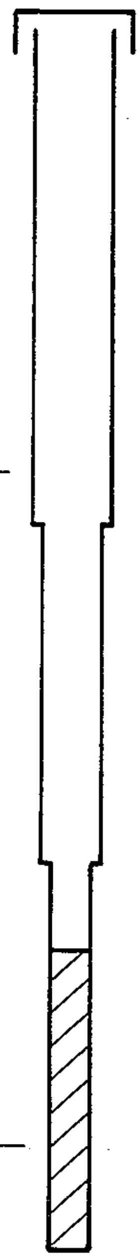
Ground Elevation: 511.56 ft.

SUMMARIZED SOIL CONDITIONS — Not to Scale

OVERBURDEN

ROCHESTER SHALE

IRONDEQUOIT LIMESTONE



Stickup above ground surface of protective cap.	3.60 ft.
Stickup above ground surface of well casing.	3.54 ft.
Inside diameter of well casing	8.0 in.
Type of casing	Steel
Diameter of borehole	Not known
Approximate depth of top of bedrock	24.0 ft.
Depth of bottom of casing	25.0 ft.
Diameter of borehole	7.9 in.
Depth of reduction in borehole diameter	58.0 ft.
Depth of top of grout plug	67.5 ft.
Depth of top of bentonite pellet seal	71.5 ft.
Diameter of Borehole	7.0 in.
Approximate depth of top of Irondequoit Limestone	90.0 ft.
Depth of bottom of boring	110 ft.

Method and Materials used to grout casings: Not known. Well Z was reportedly installed by AC Rochester for use as a production water well, date unknown.

Remarks: Construction information derived from television inspection survey performed by Hydro Group, Inc., 1 June 1989. Bentonite plug installed by Nothnagle Drilling, January 1991 and modified by Rochester Drilling Co., April 1991.

Well No. Well Z

H & A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

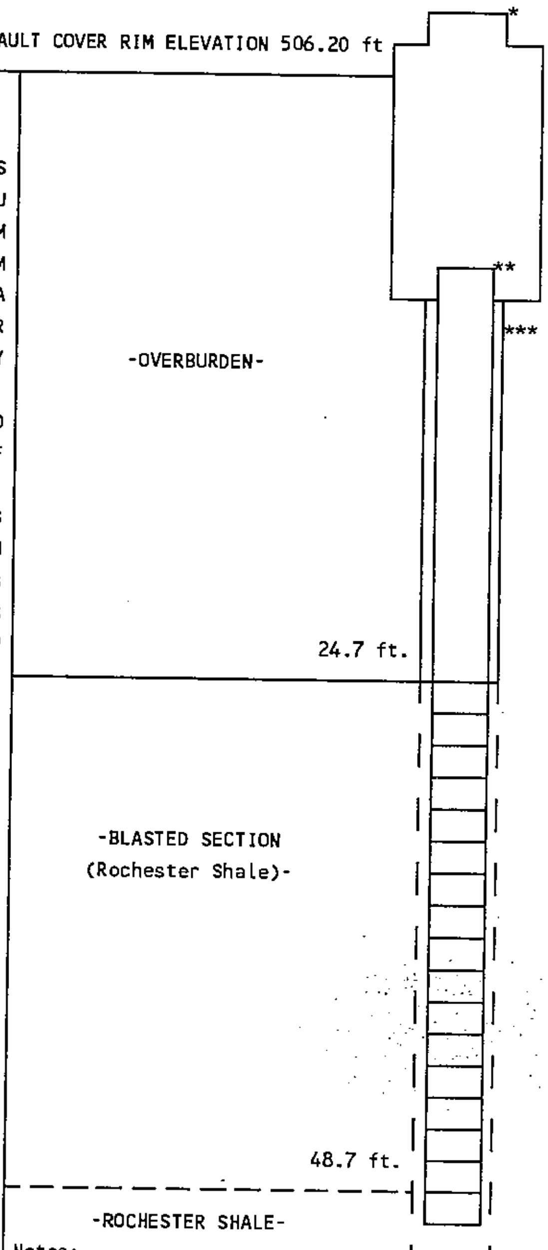
RECOVERY WELL COMPLETION REPORT

PROJECT	MIGRATION CONTROL	FILE NO.	70014-43
LOCATION	ROCHESTER, NEW YORK	WELL NO.	GR-1
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORP.	BORING NO.	(Same)
CONTRACTOR	NOTHNAGLE DRILLING	LOCATION	See Notes
DRILLER	F. Gratten INSPECTOR T. Wells		
INSTALLATION DATE	19 May 1992	SHEET	1 OF 1

SURVEY
DATUM NGVD

VAULT COVER RIM ELEVATION 506.20 ft

SUMMARY OF SUBSURFACE CONDITIONS



Stick-Up of Vault Cover (*)	+/- 0.7 ft.
Inside Diameter of Riser	8.0 in.
Depth Below Top of Vault Cover to Top of Riser (**)	5.8 ft.
Depth to Top of Outer Casing (***)	8.2 ft.
Outer Casing Diameter	12.0 in.
Borehole Diameter, 8 - 24.7 ft.:	13.0 in. +/-
Borehole Diameter, 24.7 - 51.7 ft.:	11.0 in. +/-
Wellscreen and Riser Type:	#304 Stainless
Wellscreen and Riser Manufacturer:	Houston Monitor Flow
Wellscreen and Riser Wall Thickness:	0.5 in.
Bottom of Outer Casing	24.5
Top of Wellscreen	25.7
Inside Diameter	8.0 in.
Slot Size	0.020 in.
Backfill Around Screen and Riser	
Bentonite Grout Cement:	8.2 - 19.7 ft.
Bentonite Pellets:	19.7 - 23.5 ft.
Washed Quartz Sand (Morie #3):	23.5 - 51.7 ft.
Bottom of Pump	48.5 ft.
Bottom of Wellscreen	50.7 ft.
Bottom of Borehole	51.7 ft.

Notes:
1. Location: 52066.3N, 57642.2E
   Trench Station: 3+00

FIGURES REFER TO DEPTH BELOW VAULT COVER

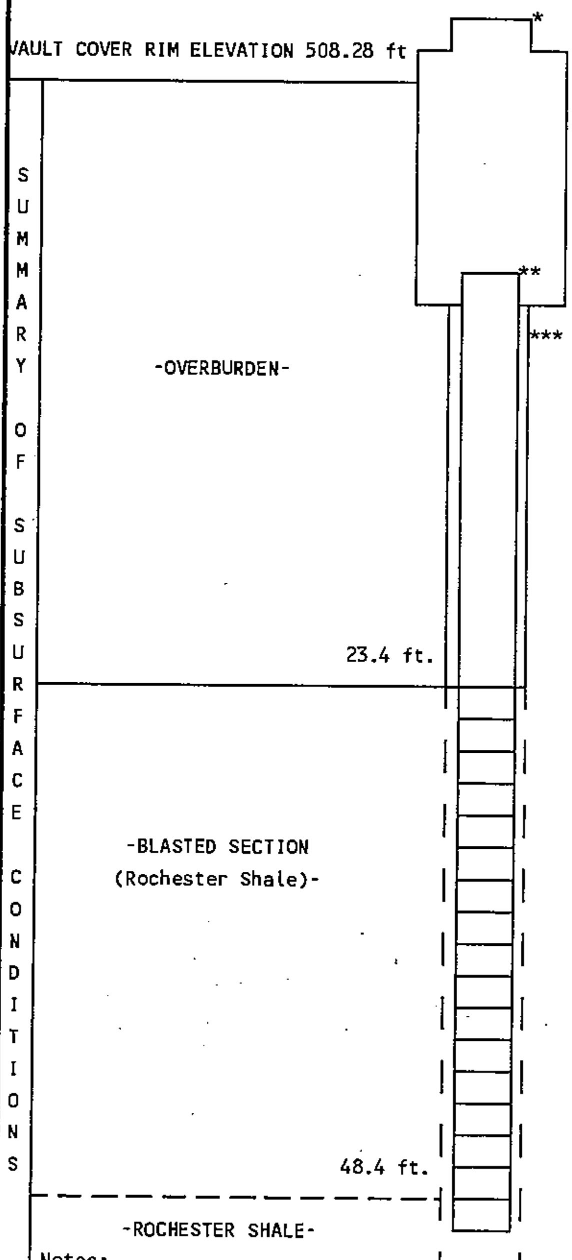
LENGTH OF CASING 19.79 ft. LENGTH OF SCREEN 25.03 ft. TOTAL CASING/SCREEN LENGTH 44.82 ft.

H & A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	RECOVERY WELL COMPLETION REPORT

PROJECT	MIGRATION CONTROL	FILE NO.	70014-43
LOCATION	ROCHESTER, NEW YORK	WELL NO.	GR-2
CLIENT	AC ROCHESTER DIVISION - GENERAL MOTORS CORP.	BORING NO.	(Same)
CONTRACTOR	NOTHNAGLE DRILLING	LOCATION	See Notes
DRILLER	F. Gratten INSPECTOR T. Wells		
INSTALLATION DATE	28 May 1992	SHEET	1 OF 1

SURVEY
DATUM NGVD

VAULT COVER RIM ELEVATION 508.28 ft



Stick-Up of Vault Cover (*)	+/- 0.4 ft.
Inside Diameter of Riser	8.0 in.
Depth Below Top of Vault Cover to Top of Riser (**)	5.8 ft.
Depth to Top of Outer Casing (***)	7.9 ft.
Outer Casing Diameter	12.0 in.
Borehole Diameter, 8 - 22.4 ft.:	13.0 in. +/-
Borehole Diameter, 22.4 - 52.4 ft.:	11.0 in. +/-
Wellscreen and Riser Type:	#304 Stainless
Wellscreen and Riser Manufacturer:	Houston Monitor Flow
Wellscreen and Riser Wall Thickness:	0.5 in.
Bottom of Outer Casing	23.4
Top of Wellscreen	24.4
Inside Diameter	8.0 in.
Slot Size	0.020 in.
Backfill Around Screen and Riser	
Bentonite Grout Cement:	7.9 - 18.9 ft.
Bentonite Pellets:	18.9 - 20.9 ft.
Washed Quartz Sand (Morie #3):	20.9 - 52.4 ft.
Bottom of Pump	None
Bottom of Wellscreen	49.5 ft.
Bottom of Borehole	52.4 ft.

Notes:

1. Location: 51597.6N, 57948.6E
   Trench Station: 8+60

[FIGURES REFER TO DEPTH BELOW VAULT COVER]

LENGTH OF CASING 18.69 ft. LENGTH OF SCREEN 25.05 ft. TOTAL CASING/SCREEN LENGTH 43.74 ft.

HALEY & ALDRICH

PUMPING WELL INSTALLATION REPORT

Well No.	GR-3
Boring No.	GR-3

PROJECT	GM Lexington	**H&A FILE NO.**	70014-113
LOCATION	1000 Lexington Avenue, Rochester, New York	**PROJECT MGR.**	D. Conley
CLIENT	General Motors Comporate Holdings	**FIELD REP.**	T. Robitaille
CONTRACTOR	Boart Longyear	**DATE INSTALLED**	6/28/2011
DRILLER		**WATER LEVEL**	19.0 ft. after drilling

Ground El. ~~~505~~ 611.11 ft

El. Datum

Location GR-3

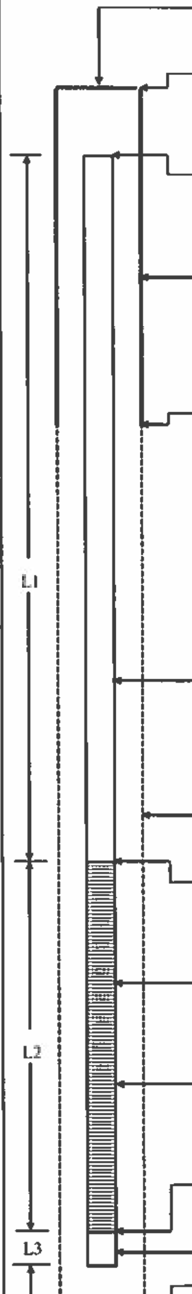
☑ **Guard Pipe**

☐ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
0.0	0.0
Fill	Sand
	3.0
12.0	Grout
Glacial Till	
17.0	
Rochester Shale	18.0
	Bentonite
	20.0
	Sand
42.3	42.3

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock: Stainless Streel Guard Pipe

Height/Depth of top of guard pipe/roadway box above/below ground surface: 2.5 ft

Height/Depth of top of riser pipe above/below ground surface: 2.3 ft

Type of protective casing: Stainless Steel

Length: 5.0 ft

Inside Diameter: 6.000 in

Depth of bottom of guard pipe/roadway box: 2.5 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Bentonite	0.0	0.6
Sand	0.6	2.4
Grout	3.0	15.0
Bentonite	18.0	2.0
Sand	20.0	22.0

Type of riser pipe: PVC

Inside diameter of riser pipe: 4.0 in

Type of backfill around riser: Bentonite Cetco medium/Cetco Grout

Diameter of borehole: in

Depth to top of well screen: 22.0 ft

Type of screen: Stainless Steel

Screen gauge or size of openings: 0.0 in

Diameter of screen: 4.0 in

Type of backfill around screen: Sand #1 VS Silica

Depth of bottom of well screen: 42.0 ft

Bottom of Silt trap: 42.3 ft

Depth of bottom of borehole: 42.3 ft

(Not to Scale)

24.25 ft	+	19.7 ft	+	0.3 ft	=	44.25 ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS:

Form 2007

HALEY & ALDRICH

PUMPING WELL INSTALLATION REPORT

Well No.	Boring No.
GR-4	GR-4

PROJECT	GM Lexington	**H&A FILE NO.**	70014-113
LOCATION	1000 Lexington Avenue, Rochester, New York	**PROJECT MGR.**	D. Conley
CLIENT	General Motors Comporate Holdings	**FIELD REP.**	T. Robitaille
CONTRACTOR	Boart Longyear	**DATE INSTALLED**	6/28/2011
DRILLER		**WATER LEVEL**	21.9 ft. after drilling

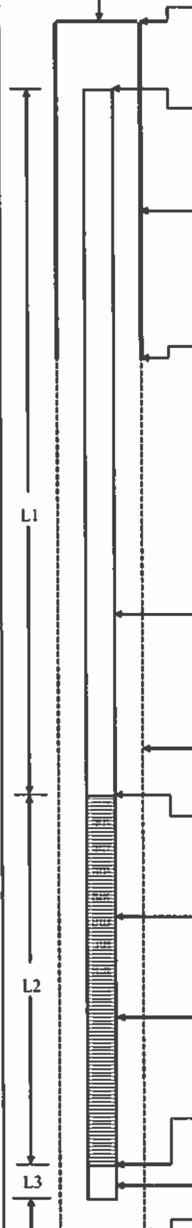
Ground El. ~~~505~~ 510.37 ft
El. Datum

Location GR-4

☑ **Guard Pipe**
☐ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
0.0	0.0
Fill	Bentonite
	0.6
	Sand
	3.0
5.5	Grout
Glacial Till	
8.0	
	19.0
	Bentonite
	21.0
Rochester Shale	Sand
44	44

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Stainless Streel Guard Pipe	
Height/Depth of top of guard pipe/roadway box above/below ground surface	2.5	ft
Height/Depth of top of riser pipe above/below ground surface	2.3	ft
Type of protective casing:	Stainless Steel	
Length	5.0	ft
Inside Diameter	6.000	in
Depth of bottom of guard pipe/roadway box	2.5	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Bentonite	0.0	0.6
Sand	0.6	2.4
Grout	3.0	16.0
Bentonite	19.0	2.0
Sand	21.0	23.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	4.0	in
Type of backfill around riser	Bentonite Cetco medium/Cetco Grout	
Diameter of borehole		in
Depth to top of well screen	23.0	ft
Type of screen	Stainless Steel	
Screen gauge or size of openings	0.020	in
Diameter of screen	4.0	in
Type of backfill around screen	Sand #1 VS Silica	
Depth of bottom of well screen	42.7	ft
Bottom of Silt trap	43.0	ft
Depth of bottom of borehole	44.0	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
24.25 ft	+	19.7 ft	+	0.3 ft	=	44.25 ft

COMMENTS:

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

RECOVERY WELL COMPLETION REPORT

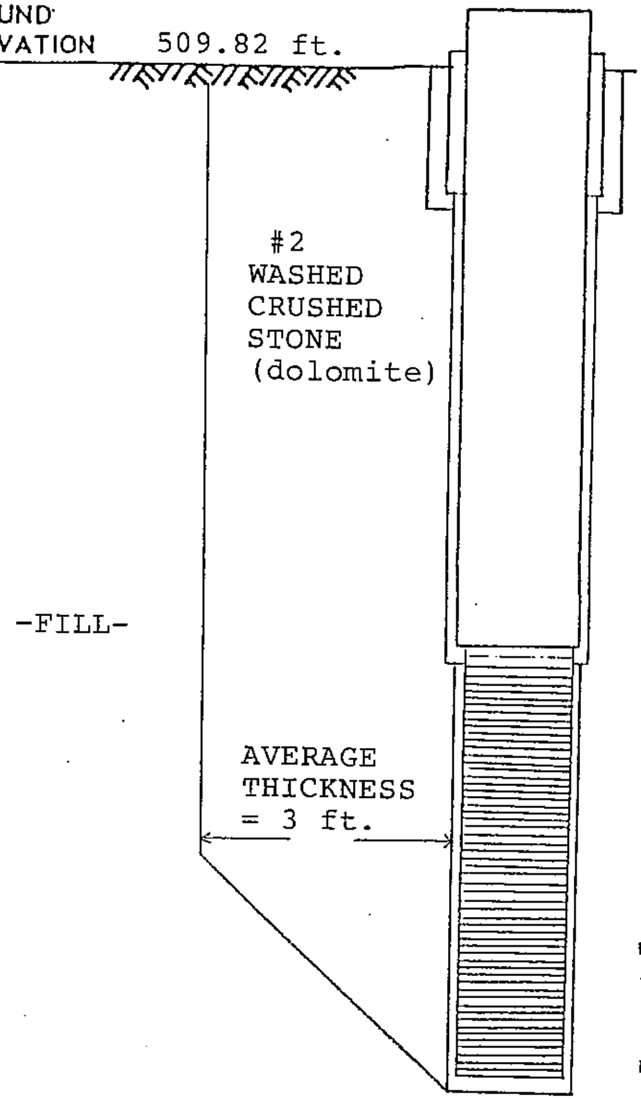
PROJECT: TANK FARM OIL RECOVERY
LOCATION: LEXINGTON AVE., ROCHESTER, NEW YORK
CLIENT: AC ROCHESTER DIVISION-GENERAL MOTORS DIV.
CONTRACTOR: INSTALLED BY AC ROCHESTER
DRILLER: --- INSPECTOR: ---
INSTALLATION DATE SEPTEMBER 1989

FILE NO. 70043-41
WELL NO. RW-2
Test Pit No. TP-4
LOCATION 50,760.78N
58,316.04E
SHEET 1 OF 2

SURVEY DATUM NGVD

GROUND ELEVATION 509.82 ft.

SUMMARY OF SUBSURFACE CONDITIONS



~~ELEVATION~~ STICKUP ABOVE/BELOW GROUND SURFACE OF PROTECTIVE CASING	(Plywood Shed)
~~ELEVATION OR~~ STICKUP ABOVE/BELOW GROUND SURFACE OF WELL CASING	2.07 ft.
~~ELEVATION~~/DEPTH OF BOTTOM OF PROTECTIVE CASING	---
DIAMETER OF Test Pit	3 to 8 ft.
INSIDE DIAMETER OF WELL CASING	1.93 ft.
WALL THICKNESS OF WELL CASING	16 guage
TYPE OF SEAL	---
INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE	
TOTAL VOLUME OF SEAL PLACED	---
METHOD OF SEAL PLACEMENT	---
~~ELEVATION~~/DEPTH TOP OF WELL SCREEN	1.7 ft.±
TYPE OF WELL SCREEN	See note below.
SCREEN SLOT SIZE	0.125 in.
INSIDE DIAMETER OF WELL SCREEN	1.93 ft.
TYPE OF BACKFILL AROUND SCREEN	#2 Crushed Stone
~~ELEVATION~~/DEPTH BOTTOM OF WELL SCREEN	10.7 ft.
~~ELEVATION~~/DEPTH BOTTOM OF Test Pit	10.7 ft.

NOTE: Well constructed with 16-guage galvanized corrugated culvert pipe fitted with solid end cap at bottom, with 6-in. long vertical slots cut two inches apart vertically (not through pipe seam) and spaced at 45-degree intervals around pipe in spiral pattern parallel to pipe seam. (Reference: Rochester Products Division drawing BX.10106, 1989.)

LENGTH OF CASING 3.8 ft. LENGTH OF SCREEN 9.0 ft. [struck out] ---

H & A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

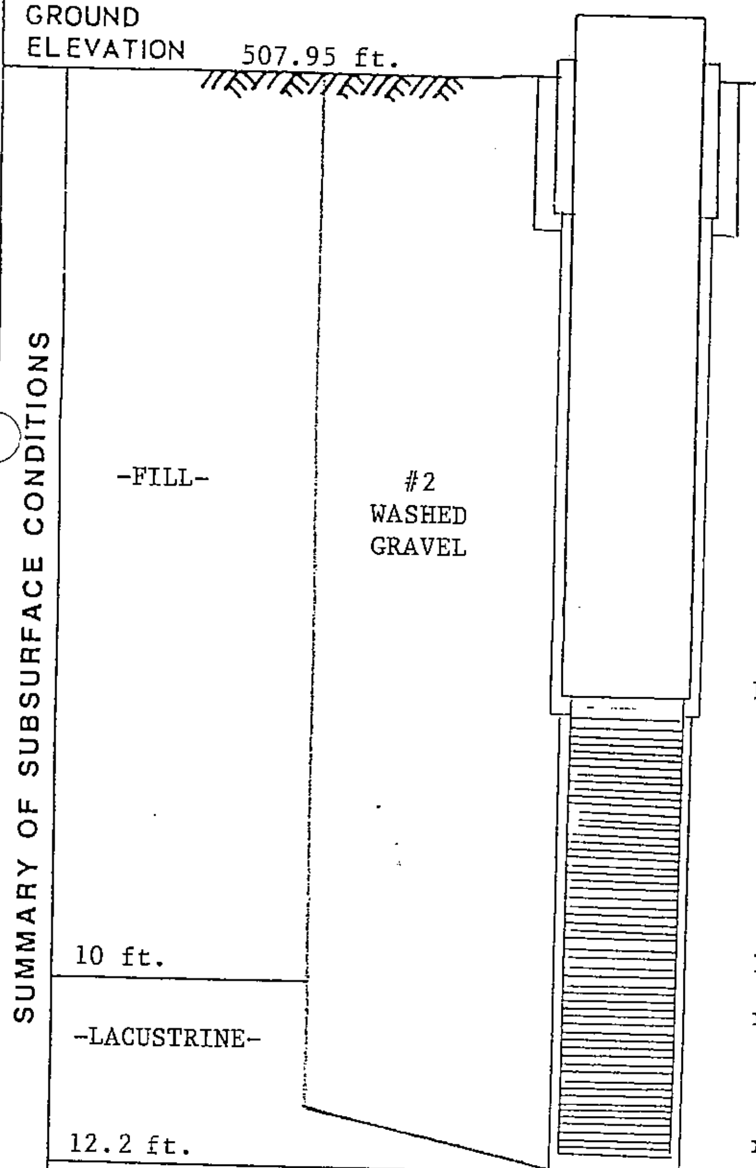
RECOVERY WELL COMPLETION REPORT

PROJECT: Tank Farm Oil Recovery
LOCATION: Lexington Avenue, Rochester, New York
CLIENT: AC Rochester Division - General Motors Corp.
CONTRACTOR: Installed by AC Rochester
DRILLER: ---- INSPECTOR: T. Wells
INSTALLATION DATE November 1, 1990

FILE NO. 70043-41
WELL NO. RW-3
trench NO. RT-1A
LOCATION 50,656N
58,425E
SHEET 1 OF 2

SURVEY DATUM NGVD

GROUND ELEVATION 507.95 ft.



ELEVATION OR STICKUP ABOVE/BELOW GROUND SURFACE OF PROTECTIVE CASING	----
STICKUP ABOVE GROUND SURFACE OF WELL CASING	3.11 ft.
ELEVATION/DEPTH OF BOTTOM OF PROTECTIVE CASING	----
Width of Trench	6 ft.
INSIDE DIAMETER OF WELL CASING	8.0 in.
TYPE OF WELL CASING	PVC
TYPE OF SEAL INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE	----
TOTAL VOLUME OF SEAL PLACED	----
METHOD OF SEAL PLACEMENT	----
DEPTH TOP OF WELL SCREEN Depth of top of slots=2.3 ft.	2.0 ft.
TYPE OF WELL SCREEN	PVC
SCREEN SLOT SIZE	0.020 in.
INSIDE DIAMETER OF WELL SCREEN	8.0 in.
TYPE OF BACKFILL AROUND SCREEN Depth of bottom of slots=11.3 ft.	washed gravel
/DEPTH BOTTOM OF WELL SCREEN	11.9 ft.
/DEPTH BOTTOM OF trench	12.2 ft.

Notes: 1. Well installed in recovery trench excavation (see report for Test Pit RT-1A).

FIGURES REFER TO: EL. ____ DEPTH X

LENGTH OF CASING 5.08 ft. LENGTH OF SCREEN 9.92 ft. TOTAL LENGTH 15.00 ft.

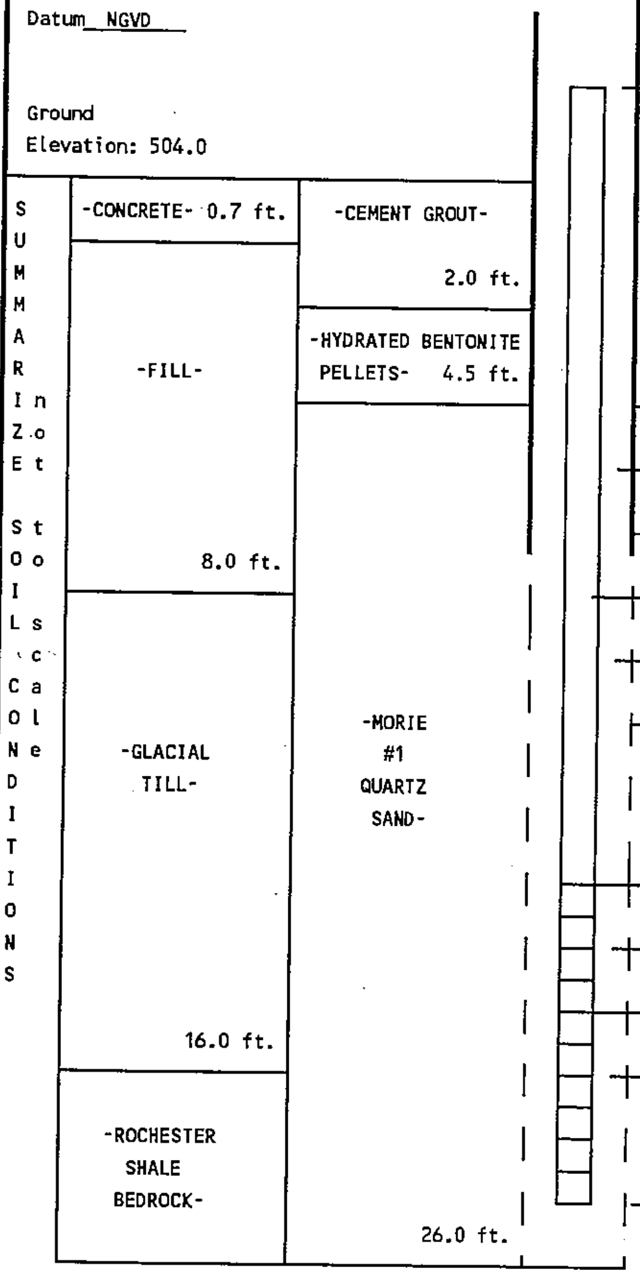
H&A OF NEW YORK
CONSULTING GEOTECHNICAL ENGINEERS
GEOLOGISTS AND HYDROGEOLOGISTS

OVERBURDEN GROUNDWATER MONITORING WELL REPORT

PROJECT:	BUILDING 22 RECOVERY WELLS
LOCATION:	LEXINGTON AVENUE, ROCHESTER, NEW YORK
CLIENT:	AC ROCHESTER DIVISION
CONTRACTOR:	NOTHNAGLE DRILLING
DRILLER:	N. Short RIG TYPE: Gus Pech 750-C Mite-e-Mite
INSTALLATION DATE:	28 December 1993
FILE NO.:	70014-47
WELL NO.:	RW-4
LOCATION:	8 ft. west of column LKL-55
SHEET:	1 OF 2
INSPECTOR:	J. Talpey

Survey
Datum NGVD

Ground
Elevation: 504.0



Depth/Stickup above/below ground surface of protective casing.	Flushmount
Depth below ground surface of riser pipe.	0.50 ft.
Thickness of Surface Seal	2.0 ft.
Type of Surface Seal [indicated all seals showing depth, thickness and type]	Portland Cement Grout
Type of Protective Casing	Steel Roadway Box
Inside Diameter of Protective Casing	12 in.
Depth of Bottom of Protective Casing	1.1 ft.
Type of Riser Pipe	Stainless Steel
Inside Diameter of Riser Pipe	8.5 in. I.D.
Wall Thickness = 0.125 in.	
Type of Backfill Around Riser	Hydrated Bentonite Pellets
Diameter of Borehole	15 in. +/- overburden 9-7/8 in. bedrock
Type of coupling (threaded, welded, etc.)	Threaded
Depth of Bottom of Riser	5.3 ft.
Type of Wellscreen	Stainless Steel
Screen Slot Size	0.020 in.
Diameter of Wellscreen	8.5 in. I.D.
Type of Backfill Around Wellscreen	Morie #1 Quartz Sand
Depth of Bottom of Wellscreen	25.0 ft.
Depth of Bottom of Borehole	26.0 ft.

Remarks: Screened sections 10.1 + 9.6 = 19.7 ft. screen
riser length 0.4 + 4.4 = 4.8 ft. riser
24.5 ft. total

Well No. RW-4

H&A of New York
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

RECOVERY WELL COMPLETION REPORT

PROJECT: AC ROCHESTER - TANK FARM OIL RECOVERY
LOCATION: LEXINGTON AVE. FACILITY, ROCHESTER, NY
CLIENT: AC ROCHESTER
CONTRACTOR: AMERICAN ENVIRONMENTAL SERVICES CO., INC.
CONTRACTOR'S REP.: ED JONES INSPECTOR: T.D. WELLS
INSTALLATION DATE 12 JULY 1989

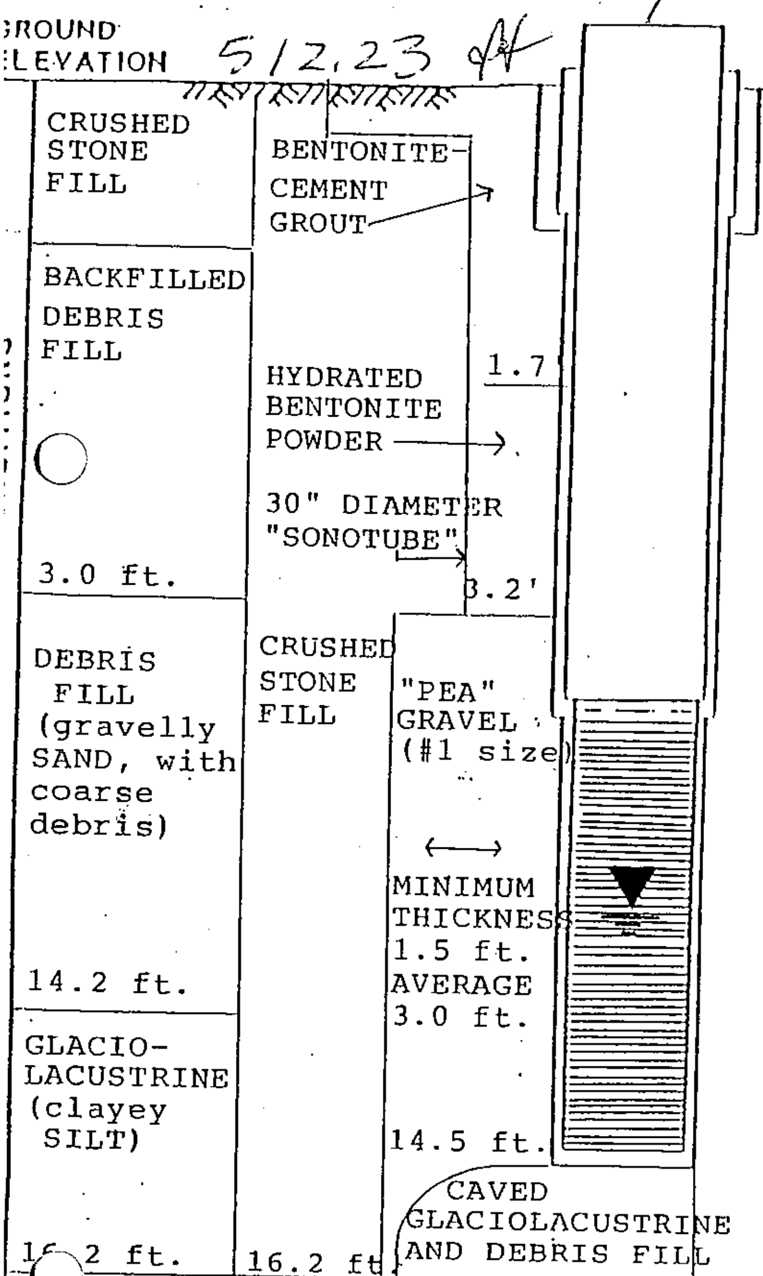
FILE NO. 70043-40
WELL NO. RW-101
BORING NO. Test Pit #1
LOCATION See Plan

SHEET 1 OF 2

SURVEY DATUM USC&GSVD

514.33 ft

GROUND ELEVATION 512.23 ft



ELEVATION OR STICKUP ABOVE/BELOW GROUND SURFACE OF PROTECTIVE CASING	—
STICKUP ABOVE/ GROUND SURFACE RISER	2.0 ft.
DIAMETER OF BOREHOLE	—
INSIDE DIAMETER OF RISER	1.93 ft.
WALL THICKNESS OF RISER	0.035 ft.
TYPE OF SEAL	Bentonite & grout
INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE	See Diagram
TOTAL VOLUME OF SEAL PLACED	at left.
METHOD OF SEAL PLACEMENT	
/DEPTH TOP OF WELL SCREEN	4.2 ft.
TYPE OF WELL SCREEN	Galvanized Steel, Slotted
SCREEN SLOT SIZE	0.020 in.
INSIDE DIAMETER OF WELL SCREEN	1.94 ft.
TYPE OF BACKFILL AROUND SCREEN	#1 Gravel
/DEPTH BOTTOM OF WELL SCREEN	14.5 ft.
/DEPTH BOTTOM OF EXCAVATION	16.2 ft.

Product/water table @ 8 ft.

FIGURES REFER TO: EL. ____ DEPTH X
From surface of grout collar.

LENGTH OF CASING 6.23 ft. LENGTH OF SCREEN 10.34 ft. DEPTH OF EXCAVATION 16.2 ft.

APPENDIX D – MONROE COUNTY PURE WATERS SEWER USE PERMIT

CK# 143143

COUNTY OF MONROE
SEWER USE PERMIT RENEWAL

Firm Name:	GM Components Holdings, LLC 1000 Lexington Avenue	Permit Number: Fee: Expires:	IWC-937 $ 75.00 August 31, 2024
Mailing Addr:	1000 Lexington Ave. Rochester, NY 14606	W/C Expire: District No:	12/31/2021 8575

Has there been any revision to the plant sewer system or any change in industrial wastes discharged to the public sewer in the past twelve months

Yes: __ No: X If yes, please explain in a separate letter.

Average monthly consumption for the past twelve (12) months:

Water Account No.(s) 600168, 600169, 600170 604027F, 604050F (cu ft/gal) 4,433,750

In consideration of the granting of this renewal permit the undersigned agrees to comply with all the requirements in the Initial Permit as listed under II.

Name of person to be contacted for inspection & sampling purposes:

Type or Print: GAIL FINKELSTEIN Phone No: 585-647-4767

YOUR PERMIT MUST BE SIGNED AS FOLLOWS:

1 For a corporation by a responsible corporate officer A corporate officer means
 (a) A president, secretary, treasurer or vice - president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision - making functions for the corporation or
 (b) The manager of one or more manufacturing, production, or operation facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second - quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures

2 For a partnership or sole proprietorship by a general partner or the proprietor, respectively, or

3 By a duly authorized representative of the individual designated in items (1) or (2) above if

 (a) The authorization is made in writing by the individual described in items (1) or (2).
 (b) The authorization specifies either an individual or a position having responsibility for the overall operation of the facility from which the Industrial Discharge originates such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying named position), and
 (c) The written authorization is submitted to this Department

Print or Type: NEAL R. EVANS Phone No: 585-647-4881

Signature: [signature] Date: 6/22/21

Title: PLANT DIRECTOR

Renewal Approved by: [signature] Issued this 8th day of JULY 20 21

Michael J. Garland, P.E.
Director of Environmental Services-PureWaters
Monroe County

COUNTY OF MONROE
SEWER USE PERMIT ENCLOSURE

GM Components Holdings, LLC
1000 Lexington Avenue
Rochester, N.Y. 14606

PERMIT NUMBER: 937
DISTRICT NUMBER: 8575

TYPE OF BUSINESS: Automotive Components Manufacturing
SIC CODE: 3714
SAMPLE POINTS: IWC-937.1 - Sample Shelter In North Parking Lot
IWC-937.2 – C.O. East Side of Bldg.
IWC-937.5 – Groundwater Discharge – East Side
IWC-937.6 – Groundwater Discharge - North Side Combined

PRETREATMENT CATEGORY: SIU- Non-Categorical, Flow >25,000 GPD

REQUIRED MONITORING & EFFLUENT LIMITS

SAMPLE POINT: IWC-937.2 – C.O. East Side of Bldg.

SELF MONITORING FREQUENCY: **QUARTERLY**

SAMPLING PROTOCOL: Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto. A grab sample, collected during a normal process day, shall be analyzed for the following parameters:

Analyte	Action Level
Polychlorinated Biphenyls	0.3 μg/L

SAMPLE POINT: IWC-937.5 – Groundwater Discharge – East Side

SELF MONITORING FREQUENCY: **MONTHLY**

SAMPLING PROTOCOL: Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto. A grab sample, collected during a normal process day, shall be analyzed for the following parameters:

Analyte	Sewer Use Limit
*Volatile Organic Compounds	2.13 mg/L
Total Oil & Grease	100 mg/L
	Action Level
Polychlorinated Biphenyls	0.3 μg/L

* The summation of all Volatile Organic Compounds greater than 10 μg/L cannot exceed 2.13 mg/L.

SAMPLE POINT: IWC-937.6 – Groundwater Discharge - North Side Combined

SELF MONITORING FREQUENCY: **MONTHLY**
(*See Special Conditions #1 and #2)

SAMPLING PROTOCOL: Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto. A grab sample, collected during a normal process day, shall be analyzed for the following parameters:

Analyte	Sewer Use Limit
*Volatile Organic Compounds	2.13 mg/L
	Action Level
Polychlorinated Biphenyls	0.3 µg/L

* The summation of all Volatile Organic Compounds greater than 10 µg/L cannot exceed 2.13 mg/L.

OPTIONAL MONITORING

SAMPLE POINT: IWC-937.1 - Sample Shelter In North Parking Lot

SAMPLING PROTOCOL: Sampling and analysis shall be performed in accordance with the techniques prescribed in 40CFR part 136 and amendments thereto.

Self-monitoring shall be considered optional for surcharge computation. The industrial user shall have the option to sample and test their discharges for the purpose of calculating the surcharge, if applicable. The testing values shall be averaged with those testing values determined by the district for the purpose of calculating the surcharge. Should the industrial user choose to self-monitor for surcharge purposes, it will be imperative, each/every wastewater sample collected by a NYS certified laboratory be submitted to this office in a timely matter.

Special Conditions:

1. IWC-937.6 is the combined discharge of the AWTA foundation sump, well Z, GR-1 and GR-2. Historically the AWTA foundation sump and well Z require treatment for PCB contamination and will pass through the Granular Activated Carbon (GAC) treatment system. Wells GR-1 and GR-2 have not needed treatment and will not pass though the GAC system. Should monitoring indicate that GR-1 and/or GR-2 require treatment then they must be routed through the GAC system.
2. Required monitoring conducted at sample point IWC-937.6 shall be collected during a normal process day which shall include flow from the AWTA foundation sump, well Z, GR-1 and GR2. If one or more of the flow streams are off line when samples are collected then these shall be identified and reported with the submission of the required monitoring report.
3. The summation of all Volatile Organic Compounds greater than 10 µg/L cannot exceed 2.13 mg/L.
4. Monthly discharge volumes must be supplied for sample points IWC-937.5 and IWC-937.6. The groundwater discharge flow totals will be used for billing purposes.
5. GM Components Holdings, LLC will be required to maintain and follow a Slug Discharge Control Plan or equivalent plan that meets the minimum requirements set forth in 40 CFR 403.8(f)(2)(vi) of the General Pretreatment Regulations.

TERMS AND CONDITIONS

GENERAL REQUIREMENTS:

A. The permittee agrees to accept and abide by all provisions of the Sewer Use Law of Monroe County (MCSUL) and of all pertinent rules or regulations now in force or shall be adopted in the future.

B. In addition to the parameters/limits outlined, the total facility discharge shall meet all other concentration values listed within the MCSUL and as described in Article III, Section 3.3(d) of the Law.

C. Included in Article II, Section 2.1 of the MCSUL, is the definition of "Normal Sewage". "Normal Sewage" may be discharged to the sewer system in excess of the concentrations outlined in the definition, however, the facility will be subject to the imposition of a sewer surcharge and possible self-monitoring requirements as a result. Surcharging procedures are outlined in Article X of the MCSUL.

D. Regulatory sampling for analytes not specified under "required monitoring" shall be conducted by Monroe County at a minimum frequency of once every three (3) years.

E. This permit is not assignable or transferable. The permit is issued to a specific user and location.

F. Per Article IX, section 9.9 of the MCSUL, a violation by the permittee of the permit conditions may be cause for revocation or suspension of the permit after a Hearing by the Administrative Board, or if the violation is found to be within the emergency powers of the Director under Section 9.6. The revocation is immediate upon receipt of notice to the Industrial User. If the revocation or suspension is issued under Section 9.6, a Hearing shall be held as soon as possible.

G. As provided under Article VI, Section 6.1 of the MCSUL, the Director and/or his duly authorized representatives shall gain entry on to private lands by permission or duly issued warrant for the purpose of inspection, observation, measurement sampling and testing in accordance with the provisions of this law and its implementing Rules and Regulations. The Director or his representatives shall not have authority to inquire into any processes used in any industrial operation beyond that information having a direct bearing on the kind and source of discharge to the sewers or the on-site facilities for waste treatment. While performing the necessary work on private lands, referred to above, the Director or his duly authorized representative shall observe all safety rules applicable to the premises as established by the owner and/or occupant.

H. All required monitoring shall be analyzed by a New York State Department of Health certified laboratory. All sampling and analysis must be performed in accordance with Title 40 Code of Federal Regulations Part 136.

I. The pH range for this permit is 5.0 – 12.0 S.U. This range is specifically permitted by the Director as allowed under Article III, Section 3.3(b) of the MCSUL. pH must be analyzed within 15 minutes of the time of collection as specified in 40 CFR, part 136.

J. Discharges of wax, fats, oil or grease shall not exceed 100 mg/L as imposed by the Director under Article III, Section 3.3 of the MCSUL.

SURCHARGE CONCENTRATIONS:

Concentration and/or characteristics of normal sewage:

"Normal Sewage" shall mean sewage, industrial wastes or other wastes, which when analyzed, show concentration values with the following characteristics based on daily maximum limits:

a. B. O. D.	300 mg/L
b. Total Suspended Solids	300 mg/L
c. Total Phosphorus, as P	10 mg/L

Annual average concentrations above normal sewage are subject to surcharge as defined in Article X, section 10.7 of the MCSUL.

DISCHARGE LIMITATIONS (SEWER USE LIMITS)

Permissible concentrations of toxic substances and/or substances the Department wishes to control:
The concentration in sewage of any of the following toxic substances and/or substances the Department wishes to control shall not exceed the concentration limits specified when discharged into the County Sewer System; metal pollutants are expressed as <u>total</u> metals in mg/L (ppm): the following pollutant limits are based on daily maximum values:

a. Antimony (Sb)	1.0 mg/L
b. Arsenic (As)	0.5 mg/L
c. Barium (Ba)	2.0 mg/L
d. Beryllium (Be)	5.0 mg/L
e. Cadmium (Cd)	1.0 mg/L
f. Chromium (Cr)	3.0 mg/L
g. Copper (Cu)	3.0 mg/L
h. Cyanide (CN)	1.0 mg/L
i. Iron (Fe)	5.0 mg/L
j. Lead (Pb)	1.0 mg/L
k. Manganese (Mn)	5.0 mg/L
l. Mercury (Hg)	0.05 mg/L
m. Nickel (Ni)	3.0 mg/L
n. Selenium (Se)	2.0 mg/L
o. Silver (Ag)	2.0 mg/L
p. Thallium (Tl)	1.0 mg/L
q. Zinc (Zn)	5.0 mg/L

REPORTING REQUIREMENTS:

A. Per the requirements of 40 CFR, Part 403.12(e), Significant Industrial Users must submit Periodic Reports on Continued Compliance to the Control Authority on a biannual (2/yr) basis. Deadline dates of submission for these reports will be August 15 and February 15, respectively.

B. Discharge monitoring reports shall be submitted to the Control Authority upon receipt from the permittee's testing laboratory. Reports submitted from industrial users identified as Significant Industrial Users (SIU) must be accompanied by a certification statement as required by 40 CFR part 403 and the MCSUL, Article VI, section 6.12.

C. Any Industrial User subject to the reporting requirements of the General Pretreatment Regulations shall maintain records of all information resulting from any monitoring activities required by 40 CFR, part 403.12 for a minimum of three (3) years. These records shall be available for inspection and copying by the Control Authority. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Industrial User or the operation of the POTW Pretreatment Program or when requested by the Director or the Regional Administrator.

D. Pursuant to Article VI, Section 6.10 (4) of the MCSUL and the reporting requirements of the Code of Federal Regulations 40 CFR part 403.12, if a permitted user elects to perform monitoring at compliance monitoring locations more often than required and uses approved laboratory procedures, the results of all such additional monitoring and any additional flow measurements shall be reported to the Director on a timely basis and shall be included in reports as outlined in the MCSUL section 6.10(1)-(4).

NOTIFICATION REQUIREMENTS:

A. Pursuant to Article VI, Section 6.10(5), the permittee shall notify the Department within 24 hours of becoming aware that discharge monitoring is in violation of any permit limit. This notification shall be directed to the Industrial Waste Section at 585-753-7600 Option 4. The User shall also repeat sampling and analysis for the analyte in non-compliance and submit the results of the repeat analysis to Monroe County within 30 days after becoming aware of the violation.

B. Notify the Director in writing when considering a revision to the plant sewer system or any change in industrial waste discharges to the public sewers. The later encompasses either an increase or decrease in average daily volume or strength of waste or new wastes.

C. Notify the Director immediately of any accident, negligence, breakdown of pretreatment equipment or other occurrence that occasions discharge to the public sewer of any waste or process waters not covered by this permit.

SLUG CONTROL

An Industrial User shall be required to report any/all slug discharges to the Monroe County sewer system by calling 585-753-7600 option 4. For the purpose of this permit enclosure, a slug discharge shall be identified as any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge. Following a review process, the Control Authority (Monroe County) shall determine the applicability of a facility slug control plan. If the Control Authority decides that a Slug Discharge Control Plan (SDCP) is needed, the plan shall contain, at a minimum, the following elements:

1. Description of discharge practices, including non-routine batch discharges.
2. Description of stored chemicals.
3. Procedures for immediately notifying the Control Authority of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5 (b), with procedures for follow up written notification within five (5) days.
4. If necessary, procedures to prevent adverse impact from accidental spills, including, but not limited to, inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents) and/or measures and equipment for emergency purposes.

SNC DEFINITION:

In accordance with 40 CFR 403.8 (f) (vii), an Industrial User is in significant noncompliance (SNC) if its violations meet one or more of the following criteria:

A. Chronic violations of wastewater discharge limits – defined as those which 66% or more of all the measurements taken during a six-month period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter (ref. Article IX, section 9.19 – MCSUL). This criteria does NOT apply to the following Monroe County surchargeable parameters: Biochemical Oxygen Demand, Total Suspended Solids, Chlorine Demand and Total Phosphorus.

B. Technical review criteria (TRC) violations – defined as those in which 33% or more of all the measurements for each pollutant parameter taken during a six month period equal or exceed the product of the daily maximum limit or the average limit times the applicable TRC (ref. Article IX, section 9.19 – MCSUL). This criteria does NOT apply to the following Monroe County surchargeable parameters: Biochemical Oxygen Demand, Total Suspended Solids, Chlorine Demand and Total Phosphorus.

C. Any other violation of a pretreatment effluent limit (daily maximum or longer-term average) that the Control Authority determines has caused, alone or in combination with other discharges, interference or pass-through (including endangering the health or POTW personnel or the general public).

D. Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or the environment or has resulted in the POTW's exercise of its emergency authority under paragraph (t)(1)(vi)(8) of 40 CFR part 403 to prevent such a discharge.

E. Failure to meet, within 90 days after the scheduled date, a compliance schedule milestone contained in a local control mechanism or enforcement order, for starting construction, completing construction or attaining final compliance.

F. Failure to provide, within 30 days after the due date, required reports such as BMRs, 90 day compliance reports, periodic reports on continued compliance.

G. Failure to accurately report noncompliance.

H. Any other violation or group of violations that the Control Authority determines will adversely affect the operation and implementation of the local Pretreatment Program.

PENALTIES

Should the facility be considered in Significant Non-Compliance (SNC), based on the above mentioned criteria, the minimum enforcement response by Monroe County will be the publication of the company name in the Gannett Rochester newspaper. The company will be published as an Industrial User in Significant Non-Compliance (SNC). Fines and criminal penalties may follow this publication (ref. Article IX – MCSUL).

Nothing in this permit shall be construed to relieve the permittees from civil/criminal penalties for noncompliance under Article IX, Section 9.7(a)(5) MCSUL. Article IX provides that any person who violates a permit condition is subject to a civil penalty not to exceed $25,000 for any one case and an additional penalty not to exceed $25,000 for each day of continued violation.

APPENDIX E – EXCAVATION WORK PLAN (EWP)

APPLICABILITY

The Site is available for commercial and industrial use with the implementation of the engineering and institutional controls (EC/IC) prescribed by this SMP. Any significant future intrusive work (as defined below) that will penetrate, encounter or disturb the remaining site contamination, and any modifications to the existing site cover (i.e. vegetation, pavement, building slab, etc.) will be performed in compliance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the site by the current site owner and/or contractor as outlined in this EWP.

Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section E-1 below.

The EWP applies to the following:

- Breaching or replacement of the cover system.
- Testing of non-visually impacted soils for excavations that will breach the cover system (asphalt pavement, building foundations, or vegetated soil areas) in the cover system areas.
- Management of groundwater encountered during excavation in all portions of the Site.
- Management of visually impacted soils identified during excavations in areas of the Site identified in Figures 7 and 8.

E-1 NOTIFICATION

The Departments will be notified for any significant site development including proposed changes to the cover system (i.e. soil to asphalt), new structures, or removal of an engineering system (i.e. monitoring wells, SSDS points, pumping wells). The facility Excavation Permit will be submitted to the Department contacts listed in Table E-1 for all ground intrusive activities (such as general facility maintenance), and the Departments will determine the extent to which the EWP applies. Notification requirements (besides sending the Excavation Permit) will not be required for emergency activities. However, if any material is to be sent off-site or material to be used as backfill is to be imported, a Request to Import/Export form must be submitted to the Departments for review and approval.

. The information on Table E-1 will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table E-1:
Excavation Work
Plan Notifications*

Danielle Miles NYSDEC Project Manager	(585) 226 5349 danielle.miles@dec.ny.gov
David Pratt P.E. NYSDEC Region 8 Remediation Engineer	(585)226-5449 david.pratt@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

The notification for site development will include:

- A description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an EC;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and historic concentration levels of contaminants of concern, and any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulation (CFR) 1910.120;
- A copy of the contractor's HASP, in electronic format, if it differs from the HASP provided in Appendix F of this SMP;
- Identification of disposal facilities for potential waste streams; and

- Identification of sources of any anticipated backfill, along with required request to import form and all supporting documentation including but not limited to associated chemical testing results.

E-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional or person under their supervision during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover and above the water table or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section E-6 of this Appendix.

Table E2: Types of Stockpiles and Management Options

Stockpile Characteristics	Reuse on-Site without further testing (Section E-7)	May be reused on-Site pending analytical testing (Section E-7)	Dispose offsite per applicable regulations and landfill requirements (Section E-4 through E-6)
Material excavated from below the cover system that is not visually impacted with free product, oily material, solid waste, or other evidence of contamination (staining, odor, elevated PID hits).	✓		
Material excavated from below the cover system and above the water table with evidence of impact (staining, odor, elevated PID hits)		✓	

Stockpile Characteristics	Reuse on-Site without further testing (Section E-7)	May be reused on-Site pending analytical testing (Section E-7)	Dispose offsite per applicable regulations and landfill requirements (Section E-4 through E-6)
Material excavated that is visually impacted by oily material or product[1]			✓

1. If this material is encountered during excavations, additional testing and reporting requirements may be required depending on the quantity and nature of impacted material identified. Refer to Section E-12 below.

E-3 SOIL STAGING METHODS

Soil stockpiles will be managed to minimize impact to nearby catch basins using sewer covers, hay bales or similar devices as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps or similar functioning covers. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

E-4 MATERIALS EXCAVATION AND LOAD-OUT

In the event that excavation and load out of materials is required the following will occur (also refer to Section E-5 below):

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional or person under their supervision. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities in accordance with the GMCH Rochester Operations Facility Excavation Permit Process prior to any intrusive activities at the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site during excavation activities, as appropriate. The qualified environmental professional or person under their supervision will be responsible for ensuring that all excavation-related outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner or treated through the on-site groundwater recovery and treatment system with discharge to the sanitary sewer in accordance with the facility sewer use permit.

Locations where vehicles enter or exit the site shall be inspected daily during excavation activities for evidence of off-site soil tracking.

The qualified environmental professional or person under their supervision will be responsible for ensuring that all egress points for excavation-related truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

E-5 MATERIALS TRANSPORT OFF-SITE

In the event that materials require transportation off-Site the following will occur,

All transport of excavation-related materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Excavated material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes shall exit the facility via the Northwest Truck Entrance Area. Once on Mt. Read Boulevard, the destination of the materials being removed will dictate the route. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. The most appropriate route that takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport will be used.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

E-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition (C/D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

E-7 MATERIALS REUSE ON-SITE

7.1 Criteria for On-Site Reuse

As noted in Section E-2 above, the following excavated soils may be reused on-Site:

- Material excavated from areas below the site cover that is not visually impacted with free product, oily material, solid waste, or other evidence of contamination may be reused on-site without further testing.
- Material excavated from areas below the site cover with evidence of impact may be reused on-Site pending testing results described below.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

7.2 Sampling for Reuse Protocol

Soils that require testing prior to reuse will be tested as described below. If the soil will be disposed off-Site, the disposal facility may require different and/or additional analysis. Chemical criteria for on-Site reuse of material are provided in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC Project Manager prior to the sampling event. Should those criteria be revised in the future, the most recent available cleanup criteria should be used.

1. Sampling will be conducted by a qualified Site Owner representative, consultant, or contractor at a sampling frequency in accordance with DER -10 Table 5.4(e)10.
2. Each sample will be collected using a decontaminated or new stainless steel, or plastic disposable device (hand trowel, shovel, scoop, hand augers, or other appropriate sampling equipment). To minimize the potential for cross-contamination, disposable sampling equipment will be used if possible. If sample equipment is reused, the equipment will be decontaminated prior to each use using the following procedure:
    a. Potable water/non-phosphate detergent (i.e. – Alconox) solution wash
    b. Potable or distilled water rinse
    c. Wipe or air dry
3. For similarly stockpiled/containerized soils, collect seven (7) discrete samples for for analysis for Volatile Organic Compounds (VOCs) via EPA Method 8260C and two (2) composite samples per 1,000 cubic yards of material in laboratory provided samplers, Semi-volatile Organic Compounds (SVOCs) via EPA Method 8270C, and Target Analyte List (TAL) Metals via EPA Method 6010/7471.
4. Immediately upon collection, samples will be labeled and placed in coolers, chilled with ice to approximately 4°C. The sample labels will identify the soil stockpile or container group, sample type, time and date of collection, name of the sampler, and required analyses. Sample coolers will be delivered with accompanying chain of custody documentation to an ELAP-certified laboratory for analysis.

Concentration criteria for on-site reuse of excavated material will be based on the SCOs for Commercial Use and/or Protection of Groundwater (whichever is lower). The qualified environmental professional or person under their supervision will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Segregated historical fill that exhibits evidence of VOCs (>10 parts per million (ppm) initial photoionization detector (PID) reading for a representative soil grab sample) or apparent petroleum contamination (visible oil sheen, product or sustained petroleum odor) will be sampled and analyzed to evaluate whether the material can be replaced beneath the final cover system or must be transported off site for disposal or treatment.

Representative sampling for waste classification will meet the requirements described above and the analysis required by applicable regulations, and the waste management facility.

If all VOCs, SVOCs, PCBs, and metals results for historical fill subject to these analyses meet the SCOs for Commercial Use or Protection of Groundwater, whichever is lower, these soils may be reused onsite. If not, GM may request NYSDEC approval for beneficial reuse of soils that do not meet SCOs or transport these soils to a permitted off-site waste management facility for disposal or treatment. Exporting historical fill or crushed concrete derived from the Site for use on any other property is prohibited.

E-8 FLUIDS MANAGEMENT

All liquids to be removed from the site will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site but will either be managed at the on-site wastewater treatment, which currently processes and treats the wastewater pumped from the groundwater migration control trench or managed off-site, unless prior approval is obtained from NYSDEC. Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

E-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Record of Decision. The existing cover system is comprised of a minimum of 12 inches of clean soil, asphalt pavement, concrete covered sidewalks and concrete building. The demarcation layer, consisting of geotextile or equivalent material will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP.

If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

E-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d) and DER-10 Appendix 5 for commercial/industrial use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table E 3. Soils that meet 'general' fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Table E3: Types of Backfill Sources Pre-Screening Requirements

Material and source	May be used on-Site without further testing	May be used on-Site pending analytical testing (Section E-10.1)	May not be used on-Site
Commercially purchased bagged topsoil used for landscaping purposes.	✓		
Gravel, rock, or stone (non-soil) consisting of virgin material from a permitted mine or quarry with >10% passing a #80 sieve.	✓		
Recycled concrete or brick from a DEC registered C&D processing facility[1,2].		✓	
Soil or sand imported from a virgin mine or pit.		✓	
Material (including gravel, rock, stone, sand, soil, etc.) from sources other than a virgin mine or pit.		✓	
Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites.			✓
Material that meets the definition of solid waste.			✓

1. Recycled material must conform to the requirements of Section 304 of the New York State Department of Transportation *Standard Specifications Construction and Materials Volume 1 (2002)*.

2. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

10.1 Sampling Protocols for Off-Site Backfill Sources

All imported soils that require testing will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are considered the lower of the protection of groundwater SCOs and commercial use SCOs and are listed in Table E4. Should the SCOs be revised in the future, the most recent available cleanup criteria should be used.

For the sources listed above that require analytical testing, the testing shall consist of the following in accordance with the May 2010 DER-10:

- Target Compound List VOCs (EPA Method 8260C)
- Target Compound List SVOCs plus 1,4 D (EPA Method 8270C)
- Target Analyte List Metals + Cyanide (EPA Method 6010/7471)
- PCBs (EPA Method 8082)
- Pesticides (EPA Method 8081)
- Per and Polyfluoroalkyl Substances (PFAS) (EPA Method 537.1 M)

Testing shall be performed by an ELAP-certified laboratory. The frequency of sampling will depend on the source of the material as follows:

- <u>Soil or sand from a virgin mine or pit</u>: Two (2) discrete samples for VOCs and one (1) composite sample for SVOCs, inorganic compounds, PCBs, pesticides and PFAS from the initial 100 cubic yards of material, only.
- <u>Materials from other sources</u>: Sample at a frequency based on the amount of material per the table below or at a frequency agreed upon with the NYSDEC.

Table E4: Recommended Sampling Frequency for Imported Materials Requiring Testing

Soil Quantity (cubic yards)	**VOCs** *(discrete samples)*	**SVOCs, Inorganics, PCBs Pesticides and PFAS** *(composite samples[1])*
0-50	1	1
50-100	2	1
100-200	3	1
200-300	4	1
300-400	4	2
400-500	4	2
500-800	6	2
800-1,000	7	2
>1,000	Add an additional 2 VOC and 1 composite for each additional 1,000 cubic yards or consult the NYSDEC.	

1. 3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

E-11 STORMWATER POLLUTION PREVENTION

Sewer covers and hay bale or similar devices installed as needed near the catch basins and other discharge points will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the sewer covers or similar devices are functional. All undercutting or erosion of any installed silt fence toe anchors shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. If required, additional measures will be installed to protect discharge points.

E-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes Target Analyte List (TAL) metals; Target Compound List (TCL) volatiles and semi-volatiles including 1,4-dioxane, and TCL pesticides and PCBs and per and polyfluoroalkyl substances (PFAS)), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

E-13 COMMUNITY AIR MONITORING PLAN

Air monitoring stations will be placed based on the prevailing wind conditions observed prior to the initiation of the significant excavation activities. These locations will be adjusted on a daily or more frequent basis based on the observed wind conditions at an upwind and at least 2 downwind monitoring stations. Exceedances of action levels listed in the CAMP provided in Appendix G will be reported to NYSDEC and NYSDOH Project Managers.

E-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events with off-site impact, and of any other complaints originating off-site about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site odor nuisances, as needed. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers as needed to mitigate odors; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances may include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

E-15 DUST CONTROL PLAN

Particulate monitoring will be conducted according to Section E-13. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the site suppression techniques listed below will be employed. The remedial party will also take measures to prevent dust production on the site.

A dust suppression plan that addresses dust management during significant invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water such as a truck for road wetting or appropriate sized water hose connected to a nearby potable water source (e.g. fire hydrant). The truck or hose system will be capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways as needed to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

E-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during significant site clearing and site grubbing, and during significant remedial work. A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX F – HEALTH AND SAFETY PLAN

PRE-TASK PLAN TEMPLATE

PART 1 - JOB SAFETY ANALYSIS

Version 6.1
Jan 2021

1.1 PROJECT / TASK DESCRIPTION

Company Name:	Job# / Name:
Prepared by:	Date:
Supervisor:	Contact #:
Proposed Start Date:	Proposed End Date:
Name(s) of supporting engineer or qualified person (if necessary):	
Project / Task Description:	

1.2 JOB SAFETY ANALYSIS OR STANDARDIZED WORK (ADD PAGES IF NECESSARY)

Instructions: If Standardized Work, Task Instruction Sheets, or Standard Pre Task Plan exist, attach it to this JSA or list below. Mark the Safety/Critical column for all those Steps that are Critical based on the requirements below. At a minimum consider the follow key information:

1. Identify the key steps, all associated hazards, the initial Hazard Potential and the required Safety Controls and Methods

2. Use this symbol for steps required the use of a Emergency Response Plan or Pre work task steps and post task/cleanup activities that may be hazardous

3. Use this symbol to identify the steps that must be completed to ensure the safety of the worker and equipment. For example if this step is NOT completed it would increase the risk of subsequent steps.

4. Use this symbol for steps that expose the worker to hazards that have the potential to cause a Fatality or Major Life Altering Injury and solely mitigated by administrative controls

Safety/Critical

5. Use the following **Hazard Potential** Categories to identify Potential Risk Level of each step. For definitions/examples of administrative or engineering controls click on the "SFMEA Instructions" tab. *(Buyer may require sketches, drawings etc. to accompany the Seller's JSA. See "Drawing Task BLANK Template" tab for a suggested format.)*

LOW RISK (L)	MEDIUM RISK (M)	HIGH RISK (H)
Hazards have the potential to cause minor and/or reversible injuries at the most. Administrative or Engineering controls are in place and properly functioning.	**Hazards have the potential to cause reversible or life altering injuries are mitigated solely by administrative controls, OR potential for a Fatality or Major Life Altering injuries mitigated by combined Engineering and Administrative Controls.**	**Hazards have the potential to cause a Fatality or Major Life Altering Injury, and are mitigated solely by administrative controls.**

	Safety / Critical	KEY STEPS IN THE TASK	HAZARDS	Hazard Potential	SAFE METHOD/CONTROL
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

- REMINDER: For <u>Non-Construction tasks</u> IF the highest "Hazard Potential" is Medium (M) Risk, then Safety FMEA - Section 2.2 is NOT Required
- Any tasks that involve GM Risk Mitigations, listed in Question 2 - Section 2.5, requires the Seller to complete **Page 3 - Planning Questions**

PRE-TASK PLAN TEMPLATE

PART 2 - Risk Assessment/SAFETY FMEA

Version 6.1
Jan 2021

2.1 PROJECT / TASK DESCRIPTION

Company Name:	Job# / Name:
Prepared by:	Date:
Supervisor:	Contact #:
Proposed Start Date:	Proposed End Date:
Name(s) of supporting engineer or qualified person (if necessary):	
Project / Task Description:	

2.2 RISK ASSESSMENT / SAFETY FMEA (Failure Modes and Effects Analysis)

Instructions: Complete a Risk Assessment/Safety FMEA FROM THE HAZARDS LISTED FROM PART 1.2 (JSA) WITH THE SAFETY/CRITICAL IDENTIFIER (UNLESS THE HIGHEST "HAZARD POTENTIAL" IS "MEDIUM (M)" RISK AND A NON-CONSTRUCTION TASK)

Determine the risk score based on the "SFMEA Instructions" page for Severity Potential, Probability of Occurrence, Frequency of Exposure and # of People Exposed.

Complete the Minimum Actions found on the *MINIMUM ACTION SUMMARY* based on the activity with the Highest Risk Score for this task.

Risk Assessment/SAFETY FMEA CALCULATION

RISK = **S** (Severity Potential Score) X **P** (Probability Score) X **F** (Frequency of Exposure Score) X **N** (# of People Exposed Score)

S - SEVERITY POTENTIAL		P - PROBABILTY		F - FREQUENCY OF EXPOSURE TO THE HAZARD		N - NUMBER OF PERSONS AT RISK	
15	Fatality	15	Certain (No Controls in place)	5	Constantly throughout the task	12	More than 50 persons
10	Critical Life Altering Injury	8	Possible (Administrative Controls Only)	4	Intermittent or more than once	8	16 - 50 persons
6	Major Life Altering Injury	2	Unlikely (Engineering Controls in place)	2.5	Only 1 time during the task	4	8 - 15 persons
4	Life Altering Injury					2	3 - 7 persons
2	Reversible Injury					1	1 - 2 persons
1	Minor Reversible						

Hazard (I.e. Shock, Electrocution, Falling, Slips, Cut, Fume Inhalation, Crushed, Entangled etc.)	**S** Score	**P** Score	**F** Score	**N** Score	**RISK** Score
HIGHEST RISK SCORE					

2.3 MINIMUM ACTION SUMMARY - BASED ON HIGHEST RISK SCORE FROM ABOVE

SCORE	RISK	MINIMUM ACTION SUMMARY (the following must be maintained for the risk level)
0- 50	LOW	1. When available follow Work Instructions/Standardized Work 2. Workers received Orientation Training 3. Management of Change Process in place if changes occur
51 - 160	MEDIUM	1. Follow the Job Safety Analysis /Work Instructions/ Standardized Work 2. Conduct a Start of Shift Meeting 3. Review Emergency Response or Rescue plan 4. Follow applicable Risk Mitigation Requirements 5. Follow requirements to perform Safety Tours and Safety Critical Equipment Inspections 6. All Worker(s) Participate in the Worker Engagement (Part 3) During Each Shift 7. Complete Planning Questions (page 3) 8. Signatures of Review: Seller Supervisor, Seller Safety and Prime Seller Representative, and Buyer
161- 500	HIGH	1. All requirements of Low & Medium and a Secondary signature in Part 2 - Signature Page
>500	UNACCEPTABLE	1. Seller cannot proceed. 2. Reduce risk below 500 prior by applying alternate safety controls. 3. Conduct a follow-up Risk Assessment/S-FMEA calculation follow the action summary

PART 2 - Planning Questions

2.4 PROJECT / TASK DESCRIPTION

Company Name:	Job# / Name:
Prepared by:	Date:
Supervisor:	Contact #:
Proposed Start Date:	Proposed End Date:
Name(s) of supporting engineer or qualified person (if necessary):	
Project / Task Description:	

HIGHEST RISK SCORE (FROM PART 2 S-FMEA)

2.5 MEDIUM / HIGH RISK TASK PLANNING QUESTIONS

Question	Answer (Yes/No)	If "YES" add
1. Are there work instructions, previous JSAs or standardized work for this activity that include a way to eliminate, substitute, or to use engineering controls to restrict exposure to the hazards?	Yes or No	

2. Are there any applicable GM Risk Mitigation Requirements included in GM's Safety Manual or GM's Special Safety Conditions for this activity? (Check those that are applicable below. NOTE: when the **"Risk Mitigation"** is marked with a (*) and highlighted in yellow, this is a reminder that per the Risk Mitigation requirements, an additional plan is required along with the PTP).

	Use of Aerial Lift	*	Hazardous and Toxic Substances (e.g. asbestos, lead, silica, fume exposure etc.)
	Barricading, Perimeter and Opening Protection	*	Material Delivery, Unloading, Storage and Stacking
*	Blasting	*	Cranes
*	Chemical Control (use of Chemicals)		Mold Remediation
*	Concrete Work & Masonry		Use of Powered Industrial Vehicles
*	Working in a Confined Space	*	Rigging and Lifting Operations
*	Demolition (of Utilities, Walls, Framing, Floors etc.)		Roof Access
	Use of Drones	*	Roofing Repairs & Replacement
*	Electrical Cable Pulling		Use of Scaffolding
	Electrical Safety, Electrical Equipment Installation, Service	*	Steel Erection
	Use of Employee's in Training / Apprentices		Welding / Hot Work
*	Excavation and Trenching		Working Alone in Isolated Areas
*	Fall Hazard Control - Working at Heights		Working in a falling objects area
	Lockout Energy Control		Work over tanks with the risk of drowning
*	Helicopter Lifts		Other:

3. Are there any GM Safety Specifications included in the contract or Scope of Requirements related to the work to be performed (i.e. Electrical Equipment Specification No. 5E Section 8.0, Buyer's EL-1, Buyers Anchor Points for PFAS etc.)	Yes or No	
4. Does this work require assistance or support from an engineer, professional engineer, or safety professional?	Yes or No	
5. Is there a need for engineering drawings, rigging calculations, anchorage point calculations, assessment of critical equipment, licenses/certifications, Safety Data Sheets (SDS) or other supportive documentation to be attached to this JSA?	Yes or No	
6. For any critical equipment or personal protective equipment used, have you verified that required preventive maintenance has been completed? If pre-use or pre-operational inspection is required, is it a part of the work instructions?	Yes or No	
7. Does this activity require a permit (e.g. confined space entry, roof access, hot work, etc.)?	Yes or No	
8. For work involving lockout energy, have you considered all energy sources and the safe method of control/verification?	Yes or No	
9. For work involving specialized training, have the assigned workers received the required specialized training?	Yes or No	
10. Does the task involve the use of a Powered Industrial Vehicle? If YES, have you validated that the vehicle has been inspected (maintenance records) in the past year for all Safety Equipment (brakes, lights, horn, siren etc.)? Does the JSA include mitigation if working or parked on an incline?	Yes or No	

2.6 PLANNING ACTION SUMMARY

Instructions: Based on the task planning questions above, list additional documentation or actions necessary to complete prior to the start of the job.

#	Action	Responsible	Date Completed
1			
2			
3			

Directions: If requested from 1.2 JOB SAFETY ANALYSIS OR STANDARDIZED WORK instruction step #5 in the PART 1 JSA, Items 1-4 on this page must be filled out by the PRIME SELLER. Explanations for guidance in blue text boxes on what is expected to be entered in each step. There are four steps on this page to complete.

Name and Number of Task from "Part 1 JSA"

1

Life Safety Items/Hazards/Equipment Use

2

Plan View of Work Area

3

Task Specific Drawing

4

2.7 SELLER APPROVAL AND BUYER REVIEW **Job# / Name:**

Project / Task Description:

HIGHEST RISK SCORE (FROM PART 2 S-FMEA)

RISK LEVEL	SELLER APPROVAL — ROLE	SELLER APPROVAL — SIGNATURE BLOCK	BUYER REVIEW
Low Risk (Score ≤50)	**Seller Worker(s) - Review Buyers Visitor Safety Protocol Video/Requirements**		**None Required**
Medium Risk (Score 51 - 160)	1. Seller Supervisor / Subcontractor Supervisor: 2. Prime Seller Representative: 3. Seller Safety Representative:	SIGNATURE: DATE: 1. ________ ________ 2. ________ ________ 3. ________ ________	1st Buyer person to review: Name: ________ ________ Date: ________
	Note: Low Risk & Medium Risk Section must be completed.		
High Risk (Score 161 - 500)	4. Prime Seller Senior Leader on Site:	4. ________ ________	2nd Buyer person to review: Name: ________ Date: ________
	Note: Low, Medium Risk and High Sections must be completed.		

***BUYER REVIEW:* Buyer Representatives authorized to review Job Safety Analysis (JSA) include Buyer Contract/Project Manager, Field Safety Resource, SCM Champion, a Global Workplace Safety Leader/Resources or anyone who has completed the PTP reviewer training.**

Buyer Representative's review of Seller's JSA, or any safety measure proposed or implemented by the Seller, is intended for the sole and exclusive benefit of Buyer. Seller may not rely upon Buyer's review as constituting validation of the means, methods, techniques, procedures or equipment. Notwithstanding the review by Buyer, the Seller/Constructor remains in control over the health and safety of their workers, and for ensuring compliance with all legal obligations as Constructor.

2.8 WORKER TRAINING & COMMUNICATION

Instructions: Direct Seller Supervisor must review the Job Safety Analysis, at a minimum, at the following times:

1. During the Start of Shift Meeting
2 When the JSA changes
3. When new contractor workers are assigned to the work

NOTE: Standardized Work / Work Instructions must be reviewed Monthly with the Worker

PART 3 - DAILY WORKER SAFETY ENGAGEMENT

3.1 PROJECT / TASK DESCRIPTION AND EMERGENCY RESPONSE

Company:________________ **Date:**______________

Job # / Name:________________________________

Frontline Supervisor:

Overall task Risk SCORE From S-FMEA:

Specific Task Location (Ex. Column/Bay #, Building)

Task Description:

EMERGENCY ACTION PLAN

Onsite Emergency Contact Number:___________________________________

DO NOT HANG UP UNTIL TOLD TO DO SO! Be prepared to give: YOUR NAME, LOCATION (building name, column #, address, etc.), and TYPE OF EMERGENCY.

Also contact the following:____

1. Is a rescue plan necessary (e.g. working at heights rescue, confined space, chemical spill, etc.)? **YES / NO**

IF YES, is it attached to this document? **YES / NO**

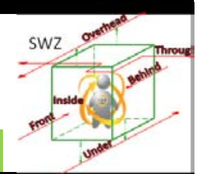
2. Is any Life Safety / Critical Equipment Necessary to perform the rescue? Is it available and inspected accordingly? **YES / NO**

3.2 CREW MEMBER VERIFICATION

Y	**N**	**1. Have all crew members completed Safety Orientation, Management of Change and any other site-specific training or access requirements?**
Y	**N**	**2. Is the Job Safety Analysis (JSA) or standardized work included with this form and was it reviewed by all crew members?**
Y	**N**	**3. Does the JSA or standardized work reviewed cover the task you are being asked to perform?**
Y	**N**	**4. Do all workers have their current year GM Orientation Sticker/Card and are Apprentice identifications clear and visible?**

3.3 DAILY HAZARD IDENTIFICATION AT THE JOB/TASK LOCATION

ON A DAILY BASIS, before the start of the activity and at the location of the job, all workers need to perform TAKE 2 FOR SAFETY to Identify Hazards specific to the work location the day of the task and act upon them. Use the questions below, and the diagram to the right as a guide to ensure all areas around the work location are evaluated for additional hazards or energy sources found that could potentially Feed Into, Back-Feed Into, Run Overhead, Run Underneath, Run Through, or Be Inside of the SWZ before beginning the task.



TAKE "2" FOR SAFETY

IF ANY QUESTION 1 - 6 ARE ANSWERED "YES"- REFER TO SECTION 3.5 AND 3.6

Y	N	1. New Slip or Trip Hazard?
Y	N	2. Additional/Other Workers in the Area?
Y	N	3. Additional PPE required and Available? (Ex. Full-Face Shield, Respirator, Goggles, Ear Plugs, Seat Belts etc..)
Y	N	4. Additional Barricades/ Safety Tape Needed?
Y	N	5. Additional Production Vehicle Activity?
Y	N	6. Has anything changed since the last shift / time the crew performed this task?

IF ANY QUESTION 7 - 16 IS ANSWERED "YES" - STOP! THE MITIGATION MUST BE ACCEPTED BY YOUR LEADERSHIP AND GM / BUYER. REFER TO SECTION 3.5 AND 3.6

Y	N	7. Additional Hazardous Motion?
Y	N	8. Additional Lockout Required?
Y	N	9. New Pinch Points or Laceration Hazard?
Y	N	10. New Fall Hazard?
Y	N	11. New Fire/Explosion Hazard?
Y	N	12. New Mobile Equipment Hazard?
Y	N	13. Additional Rigging Hazard?
Y	N	14. New Hazardous Materials/Chemicals?
Y	N	15. Working in Isolation (working alone in a remote location)?
Y	N	16. Additional Permits/Interruption Requests Needed? **(Ex. Hot Work, Confined Space Entry, Roof Access)**

3.4 MANAGEMENT OF CHANGE (TASK CREEP PREVENTION)

Contact your Supervisor if the change;
- Requires a deviation from the JSA
- Defeats any safety devices (electronically or physically)
- Creates or exposes new hazards to people, property or process

Before starting activities, describe in the section 3.5 (below) any new steps required to address changes, identify the new hazards and control measures.

Supervisors MUST review these steps with WORKERS and initial the SECTION 3.6.

3.5 MOC VALIDATION / SAFETY ANALYSIS FROM ADDITIONAL HAZARDS IDENTIFIED

STEPS IN THE TASK	HAZARDS	ELIMINATION / CONTROL MEASURES

3.6 SUPERVISOR INITALS

Supervisor initials of the Mitigation method utilized above:	
Supervisor initials that GM / BUYER has been notified of the change above (required for YES questions 7-16) :	

3.7 WORKER SIGNATURE BLOCK - All workers must acknowledge review of JSA/standardized work before beginning the task, and initial post task.

Printed Name:	Signature	Post-Task Initials	
			Upon completion of the task and initializing this form, I confirm to the best of my knowledge that all tasks were performed according to the JSA or standardized work and this review sheet, and that there was no injury or incident during the completion of this task that was not reported to my supervisor.

3.8 DEBRIEF - Contractor worker(s) (with the assistance of the Direct Contractor Supervisor) must answer the following questions after the work has been completed

Questions	Answer		Action(s) / Comments
During the task, did you or the team have to deviate from the JSA or was a new hazard identified requiring the use of the MOC process? Does the JSA or standardized work need to be updated?	Y	N	
Did any incidents, Serious Injuries or Fatalities (SIF) occur?	Y	N	
Are all of the tools/equipment used, debris, trash, etc. cleaned up and stored properly? Have all permits been closed or called off as required and all lockout locks been removed?	Y	N	
Are there any lessons learned to be shared at the next Start of Shift meeting?	Y	N	

3.9 FRONT LINE SUPERVISOR REVIEW:

Signature:_______________________________ **Date:**___________________________________ **Time:**_____________________________

Review & Signature *__at end of task__* by the Frontline Supervisor indicates thorough completion of this document by all crew members.

GENERAL NOTES AND COMMENTS

Risk Assessment/SAFETY FMEA Instructions

(S) - SEVERITY POTENTIAL - [WITHOUT Controls in Place]

SCORE	CATEGORY	DESCRIPTION (JUSTIFICATION OF SCORE)
15	**Fatality**	**Death of one or more people**
10	**Critical Life Altering Injury**	Loss of two limbs/eyes, both hands, both feet, Paralysis, or serious permanent illness (permanent loss of respiratory function, above mild hearing loss, non terminal disease). Full thickness/third degree burn of > 9% of body. Any injury requiring greater than a week-long hospitalization.
6	**Major Life Altering Injury**	Loss of one limb/eye, a hand, a foot. Partial thickness/second degree burn of >9% of body. Any injury requiring 2-7 days in the hospital.
4	**Life Altering Injury**	Loss of digits (fingers/toes), break of major bone (e.g. skull, arm, back, pelvis, leg, rib) or minor permanent illness (e.g. mild hearing loss). Full thickness/third degree burn of <9% of body. Any injury requiring a hospital overnight stay.
2	**Reversible Injury**	Break of minor bone (fingers, hand, toes, foot) or minor temporary illness (e.g. concussion, sprain or repetitive strain injury). Partial thickness burn 1% to 9% of body. No overnight hospitalization required.
1	**Minor Reversible**	Laceration or minor ill-health effect or Partial thickness/secondary degree burn <1% of body. First Aid only.

(P) - PROBABILITY OF OCCURRENCE - [Layers of Control in Place]

SCORE	CATEGORY	DESCRIPTION (JUSTIFICATION OF SCORE)
15	**CERTAIN**	**Typically risks in this category have NO or Minimum controls in place.** 80-to 100% chance an injury will occur due to the hazards. An injury will occur immediately when a person comes into contact with the hazard. A person is in the danger zone, or it is highly likely that an accident will happen, such as in the case of a mezzanine without handrails, or a live wire exposed in an occupied area.
8	**POSSIBLE**	Typically risks in this category are **mitigated solely with administrative controls** such as standardized work, pre task plans, warning signs, or PPE. The injury will occur if a single person fails to follow directions or follow procedures. 5 to 80% chance an injury will occur due to the hazards. An injury may happen if additional factors precipitate it, but it is unlikely to happen without them. In the presence of the hazard, an additional factor such as vibration, wind, or human carelessness will cause the injury. An incident occurs if a single person fails to follow directions or procedures.
2	**UNLIKELY**	Typically risks in this category are **mitigated by engineering controls <u>and</u> administrative controls.** The application of engineering controls reduces the probability of an injury (2 - Unlikely). **There are special instances where a combination of continuous Administrative controls** (i.e. standardized work, pre task plans, training, warning signs, PPE etc.) **can bring probability to unlikely. For this to occur, continuous monitoring is applied that relies on more than one worker (ground person / spotter) or there is a checking processes in place during the task (Safety Observation Tour / layered audit).** Multiple people would need to fail to follow directions or follow procedures. For example a person is in an aerial platform without being tied off and the spotter does not remind the worker to use fall protection. 1 to 5% chance an injury will occur due to the hazards.
Engineering Controls Definition		Strategies designed to protect workers from hazardous conditions by placing a barrier between the worker and the hazard Engineering controls involve a physical change to the workplace itself, rather than relying on workers' behavior or requiring workers to wear protective clothing.
Administrative Controls Definition		PPE (Personal Protective Equipment), Trainings and Procedures, Warnings (visual and/or audible)

(F) - FREQUENCY OF EXPOSURE TO THE HAZARD [DURING the Task, not the Shift]

SCORE	CATEGORY
5	**Constantly** [exposed to the hazard throughout the task]
4	**Intermittently** [more than once, exposed to the hazard throughout the task]
2.5	**One time only** [exposed to the hazard once during the task]

(N) - NUMBER OF PERSONS AT RISK

SCORE	CATEGORY
12	MORE THAN 50 PEOPLE
8	16 TO 50
4	8 TO 15
2	3 TO 7
1	1 TO 2

Note: Only values listed above can be used for SFMEA calculations

(Seller Company Name) has a Management of Change (MOC) Program for changes, modifications or deviations for work processes that identify new hazards. Identified hazards will be mitigated prior to adopting the change. At a minimum, the MOC Process applies to the following:

- Changes to Personnel – Transfer, New or Replacement
- New or modified equipment and tools
- Processes and work methodology (e.g. pre-task plans or standardized work)
- Use of new chemical materials
- Regulations
- Management of Change Review Individual/Team
- Use of MOC Change Checklist
- Training Requirements
- Program Evaluation

(Seller Company Name) MOC process validates that all new risks introduced by the change are identified, assessed and have mitigation actions implemented to eliminate or reduce the risks. Mitigations include elimination, substitution, engineering controls, administrative controls, Safe Operating Practices (SOP) and Standardized Work. Changes or mitigations that impact compliance to regulatory requirements will require a review by a GM Representative.

(Seller Company Name) will require all employees to complete a Hazard Assessment / Worker Engagement Form at the location of the task prior to starting the task. If the employees notes any of the following additional hazards both (Seller Company Name) Supervisor and a **GM / Buyers Representative must be notified prior to the change and proposed mitigation prior to starting task:**

Additional Hazardous Motion | **Additional Lockout Required** | **New Pinch Points or Laceration Hazard** | **New Fall Hazard**
New Fire/Explosion Hazard | **New Mobile Equipment Hazard** | **Additional Rigging Hazard** | **New Hazardous Materials/Chemicals**
Working in Isolation (working alone in a remote location) or in Confined Space | **Additional Permits/Interruption Requests Needed (Ex. Hot Work, Confined Space Entry, Roof Access)**

In addition, if the change will cause a deviation from GM's design or contract specifications work will STOP and the change will be reviewed by a GM Representative before proceeding. Acceptance signature's will be obtained by a (Seller Company Name) Representative and GM Representative using the template below. (Seller Company Name) will Control this Document based on the requirements listed in the Special Safety Conditions or the GM Safety Manual.

MOC

MOC Change Acceptance Form

Risk 360° Look for hazards above, below, beside, in front and behind.

Site: ______________________ **Contact Number:** ______________________

Reference #: ______________________

Initiated By: ______________________ **Date Initiated:** ______________________

Description of Change (Include Attachments As Necessary):

MOC 1 + 3 Approach		Yes	No	Guidance
-	Will the change cause a deviation from GM's design or contract specifications			IF YES, STOP! **Notify the GM Contract Manager, obtain acceptance and signatures using this form prior to proceeding with the change**

(Seller Company Name) Signature______________________ Name (Print:)______________________ Date Accepted:______________________

Buyer Representative Signature______________________ Name (Print:)______________________ Date Accepted:______________________

Click Button to reference additional safety contractual requirements (Risk Mitigation Requirements)

	Risk Mitigation Requirements	Yes	No	Applicable Safety Condition Requirement (GM Safety Manual)	Applicable Safety Condition Requirement (Special Safety Conditions)	Define Risk or Hazard	Mitigation plan	Due Date	Mitigation Validated (initial)

APPENDIX G – COMMUNITY AIR MONITORING PLAN

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all <u>ground intrusive</u> activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during <u>non-intrusive</u> activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

<u>VOC Monitoring, Response Levels, and Actions</u>

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. 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 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

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

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

P:\Bureau\Common\CommunityAirMonitoringPlan (CAMP)\GCAMPR1.DOC

APPENDIX H – O&M MANUAL (FOR EACH ACTIVE EC)

SUBJECT: **Treatment of Groundwater for PCBs**

PURPOSE & SCOPE: To provide instructions for the treatment of groundwater contaminated with PCBs at Rochester Operations.

FUNCTIONAL AREA: Wastewater Treatment

ASSOCIATED ASPECTS: See 6.0 Planning chart, Significant Aspects section.

DEFINITIONS: PCBs - Polychlorinated Biphenyls
Perox UV/H_2O_2 Treatment Unit - a groundwater treatment system that uses ultra-violet light and hydrogen peroxide to destroy groundwater contaminants.

RESPONSIBILITY / INSTRUCTIONS:

Under the direction of the Env. GL, the Env. Techs are responsible for treating groundwater contaminated with PCBs using a two-step treatment process. A third step is also available, and is described here for reference, but is not currently in use.

1. PCB-contaminated groundwater containing free oil is first pumped to the PCB oil/water separator.
   A) The separated oil is collected in a drum for disposal at a permitted PCB incinerator.
   B) The water flows into the transfer sump and is pumped to the second step in the treatment process.
   C) The oil/water separator is cleaned at least annually to remove floating sludge and settled solids.

2. The water discharge from the PCB oil/water separator, along with groundwater pumped from the bottom of the wastewater treatment building foundation sump, is pumped through filters to remove solids.
   A) The filter bags are changed at a frequency determined by experience and filter pressure gauge readings using EMS-WW-11 Changing PCB Filter Bags, followed by EMS-WW-19 Backwashing the GAC Vessel.
   B) Dirty filter bags are placed in drums for disposal at a permitted PCB incinerator.
   C) Filtered water goes through a carbon filter, and directly discharged to the combined sewer.

3. The third treatment step, not currently in use, would be used if the PCB filters were not able to remove sufficient organics from the effluent. The effluent would be held in Day tank #2 for batch analysis. If the PCB and VOC concentrations are below permit limits, the water is discharged. If concentrations are above permit limits, the water is treated through the Perox UV/H_2O_2 Treatment Unit.
   A) The Perox Unit is operated and maintained according to the manufacturer's instructions.
   B) Treated water is discharged to the municipal sewer.
   C) The discharge is sampled monthly for compliance with permit conditions.

KEY CHARACTERISTICS TO MONITOR AND MEASURE; FREQUENCY:

Key Characteristics	Monitoring & Measuring Frequency
PCB levels in discharge	Monthly

MONITORING EQUIPMENT / CALIBRATION: Outside Laboratory Analysis, Laboratory Quality Control/Quality Assurance

RECORDS: Analysis Reports

REFERENCES: ISO 14001:2015 Standard - Section 8.1 Operational Planning and Control
EMS-WW-11 Changing PCB Filter Bags
EMS-WW-19 Backwashing the GAC Vessel

Erik Anderson (Signature on File)	Gail Finkelstein (Signature on File)
ORIGINATOR	DEPARTMENTAL APPROVAL

SUBJECT: **Changing PCB Filter Bags**

PURPOSE & SCOPE: To provide instructions for changing filter bags on the PCB filters at the Wastewater Treatment Area at Rochester Operations.

FUNCTIONAL AREA: Wastewater Treatment

ASSOCIATED ASPECTS: See 6.0 Planning chart, Significant Aspect section

DEFINITIONS: PCBs - Polychlorinated Biphenyls
psi – Pounds per square inch

RESPONSIBILITY / INSTRUCTIONS:

PCB filter bags are an integral part of the PCB treatment process, described in EMS-WW-10 Treatment of Groundwater for PCBs.

Under the direction of the Env. GL, the Env. Techs are responsible for:

a. Monitoring the PCB filters to make sure they are running properly,

b. Notifying the Env. GL when there is resistance in the filters to indicate need of a filter bag change,
    a. Filter bags must be changed when the difference between inlet and outlet pressure gauges exceeds 15 psi while one of the feed pumps is running. (For example if the inlet gauge reads 30 psi and the outlet gauge reads 15 psi, it's time to change the bags.

    The Env. GL schedules the contractor, and notifies the Env. Techs, so that they know when to start the draining process.

c. Starting the process to drain the filters, in preparation of filter bag change.
    a. Shut off pumps feeding the filter: Turn the main POWER switch (top switch) at the PCB Separator Control Panel to OFF; turn the switch in the Foundation Sump Pump Control Panel to OFF. Place "DO NOT RESTART" magnetic signs across the front of both panels.
    b. Close the two main 3" valves for the filter system, Valves # 73 and # 74
    c. Open the 1" drain valves on each filter OUTLET pipe, Valves # 82 and # 84.
    d. Open the vent ball valve on the top of each filter (Valves # 71 and # 72) to allow air to enter the filters.
    e. Allow at least 4 hours for the filter bags to drain.
    f. Close vent ball valves on the top of each filter (Valves # 71 and # 72). Attach low pressure air hoses to each filter housing and open air valves. Allow air to blow through filters for approximately 2 hours. Then shut off air and remove hoses.

d. Recording the filter bag change in EMS-WW-1F2 AWTA Operations Log.

Contractor Responsibility – Changing Filter Bags
Filter bags are changed by an outside contractor with experience to deal with PCBs
.
1. Open the filter housings. (Lift and swing down safety valve handle; open cover clamp, lifting "T" handle of safety stop to allow full movement of clamp handle.)
2. Raise the filter bag hold-down assembly.
3. Remove dirty bags and place in a PCB drum for disposal. It may be easier to lift the filter basket out of the filter and then remove the bag from the basket. Turning the top of the bag while keeping the basket stationary will help break the adhesion between bag and basket.
4. Carefully insert new bags into mesh baskets. (Slightly folding the bags lengthwise will make insertion easier.)

5. Use the PVC ram to gently push the bag as far into the basket as possible.
6. Press ring at the open end of the filter bag into the seat on the filter retaining plate.
7. When all bags have been replaced, lower the filter bag hold-down assembly.
8. Close the filter lid, lifting the safety stop to allow complete closure.
9. Close the pressure relief valve on the front of the filters and open the vent valves on top of the filters.
10. Close the two drain valves, Valves # 82 and # 84.
11. Open the two main valves for the filter system, Valves # 73 and # 74.
12. Turn on pumps feeding the filter: Turn the main POWER switch at the PCB Separator Control Panel to ON; turn the switch in the Foundation Sump Pump Control Panel to AUTO. Stick " DO NOT RESTART" signs to the bottom side pf the control panels.
13. After all the air is vented from the filter, close the vent ball valves, # 71 and # 72.
14. Check for leaks around the cover O-ring seal.
15. The Changing of Filters is recorded on the AWTA Operations Log (EMS-WW-1F2)

KEY CHARACTERISTICS TO MONITOR AND MEASURE; FREQUENCY:

Key Characteristics	**Monitoring & Measuring Frequency**
Proper changing of filter bags	As required, based on time or differential pressure

MONITORING EQUIPMENT / CALIBRATION: Visual

RECORDS: EMS-WW-1F2 AWTA Operations Log

REFERENCES: ISO 14001:2015 Standard - Section 8.1 Operational Planning and Control
EMS-WW-1 Wastewater Treatment General Operations
EMS-WW-10 Treatment of Groundwater for PCBs
EMS-WW-19 Backwashing the GAC Vessel

ORIGINATOR	DEPARTMENTAL APPROVAL
Erik Anderson (Signature on File)	Gail Finkelstein (Signature on File)

SUBJECT: **Backwashing the GAC Vessel**

PURPOSE & SCOPE: To provide instructions for changing filter bags on the PCB filters at the Wastewater Treatment Area at Rochester Operations.

FUNCTIONAL AREA: Wastewater Treatment

ASSOCIATED ASPECTS: See 6.0 Planning chart, Significant Aspect section

DEFINITIONS:
GAC – granular activated carbon
PCBs - Polychlorinated Biphenyls
psi – Pounds per square inch

RESPONSIBILITY / INSTRUCTIONS:

PCB filter bags are an integral part of the PCB treatment process, described in EMS-WW-10 Treatment of Groundwater for PCBs.

Under the general direction of the Env. GL, the contractor, who has just changed the PCB filters, is responsible for backwashing the carbon.

The step-by-step process, developed by the contractor, is attached to this cover sheet.

KEY CHARACTERISTICS TO MONITOR AND MEASURE; FREQUENCY:

Key Characteristics	Monitoring & Measuring Frequency
Proper backwashing of carbon	As required; normally performed whenever PCB filter bags are changed.

MONITORING EQUIPMENT / CALIBRATION: Visual

RECORDS: EMS-WW-1F2 AWTA Operations Log

REFERENCES: ISO 14001:2015 Standard - Section 8.1 Operational Planning and Control
EMS-WW-1 Wastewater Treatment General Operations
EMS-WW-10 Treatment of Groundwater for PCBs
EMS-WW-11 Changing PCB Filter Bags

Erik Anderson (Signature on File)	Gail Finkelstein (Signature on File)
ORIGINATOR	DEPARTMENTAL APPROVAL

Introduction:

The following summarizes the proper process for performing the granular activated carbon (GAC) vessel backwash maintenance procedure for Additional Wastewater Treatment Area (AWTA) at the General Motors Components Holding LLC, Lexington Avenue facility. It is anticipated that this process will be performed when the pressure at the vessel inlet exceeds 35 pounds per square inch (psi) and should be completed with two personnel.

Personal Protective Equipment (PPE)

- Safety Glasses
- Chemical Resistant Steel-toed boots
- Durable Safety Gloves

Equipment

- 250 Gallon Portable Tote (Provided by GM)
- Fork Truck (Provided by GM)
- Discharge Sump Pump For transfer from tote to PCB Separator

Timing for Maintenance Procedure

A backwash of the GAC vessel is required when solids and sediment have built up in the carbon media to the point where the differential pressure over the carbon vessel increases, and flow is restricted. These processes are interconnected and as pressure increases flow will decrease. Eventually, the pressure will build up to a point where the flow will decrease until it is less than the normal operating influent flow rate (30-60 gallons per minute (gpm)). The Inlet pressure of the GAC vessel typically operates at or below 10 psi. Pressure in the 25-30 psi range will typically impede normal operating flow. When pressure meets or exceeds a range of 35 psi, a backwash will be required.

Backwash process

The process uses the water from the system to backwash the GAC vessel. Figures 1 – 4 provide visuals for the process.

The procedure for backwashing the carbon vessel is as follows.

(1) Ensure that all pumps are turned off (Figure 1). Pumps to deactivate include:

(a) Building Foundation pump
(b) PCB Separator (P-100) Transfer Pump
(c) **GR-1 and GR-2 Trench pumps (Only if line is actively directed through GAC)

(2) Go to the GAC manifold (Figure 2). Ensure Valving is in proper position for forward flow. Valves V200 – V203 should be in the open (horizontal) position. V204 - V205 should be in the closed (horizontal) position.

(3) Switch V201 and V203 to the closed (vertical) position and open V204 and V205 to the open (vertical) position (Figure 3). This performs the following functionality:

(a) Brings the influent flow to the bottom of the vessel, rather than the top of the vessel, as it is in normal operation; and
(b) Diverts the discharge of the carbon vessel through V205 that discharges to the portable tote.

(4) Activate Pumps that were turned off in step 1 to bring flow through the GAC.

(5) Operate the system in backwash mode until the portable tank has been filled (approximately 220 gallons). During the backwash, monitor the discharge pressure at the carbon vessel inlet pressure gauge (PG-200) and discharge pressure gauge (PG-201). The inlet pressure should drop and eventually get to below ten (10) psi. At this point, the carbon vessel has been flushed of the solids build-up.

(6) Deactivate Power for the pumps flowing through the GAC vessel.

(7) Go to the carbon vessel manifold and return the valves to the horizontal position for normal operating flow (as shown in figure 2). V200-V203 should be open and V204-V205 should be closed.

(8) Activate power to the pumps through the system. Monitor the GAC vessel inlet pressure at PG-200.

(9) Open the air relief valve on the top of the GAC vessel to allow any air in the system to exhaust (Figure 4). Close the valve after air has been released. The system is now returned to normal operation. Remain with the system to ensure that discharge pressure is less than 10 psi.

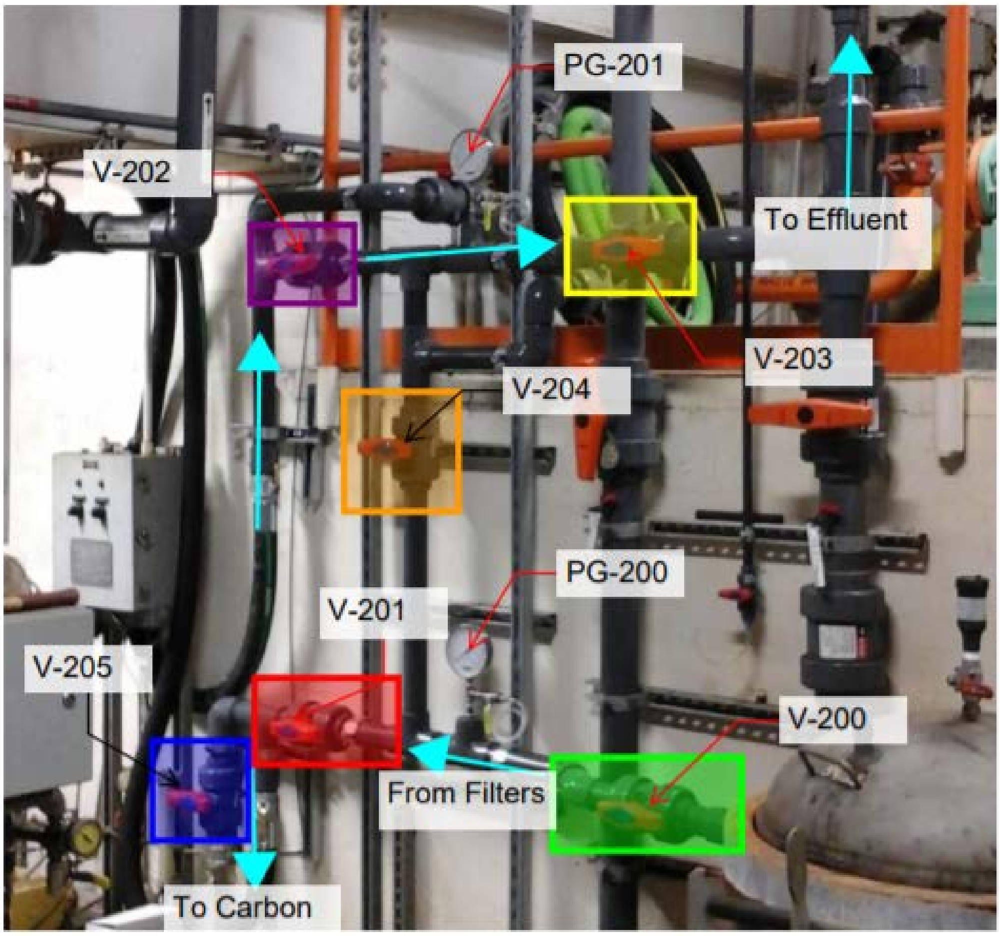
(10) After backwash is complete, the portable tote should be moved by a GM fork truck operator to the area near the T-100 PCB separator.

(11) Discharge the backwash return water in the portable tote to the T-100 PCB Separator using a submersible pump to transfer the water at less than 10 gpm. The backwash water will be recycled through the system.

List of Figures:

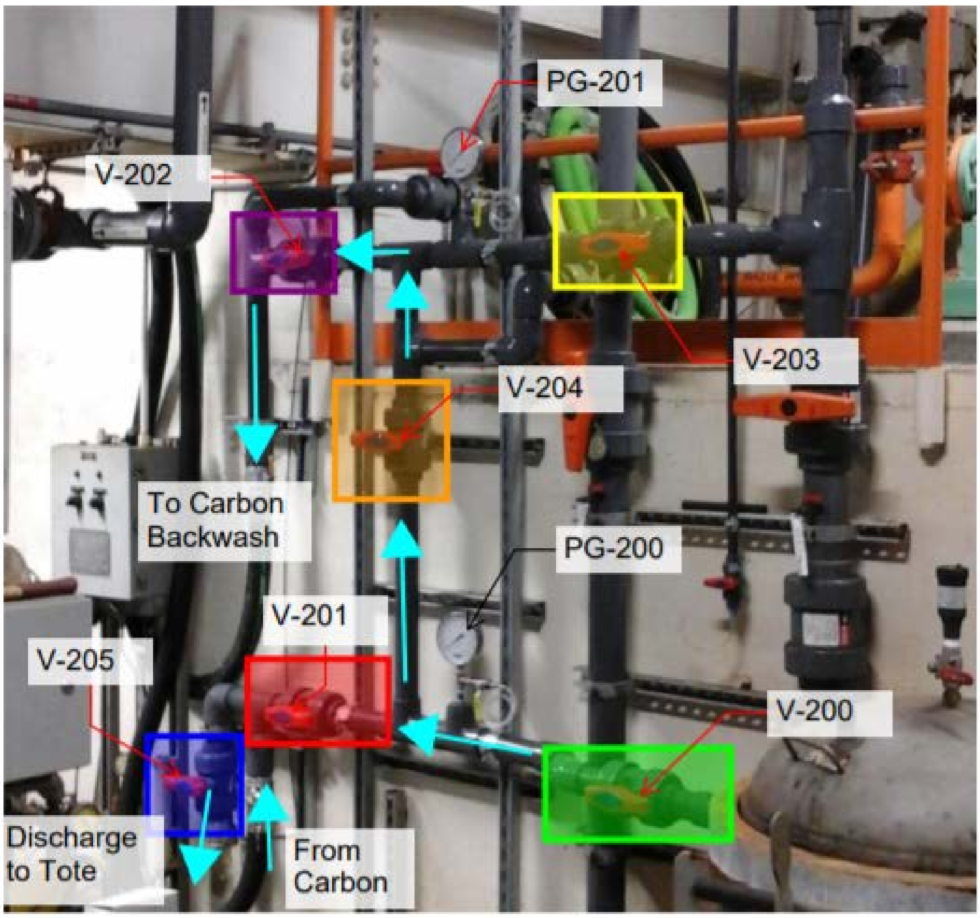
Figure 1 – System Pump (P-100)

Figure 2 – Normal Operating Flow



Flow Direction : Light Blue
V-200 : Green - **Open**
V-201: **Red** - **Open**
V-202: **Purple** - **Open**
V-203: **Yellow** - **Open**
V-204: **Orange** - **Closed**
V-205: **Blue** - **Closed**
PG-200: Inlet Pressure Gauge
PG-201: Discharge Pressure Gauge

Figure 3 – Backwash Flow



Flow Direction : Light Blue
V-200 : Green - **Open**
V-201: **Red** - **Closed**
V-202: **Purple** - **Open**
V-203: **Yellow** - **Closed**
V-204: **Orange** - **Open**
V-205: **Blue** - **Open**
PG-200: Inlet Pressure Gauge
PG-201: Discharge Pressure Gauge

Figure 4 – GAC Vessel

1 System Overview

The Building 22 Light Non-Aqueous Phase Liquid (LNAPL) Recovery System is designed to recover groundwater and LNAPL impacted with polychlorinated biphenyl (PCBs) compounds present in the overburden and bedrock groundwater bearing units around Building 22 and the Additional Waste Treatment Area (AWTA) Wastewater Treatment Building.

The system consists of four main components:

- Pumps that recover groundwater and LNAPL from the Building foundation sump
- An oil/water separator (OWS) that collects the LNAPL (when present)
- Bag filters that remove solids with adsorbed PCBs from the groundwater
- And a 1000 lb Granulated Activated Carbon (GAC) vessel adsorber to remove PCBs dissolved in the groundwater

2 Main System Components

Following is a brief description of each main component of the Building 22 LNAPL RecoverySystem. More detailed information is provided as an attachment to this procedure.

2.1 Groundwater/LNAPL Pumping Systems

2.1.1 Foundation Sump Pumps

The pumping location is at the AWTA Wastewater Treatment Building foundation sump.This sump is located outside the north wall of the building. There are two pumps at this location.

2.1.1.1 Air Diaphragm Pump

An air diaphragm pump is installed on the north wall near the OWS in the AWTA Building. The suction line for this pump is placed at the top of the foundation sump and a wire mesh screen in the sump prevents debris from blocking the pump suction line. The air diaphragm pump will skim off the LNAPL present in the sump and directs the recovered LNAPL and groundwater directly to the OWS for separation and collection of the LNAPL. A HAND/OFF/AUTO switch ("Recovery Pump Valves") on the Control Panel located at the PCB Separator controls the solenoid valve. The solenoid valve is also under the control of a single float in the foundation sump. The float will start the pump when the water level rises and stop the pump when the water level drops sufficiently. The pump will also shut off if there is a high-level alarm in either the OWS or the drum that receives oil from the separator. There is also a manual air shut-off valve located at this pump. This pump delivers approximately 5 gallons per minute to the PCB Separator.

2.1.1.2 Electric Submersible Pump

An electric submersible pump is installed within the foundation sump. This pump is operated to maintain the groundwater level beneath the foundation of the AWTA building to prevent water infiltration into the basement. The pump is controlled by Low/Off, High/On, and High/Alarm floats. The discharge of the submersible pump is directed through the filter system and the GAC vessel, by-passing the PCB Separator. The Low/Off float is set sufficiently above the pump intake to prevent LNAPL from entering the pump suction. The capacity of this pump is approximately 50 gpm. The control panel for this pump (Foundation Sump Pump) is insidethe AWTA on the north wall, near the foundation sump.

2.2 Oil Water Separator (OWS)

The PCB Separator is located in the AWTA Basement. The mixture of LNAPL and recovered groundwater enters the OWS and through a submerged coalescing media pack that improves oil removal. Sludge settles in the "V" shaped sludge hopper, and LNAPL floats to the top and is skimmed off by an adjustable"half pipe" weir. The recovered LNAPL (when present) flows into a 55-gallon drum equipped with a high-level float switch. When the drum is full, the float switch will shut off the air diaphragm pump.

Treated groundwater flows over the OWS effluent weir into an effluent transfer sump. A 50-gpm centrifugal pump discharges the effluent through the filters and GAC vessel to the Northside Sanitary Sewer Discharge monitoring point where the total flow is recorded and samples are collected for analysis with monthly discharge monitoring and reporting to the Monroe County Division of Pure Waters.

2.3 Bag Filter System

The Bag Filter System consists of two filter housings each holding six filter bags. The filters are located in the AWTA basement. Groundwater from the outside foundation sump and the OWS is combined and pumped through the filters. Solids containing PCBs are removed by the filter bags, and the filtered water is directed through the GAC Vessel and then flows to the Northside Sanitary Sewer discharge monitoring point where the total flow is recorded and samples are collected for analysis with monthly discharge monitoring and reporting to the Monroe County Division of Pure Waters.

2.4 Granulated Activated Carbon (GAC) Vessel

The granulated activated carbon (GAC) vessel is located in the AWTA Basement and is connected to the filter bag system to remove dissolved phase PCBs remaining in the AWTA foundation sump pump and OWS combined effluent streams. The vessel contains 1000 pounds (lbs) of GAC that is periodically removed for regeneration and/or replacement with virgin material provided by an approved GM supplier.

3 SYSTEM OPERATION

The Building 22 LNAPL Recovery System generally operates continuously. Under normal conditions the manual ball valves are open and the pumps controlled at the control panel located on the OWS. Switches on the OWS Control Panel should be set as follows:

Power	ON
Recovery Pump Valves	AUTO
OM/ Pump	AUTO

To turn the system off, move the Power switch to the OFF position to off air to all three pumps. To re-start the system, turn the Power switch to the ON position to turn on the air to all three pumps. Verify that the air diaphragm pump for the AWTA foundation sump starts up. If this pump fails to start, try increasing the air pressure to the pump from the normal setting of 25 psi. After the pump starts, decrease the pressure to about 25 psi. The submersible sump pump in the foundation drain sump should normally operate in the AUTO mode under control of the level floats at all times. It should only be OFF for filter bagchanges, maintenance or to prevent unintended direct discharge. The control panel for the Foundation Sump Pump is mounted on the north wall of the AWTA basement, near the PCB Separator. If the pump fails or excessive water enters the foundation sump due to snowmelt or heavy rains, a High/Alarm float will activate a flashing red light on the control panel.

3.1 Routine Inspection

The operator should inspect the system to check for high level alarm for the oil collection drum, the separator effluent transfer sump, and the AWTA foundation sump. The bag filter pressure gauges should also be checked for pressure drop across the filter while one of the feed pumps is running.

If the Oil Drum High Level alarm light is lit, transfer the contents to an empty closed top drum using the drum pump located in the collection drum. The drum must be properly labeled with a PCB label and a Hazardous Waste label. Be sure to put the Fill Start Date on the drum. Reset the Oil Drum Alarm and the system will re-start.

If the separator Transfer Sump High Level alarm light is lit, check to be sure the transfer pump switch is in the AUTO position. If the switch is in the correct position but the pumpwill not run, call Maintenance.

If the AWTA Foundation Sump high level alarm is flashing, check the control panel to see if the switch is in the AUTO position and the green RUN light is lit. If the condition continues for more than one day, notify the GM Environmental Department.

If the bag filter inlet pressure gauge reads 10 psi higher than the outlet gauge when one of the pumps feeding the filter is running, change the filter bags following the procedure posted at the filters. An accumulation open-top drum is located adjacent to the Bag Filter System. Notify the GM Environmental Department when drum is full.

4 ROUTINE MAINTENANCE

4.1 Preventative Maintenance

Accumulated sludge is drained off the bottom of the OWS into a closed top drum. The tubing pump is used to remove floating sludge off the top of the separator. The pumps feeding the separator can be left on during this operation, as long as the AWTA foundation sump air diaphragm pump is discharging air into the separator because the air bubbles entering the separator will suspend particulates. Floating and settled sludge removed from the separator is placed in a properly labeled closed top drum. Contact GM Environmental Department for labels and drum storage instructions.

4.2 Semi-annual Maintenance

Twice a year remove accumulated solids from the outside foundation sump. Pump heavy solids directly into a closed top drum, bypassing the filter unit. When the water begins to clear, begin pumping the water through the filter to remove remaining solids. Contact GM Environmental Department for labels and drum storage instructions.

Raise the screen around the suction line of the air diaphragm pump up far enough to allow the screen to be hosed off. The accumulated debris will fall into the sump.

4.3 Annual Maintenance

At least annually, after the floating sludge has been removed from the OWS, the separator should be drained and the filter pack cleaned of attached materials. Protect the surrounding area with plastic before beginning this operation.

Replace plastic tubing used for the AWTA foundation sump air-diaphragm pump and the Separator oil drain line annually to prevent tubing failures. Be careful to prevent liquid spills. Dispose of used tubing in the PCB debris drum.

5 SPECIAL PRECAUTIONS FOR HANDLING PCBs

The oil layers found in the AWTA Foundation Sump, contain PCB concentrations greater than 10 parts per million (ppm). PCBs are toxic, and exposure should be minimized. PCBs at concentrations greater than 10 ppm is regulated as a hazardous waste by the State of New York. Although some of the PCB-impacted materials is below the 10 ppm threshold, all PCB-impacted materials will be handled as a hazardous material subject to applicable State and Federal disposal regulations.

5.1 Personal Protective Equipment

Use of personal protective equipment is recommended whenever contact with PCB impacted LNAPL is possible. Immediately wash any skin that has come in contact with PCB impacted LNAPL with soap and water. Discard any clothing that is splashed with fluids (oils or stoddard solvent.) Use of Tyvek suits and chemical resistant gloves are recommended during maintenance activities. PCBs have a very low vapor pressure approximately 0.0001 mm Hg at 25° C. Under normal conditions inhalation of PCBs will not be a significant exposure route and respiratory protection is not recommended however, the use of splash guards and face masks are recommended to mitigate the potential for incidental ingestion and inhalation of water vapor.

5.1.1 LNAPL Clean-up Procedure

1. Notify Environmental Activities (ext. 4766 or 7254) and immediately segregate off the area to eliminate the possibility of people walking through the spill.
2. Absorb any free liquid with absorbent pads. Place spent pads in the PCB labeled waste drum.
3. Wipe contaminated surfaces with towels soaked with organic solvent. All surfaces should be wiped twice. Dispose of towels in the PCB labeled waste drum.
4. Wash and rinse all surfaces twice using water and an industrial detergent. Absorb wash and rinse solutions with absorbent pads and place in the PCB labeled waste drum. Don't allow any wash/rinse fluids to reach floor drains or sumps.

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GROUNDWATER RECOVERY AND TREATMENT SYSTEM OPERATION AND MAINTENANCE MANUAL DELPHI AUTOMOTIVE SYSTEMS SITE #828064 EASTSIDE WASTEWATER TREATMENT AREA (EWTA) 1000 LEXINGTON AVENUE ROCHESTER, NEW YORK

by Haley & Aldrich of New York
Rochester, New York

for GM Components Holdings, LLC
Rochester, New York

File No. 127982-012
September 2022

20 September 2022
File No. 127982-012

GMCH Rochester Operations Facility
1000 Lexington Avenue
Rochester, New York 14606

Attention: Natalie Hahn
Environmental Engineer

Subject: Eastside Wastewater Treatment Area (EWTA)
Groundwater Recovery and Treatment System (GRTS)
Operations and Maintenance Manual
1000 Lexington Avenue
Rochester, New York 14606

Ladies and Gentlemen:

Haley & Aldrich of New York (Haley & Aldrich) has prepared this Operation, Monitoring and Maintenance (OM&M) plan for the groundwater recovery and treatment system (GRTS) installed within the Eastside Wastewater Treatment Area (EWTA) as part of the interim remedial measures (IRM) implemented to address groundwater impacts associated with the Delphi Automotive Systems, New York State Department of Environmental Conservation (NYSDEC) State Superfund Site No. HW828064.

This OM&M plan should be used to operate, monitor and maintain the GRTS to manage the recovered groundwater and light non-aqueous phase liquids (LNAPL) extracted from the groundwater monitoring wells and shallow groundwater recovery trench implemented as an IRM and selected as the final remedy by the NYSDEC in the Record of Decision (ROD) issued in March 2011.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Jonathan M. Sanger
Field Engineer

Darrin J. Costantini
Senior Associate

LIST OF FIGURES

1. Operational Overview

1.1 GENERAL

This document provides an overview of operations and required monitoring and maintenance procedures for the Groundwater Recovery and Treatment System installed within the Eastside Wastewater Treatment Area (EWTA) building located at the GM Rochester Operations Facility, 1000 Lexington Avenue, Rochester, New York. A presentation of the general process flow through the GRTS is provided as Figure 1.

1.2 GENERAL OPERATION

The operation of the system is controlled through the Human-Machine Interface (HMI) located on panel PLC-1000. The HMI provides an interface to all control functions, as well as data logging, alarming, and remote annunciation.

Operation of the system is controlled through several equipment enable functions provided on the HMI, as follows:

1. An Overall System Enable: This controls operation of the entire system. The button is located on the Main Overview Screen (See Figure 1). The button turns green when the system as a whole is enabled and gray when the system as a whole is not enabled. Disabling this system through this button is similar to pressing an "emergency stop" button, as all equipment is disabled in this state.
2. Enable of Individual Components: Several of the components have individual enable/disable toggles which the operator must enable from the HMI. The components are:
    a. Air Stripper; and
    b. Well pumps (GR-3, GR-4, and RW-1).
3. Physical HOA Switches: In addition, several of the components have physical hand-off-auto switches located adjacent to the equipment. These components are:
    a. Oil-Water separator discharge pumps;
    b. Air Stripper Feed Pumps;
    c. Air Stripper Blower; and
    d. Air Stripper Discharge Pump.

All control of the system is performed through the Programmable Logic Controller (PLC), and not through the HMI. Occasionally, the HMI will "lock up", as with any personal computer. System operations will not change during a computer lock-up. Only logging (data and alarms) will be lost, however flow totals and hours of operation will continue to increment in the PLC. If the computer becomes non-responsive, it can be re-booted by opening the right hand door of the panel (Panel PLC-1000) and opening 24VDC terminal block number 5. This will cut power to the HMI. Leave the terminal block open for approximately 30 seconds, and then replace the terminal block. The computer will power back up. After touching the user name on the login screen, all programs will automatically load and continue with normal operation and data logging.

1.2.1 System Design Overview

The EWTA System extracts groundwater from three locations; GR-3, GR-4 and RW-2. Water extracted from RW-2 is sent to Oil-Water Separator Number 1 (OWS-101), where light phase oil is skimmed from the water and transferred to a drum (T-102) for disposal. Water extracted from GR-3 and GR-4 is sent to Oil-Water Separator Number 2 (OWS-102), where light oil and/or light non-aqueous phase liquid (LNAPL) is skimmed from the water and transferred to a drum (T-103) for disposal. Water from both OWS-101 and OWS-102 is transferred to the equalization tank (T-101) via centrifugal pumps. Groundwater in Tank T-101 is treated through a bag filter, air stripper, and granular activated carbon prior to discharge to the storm sewer.

1.2.2 Alarm Scheme

The system has been designed to use a cascading alarm system. In this way, a critical alarm does not shut the entire system down, but only a subsystem. If the alarm is not rectified, the alarm will eventually "cascade" through the system, causing upstream processes to alarm as well. This may extend extraction by up to twelve hours before well pumps are shut down. As an example: Bag filter differential pressure reaches the high-high alarm setpoint. Feed to the air stripper is stopped due to this alarm, but groundwater extraction from the wells and transfer from the oil-water separators is continued. Without the air stripper feed active, the equalization tank will eventually reach its high-high alarm setpoint. This will then stop the transfer of water out of the oil water separators, but extraction from the wells will continue. Again, without transfer out of the oil-water separators, these will each eventually also reach a high-high level, which will shut down extraction from the associated well(s).

Analog alarms have information and critical alarm setpoints. Informational alarms will be annunciated (locally through the HMI and remotely through the Win911 app), but will not shut the system down. This is intended to provide the operator with advanced warning of a potentially impending shutdown and provide time to rectify the situation. If any informational alarm is present, there will be a yellow box indicating "Informational Alarm" present on the left side of the screen adjacent to the "Alarm Reset Button".

A critical alarm is a condition that requires a shutdown of a piece of equipment (or the entire system) due to a condition that may cause damage to the system or could result in inadequately treated process water to be discharged. If a critical alarm is present, the equipment associated with the alarm (e.g., equipment which has been disabled) will turn RED on the HMI screen, and a red box indicating "Critical Alarm" will become visible adjacent to the "Alarm Reset" button.

All alarms and alarm statuses are logged on the hard drive of the HMI. Events which trigger a logging include "In Alarm", "Out of Alarm", "Alarm Acknowledged", and all events are logged with a date and time stamp. Alarm logs are stored in the ALMLOG folder and are periodically downloaded for recordkeeping. Alarms may also be sent to any operators that we wish through the Win911 software.

A table of current alarm setpoints are provided on Table 1.

1.3 INITIAL START-UP

To initially start the system up, the following procedure should be used.

(1) Ensure that the physical HOA switches are all in the "AUTO" Mode for the following equipment:
   a. Air Stripper Blower
   b. Air Stripper Discharge Pump
   c. Air Stripper Feed Pump
   d. Oil Water Separator #1 Transfer Pump
   e. Oil Water Separator #2 Transfer Pump

(2) Press the "System Enable" button located on the main overview screen. This will enable overall system operation.

(3) Touch the Equalization Tank on the Main Overview Screen. This will bring up the Equalization Tank sub-system screen. Touch the Equalization Tank on this screen to bring up the LE-103 Setpoint Screen (the level element in the equalization tank). Check the setpoints for the desired mode of air stripper operation to ensure they are in the range desired, as follows:
   a. For "Continuous Mode", check the level setpoint for continuous operation. In this mode, the speed of the pump feeding the air stripper will vary to hold a continuous level in the equalization tank. Note that this mode should only be utilized when the influent flow is greater than 5 gpm, to ensure proper cooling of the air stripper feed pump motor.
   b. For "Batch Mode", check the "Air Stripper On" and "Air Stripper Off" level setpoints, as well as the "Air Stripper Feed Rate" Setpoint. In this mode the air stripper will turn on when the level in the EQ tank reaches the "Air Stripper On" Level setpoint. The Air Stripper Feed pump will feed water to the air stripper at the setpoint flow rate, until the level in the EQ reaches the "Air Stripper Off" level. At this point the air stripper feed pump shuts off, and the air stripper blower continues to operate for 15 minutes to ensure proper treatment of the water that is in the stripper.

(4) Touch the Air Stripper on the Main Overview Screen. This will bring up the air stripper screen. Ensure that the desired mode of Air Stripper Operation is selected (either "Continuous" or "Batch Mode") and press the Air Stripper enable Button. This will allow the air stripper to operate. Press "Close" to return to the Main Overview Screen.

(5) Touch the area of the Main Overview Screen showing the wells. This will bring up the well overview screen. Wells should be enabled that are desired to operate. Wells are enabled as follows:
   a. RW-2: There are no setpoints on the HMI for this well. The well enable button is located on the Well Overview screen. Press the button to enable the well. The (constant) speed of pump operation is adjusted by pressing the up or down arrows on the variable frequency drive (VFD) mounted on the pump itself (only when the pump is operating). The display on the pump reads in Hertz which ranges from 0 (off) to 60 (full speed). The pump will operate regardless of the level or presence/absence of water in the well. The pump is capable of dry operation, so no damage will occur to the pump if there is no flow.
   b. GR-3 and GR-4: The current operational mode of the pumps are shown on the Well Overview Screen. To modify any of these settings or to change setpoints, touch the well to bring up the well details screen. Various setpoints are available for each of the modes of operation, as follows:
      i. On/Off Mode: In this operational mode, the pump will turn on at the "Pump On" setpoint and turn off at the "Pump Off" setpoint. The pump runs at constant speed during operation. The pump will cycle on and off as water levels rise and fall in the well in this setpoint. Setpoints are located on the left side of the well

screen and include the “Pump On Level” (in feet above the transducer), “Pump Off Level” (also in feet above the transducer) and pump speed (as a percentage of full speed).

ii. VFD Control: Under VFD control, the speed of the pump will vary to match a setpoint. There are two modes of VFD control provided, which is selectable through a toggle switch (called “Control Mode”) on the right side of the well screen. The two modes of operation are:
    1. Flow Control: This will vary the speed of the pump to match a constant flow rate out of the well. The flow setpoint which the system will match is located on the right side of the well screen.
    2. Level Control: This will vary the speed of the pump to match a constant level in the well (level is feet above the transducer). The level setpoint which the system will match is located on the right side of the well screen.

Note that there are level alarms associated with the well levels in GR-3 and GR-4. The pump will (temporarily) shut down if the low-low level in the well is reached. This is a non-latching alarm, so the alarm does not need to be cleared prior to the pump re-starting.

1.4 ALARM RE-START

For most alarms (see below for one exception), simply pressing the “CLEAR ALARMS” button in the lower right-hand corner of the main overview screen will reset the alarm and restart the system. As long as the alarm is no longer active, the system (or component) will restart and the alarms will clear from the alarm summary at the bottom of the overview page.

The ONE exception to this rule is the “Low-low Air Flow at Air Stripper Alarm”. Since this alarm is only active when the air stripper is running (e.g. cannot test to see if the air flow is low when the air stripper is not running), the air stripper blower must be started in order to clear this alarm. If the “Air Stripper Low-Low Air Flow” alarm is active, the procedure to clear the alarm is as follows:

1. Go to the air stripper control panel.
2. Place the Air stripper Blower in HAND mode. The blower will start.
3. Go to the HMI and press the CLEAR ALARMS button. The air stripper should change from red to green and the alarm will clear.
4. Return to the air stripper control panel, and place the blower in AUTO mode.

1.5 DETAILED OPERATIONS

1.5.1 Bag Filter Change-out

Bag filter changeouts are the most frequent maintenance activity associated with the operation of the system. The bag filters protect the air stripper system by removing particulate matter that has accumulated within the equalization tank as the recovered groundwater is transferred to the air stripper system for treatment. Bag filters are required to be changed when the differential pressure measure at sensor DPI-106 approaches 15 pounds per square inch (PSI). The Standard Operating Procedure (SOP) for bag filter change-outs is provided in Appendix A.

1.5.2 Carbon Backwash Procedure

This is a maintenance activity that should be performed monthly or when the discharge rate of process water from the air stripper discharge sump is measured at less than 25 gallons per minute (gpm). The SOP for the carbon backwash process is included in Appendix B.

1.5.3 LNAPL Drum Change-Out

There is a high-level switch located in each of the two LNAPL drums adjacent to the oil-water separators. When this switch is triggered, the pumps feeding the oil-water separators will be stopped. When a drum reaches the high level, the first check that should be done is to determine if the contents of the drum are LNAPL or contain some water. The procedure for checking the LNAPL level is as follows:

1. Close the valve from the oil water separator to the drum.
2. Remove the clamp holding the hose onto the drum and remove the hose.
3. Place the manual drum pump into the drum so that the suction is at the bottom of the drum.
4. Pump a small amount of fluid into a 5-gallon pail. Be careful of syphoning of liquid. If siphoning begins to occur, lift the drum pump out of the fluid.
5. Check the liquid in the bucket and determine if it is oil or water. If it oil, contact GM personnel to get the drum changed out. If it is water, continue removing fluid from the drum until the liquid becomes oil. The change should be obvious. Water in the bucket may be dumped in the building sump for pumping to the equalization tank. If oil is present, it should be return to the drum or to the oil water separator.

When a drum is full of oil, GM personnel should be contacted to change the drum out. The well pumps associated with the oil water separator with the full drum should not be operated until the drum is changed out.

1.5.4 Air Stripper cleaning

The air stripper should be cleaned when calcium (Ca) and other minerals build up to the point that the air flow is decreased through the system. Observed reduction in air stripper air flow, or a “low flow” alarm from the air stripper are indicative of this condition. Cleaning should be performed on at least an annual basis or when “low flow” conditions are noted. The Operations and Maintenance Manual for the air stripper system that contains instructions for cleaning of the individual components of the system is provided in Appendix C.

EASTSIDE WASTE TREATMENT AREA
ALARM CONDITIONS

TABLE 1

MARCH 2022

Alarm List - Groundwater Recovery and Treatment System (GRTS) Delphi Automotive Systems Site No. 828064

PLC Tag	Description	Setpoint	Logged	Interlock	Interlocked Equipment	Description
DPI101H_IA	Informational Alarm - High differential pressure over bag filter	10 psid	Y	N	--	--
DPI101HH_CA	Critical Alarm - High differential pressure over bag filter	15 psid	Y	Y	P-103	Shut down air stripper feed pump
E103_FAIL	Critical Alarm - Air Stripper General Fault	N/A	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE101_FAIL	Instrument Failure: FE-101 (Well GR-3)	< 4 mA, > 20 mA	Y	Y	P-106	Shut down well pump
FE101H_IA	Information Alarm: High flow in Well GR-3	1 gpm	Y	N	--	--
FE101HH_CA	Critical Alarm: High-high flow in Well GR-3	6 gpm	Y	Y	P-106	Shut down well pump
FE101L_IA	Information Alarm: Low flow in Well GR-3	0.2 gpm	Y	N	--	--
FE101LL_CA	Critical Alarm: Low-low flow in Well GR-3	0.1 gpm	Y	Y	P-106	Shut down well pump
FE102_FAIL	Instrument Failure: FE-102 (Well GR-4)	< 4 mA, > 20 mA	Y	Y (*)	P-107	Shut down well pump
FE102H_IA	Information Alarm: High flow in Well GR-4	12 gpm	Y	N	--	--
FE102HH_CA	Critical Alarm: High-high flow in Well GR-4	15 gpm	Y	Y	P-107	Shut down well pump
FE102L_IA	Information Alarm: Low flow in Well GR-4	2 gpm	Y	N	--	--
FE102LL_CA	Critical Alarm: Low-low flow in Well GR-4	1 gpm	Y	Y	P-107	Shut down well pump
FE103_FAIL	Instrument Failure: FE-103 (Well RW-2)	< 4 mA, > 20 mA	Y	N	--	--
FE104_FAIL	Instrument Failure: FE-104 (Air Stripper Air Flow)	< 4 mA, > 20 mA	Y	N	--	--
FE104H_IA	Information Alarm: High flow in air stripper vapor phase	300 acfm	Y	N	--	--
FE104HH_CA	Critical Alarm: High-high flow in air stripper vapor phase	350 acfm	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE104L_IA	Information Alarm: Low flow in air stripper vapor phase	110 acfm	Y	N	--	--
FE104LL_CA	Critical Alarm: Low-low flow in air stripper vapor phase	90 acfm	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE105_FAIL	Instrument Failure: FE-105 (Discharge Flowmeter)	< 4 mA, > 20 mA	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE105H_IA	Information Alarm: High flow at discharge	45	Y	N	--	--
FE105HH_CA	Critical Alarm: High-high flow at discharge	50	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE105L_IA	Information Alarm: Low flow at discharge	10	Y	N	--	--
FE105LL_CA	Critical Alarm: Low-low flow at discharge	5	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE106_FAIL	Instrument Failure: FE-106 (Air Stripper Feed)	< 4 mA, > 20 mA	Y	Y	P-103	Shut down air stripper feed pump
FE106H_IA	Information Alarm: High water flow to air stripper	35	Y	N	--	--
FE106HH_CA	Critical Alarm: High-high water flow to air stripper	40	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
FE106L_IA	Information Alarm: Low water flow to air stripper	5	Y	N	--	--
FE106LL_CA	Critical Alarm: Low-low water flow to air stripper	2	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
LE103_FAIL	Instrument Failure: LE-103 (Level Element in EQ Tank)	< 4 mA, > 20 mA	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
LE103H_IA	Information Alarm: High level in equalization tank	70	Y	N	--	--
LE103HH_CA	Critical Alarm: High-high level in equalization tank	75	Y	Y	P-101, P-102, P-105	Shut down all EQ Tank feed pumps
LE103L_IA	Information Alarm: Low level in equalization tank	20	Y	N	--	--
LE103LL_CA	Critical Alarm: Low-low level in equalization tank	10	Y	Y	P-103	Shut down air stripper feed pump
LSHH101_CA	High-High Level in Oil Water Separator #1	N/A	Y	Y	P-108	Shut down RW-2 Pump
LSHH102_CA	High-High Level in Oil Water Separator #2	N/A	Y	Y	P-105, P-106	Shut down GR-3 and GR-4 pumps
LSHH103_CA	High Level in Oil Drum #1	N/A	Y	Y	P-108	Shut down RW-2 Pump
LSHH104_CA	High Level in Oil Drum #2	N/A	Y	Y	P-105, P-106	Shut down GR-3 and GR-4 pumps
LSHH105_CA	Redundant High -High Level in Equalizaton Tank	N/A	Y	Y	P-101, P-102, P-105	Shut down all EQ Tank feed pumps
LSHH106_CA	High-High Level in Sump Pump	N/A	Y	Y	System Enable Off	Shut down the entire system
P101_FAIL	Pump Failure: P-101 (OWS #1 Discharge Pump)	N/A	Y	Y	P-101	Shut down P-101 (OWS #1 Discharge Pump)
P102_FAIL	Pump Failure: P-102 (OWS #1 Discharge Pump)	N/A	Y	Y	P-102	Shut down P-102 (OWS #1 Discharge Pump)
P103_FAIL	Pump Failure: P-103 (Air Stripper Feed Pump)	N/A	Y	Y	P-103	Shut down P-103 (Air Stripper Feed Pump)
P106_FAIL	Pump Failure: P-106 (Well GR-3 Pump)	N/A	Y	Y	P-106	Shut down P-106 (Well GR-3 Pump)
P107_FAIL	Pump Failure: P-107 (Well GR-4 Pump)	N/A	Y	Y	P-107	Shut down P-107 (Well GR-4 Pump)
P108_FAIL	Pump Failure: P-108 (Well RW-2 Pump)	N/A	Y	Y	P-108	Shut down P-108 (Well RW-2 Pump)
PE101_FAIL	Instrument Failure: PE-101 (Level in GR-4)	< 4 mA, > 20 mA	Y	Y	P-107	Shut down GR-4 Pump
PE101H_IA	Information Alarm: High level in Well GR-4	20 ft	Y	N	--	--
PE101HH_CA	Critical Alarm: High-High level in Well GR-4	25 ft	Y	N	--	--
PE101L_IA	Informational Alarm: Low level in Well GR-4	0.2 ft	Y	N	--	--
PE101LL_CA	Critical Alarm: Low-Low level in Well GR-4	0.1 ft	Y	Y	P-107	Shut down GR-4 Pump
PE102_FAIL	Instrument Failure: PE-102 (Level in GR-3)	< 4 mA, > 20 mA	Y	Y	P-106	P-106
PE102H_IA	Information Alarm: High level in Well GR-3	10 ft	Y	N	--	--
PE102HH_CA	Critical Alarm: High-High level in Well GR-3	20 ft	Y	N	--	--
PE102L_IA	Informational Alarm: Low level in Well GR-3	1.0 ft	Y	N	--	--
PE102LL_CA	Critical Alarm: Low-Low level in Well GR-3	0.5 ft	Y	Y	P-106	P-106
PE103_FAIL	Instrument Failure: PE-103 (Pre-filter pressure)	< 4 mA, > 20 mA	Y	Y	P-103	P-103
PE103_H_IA	Informational Alarm: High Pressure at inlet to bag filters	30 psi	Y	N	--	--
PE103HH_CA	Critical Alarm: High-High Pressure at inlet to bag filters	40 psi	Y	Y	P-103	Shut down air stripper feed pump
PE104_FAIL	Instrument Failure: PE-104 (Post-filter pressure)	< 4 mA, > 20 mA	Y	N	--	--
PE104H_IA	Informational Alarm: High Pressure at discharge of bag filters	20 psi	Y	N	--	--
PE104HH_CA	Critical Alarm: High-High Pressure at dicharge of bag filters	30 psi	Y	Y	P-103	Shut down air stripper feed pump
PE108_FAIL	Instrument Failure: PE-108 (Discharge Pressure)	< 4 mA, > 20 mA	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump
PE108H_IA	Informational Alarm: High Pressure at system discharge	20 psi	Y	N	--	--
PE108HH_CA	Critical Alarm: High-High Pressure at system dicharge	30 psi	Y	Y	E-103, P-103	Shut down air stripper and air stripper feed pump

See: EWTA Operations and Maintenance Manual for additional information.

Figures

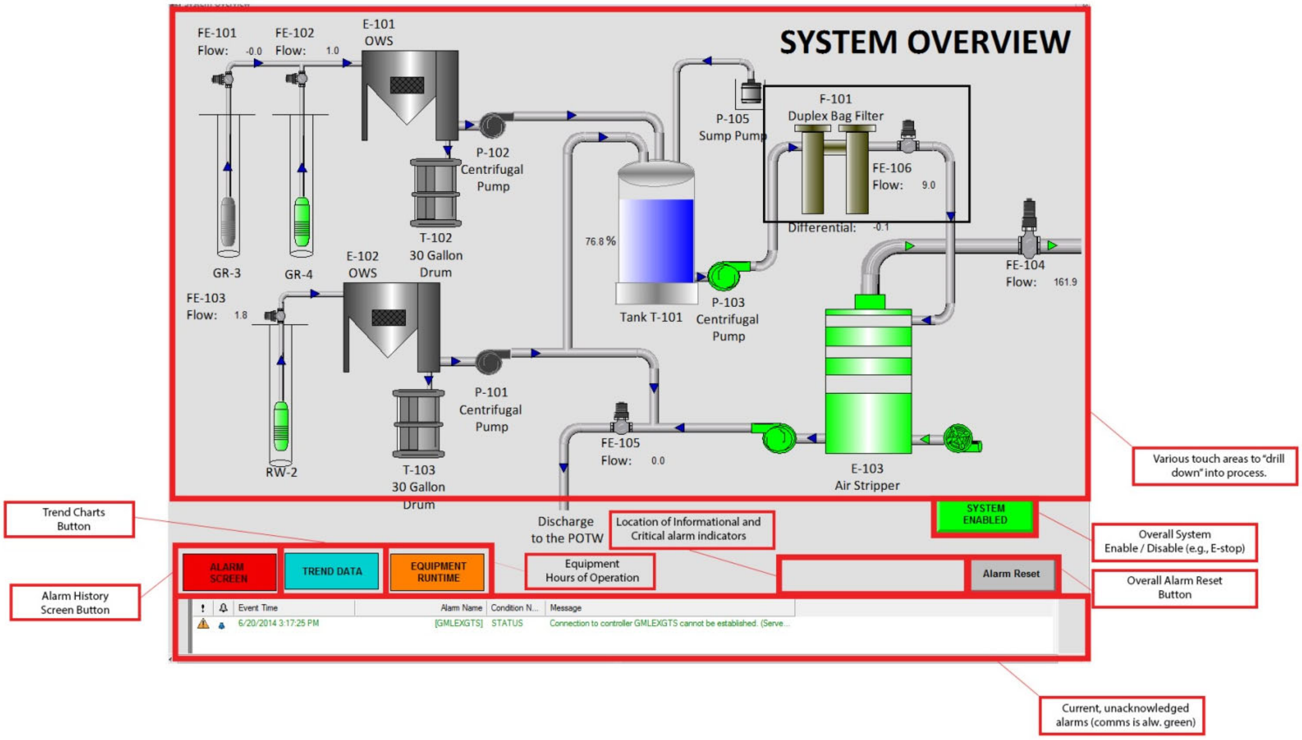


FIGURE 1
GENERAL AREAS OF THE SYSTEM OVERVIEW SCREEN

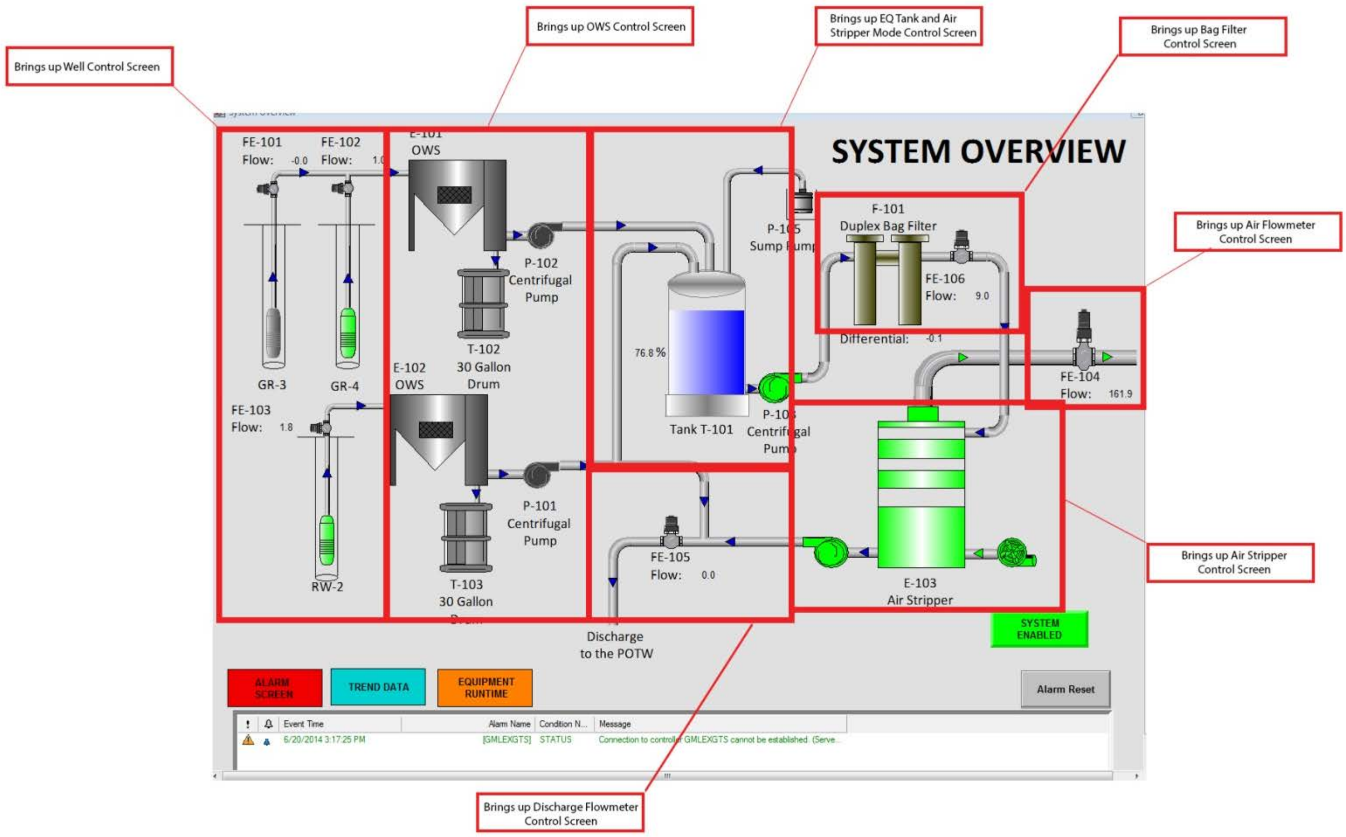


FIGURE 2
EQUIPMENT TOUCH AREAS OF THE SYSTEM OVERVIEW SCREEN

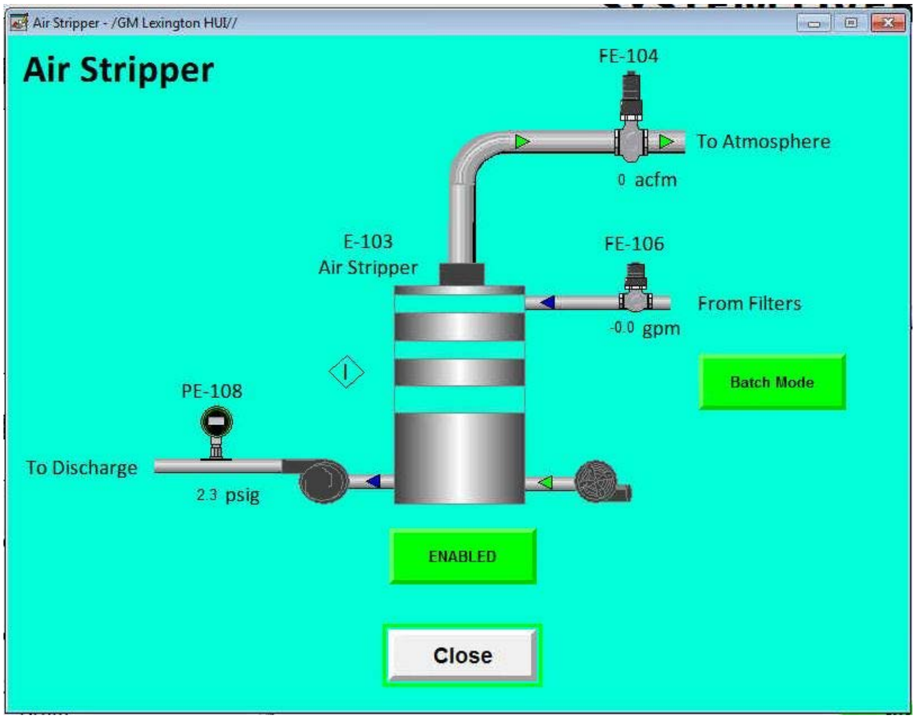


FIGURE 3
AIR STRIPPER CONTROL SCREEN

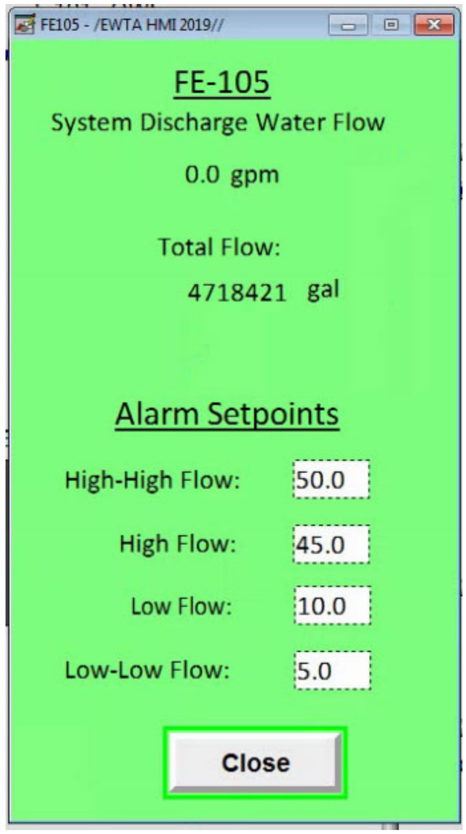


FIGURE 4
AIR STRIPPER DISCHARGE FLOW DETAIL SCREEN

FIGURE 5
EQUALIZATION TANK DETAIL SCREEN

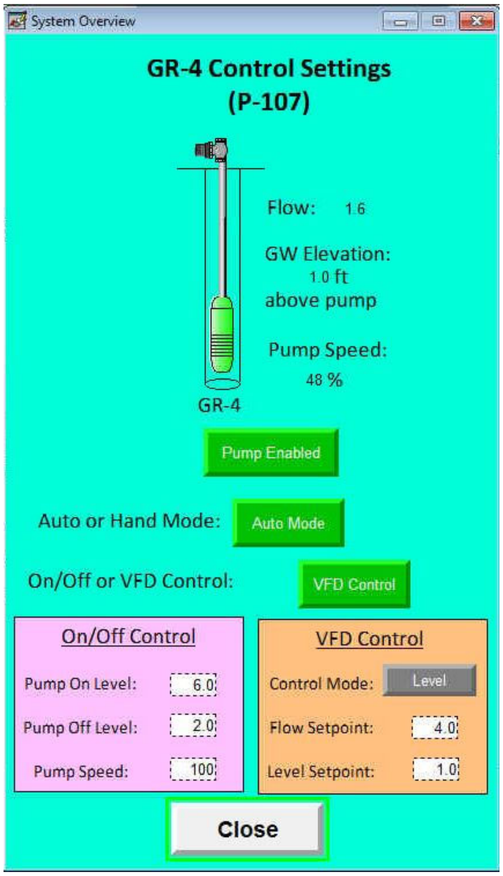


FIGURE 6
EXTRACTION WELL DETAIL SCREEN (LEVEL CONTROL MODE)

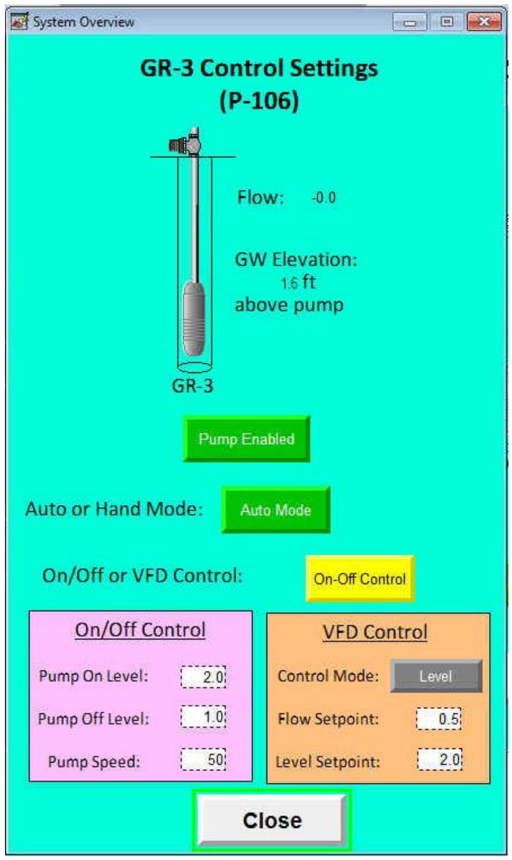


FIGURE 7
EXTRACTION WELL DETAIL SCREEN (ON/OFF CONTROL MODE)

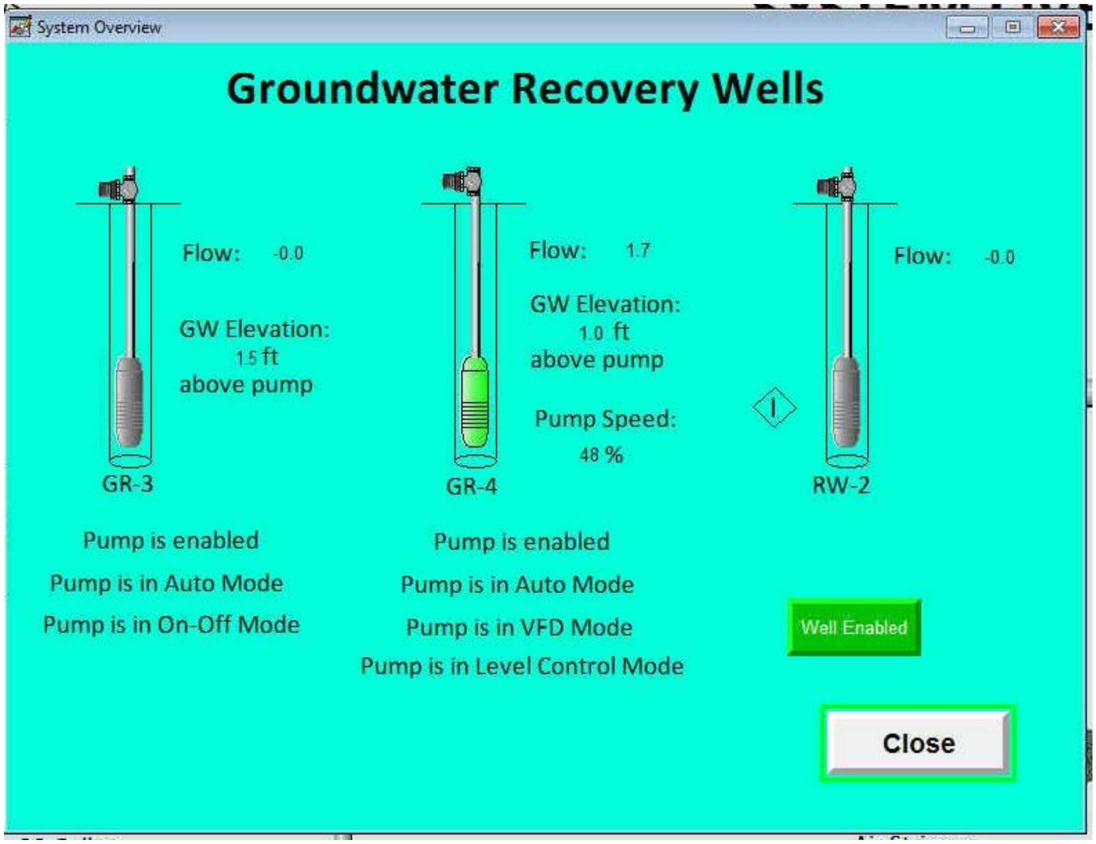


FIGURE 8
EXTRACTION WELL OVERVIEW SCREEN

HALEY ALDRICH

APPENDIX A

Standard Operating Procedure
Bag Filter Change

Introduction

The following summarizes the equipment and procedures necessary to correctly manage the Groundwater Treatment system at the GM Components Holdings LLC, Lexington Ave facility. At minimum, the system must be checked on a weekly basis to ensure that it is running properly. This will consist of replacing spent bag filters with new bag filters when necessary.

Equipment List

- Channel Locks
- Nitrile Gloves
- Safety Glasses
- Face Shield
- Chemical Resistant Work Boots
- Long Neoprene Gloves
- Long sleeves/splash resistant gear
- Steel toe boots
- Apron/Splash Guard

Replacing Bag Filters

(1) The Treatment system is programed to shut down when the bag filters reach above a level of 15 PSI for 30 seconds or more. At this point the bag filter needs to be replaced before the system can return to normal operating conditions.

(2) Before performing any maintenance activities a face shield, apron and protective gloves (nitrile and neoprene) must be worn. Long neoprene gloves worn over nitrile gloves are necessary when removing spent filters from the housing. Other PPE such as Tyvek may be worn at the discretion of the operator.

(3) The Air Stripper must be shut down prior to filter replacement to avoid spills and damage to the system. If this is the case, follow the steps under **Air Stripper Shutoff.**

(4) When the system is set to run in parallel, both filters will require replacement. Close the housing valves by positioning the arm away from the filter housing. Close the Influent Valve from the EQ tank and the effluent valve to the air stripper (Figure A1-3).

(5) Remove the top of the filter housing by unscrewing the three knobs on the top using a wrench/channel locks.

(6) Open the water release valves (Figure A3) at the bottom of each filter housing to release excess water. The water will flow into the sump drain at the South wall of the building.

(7) Remove the filter bag from the filter housing and pour excess water from filter down the sump pump floor drain.

(8) Remove the bag filter from the filter casing, wring out excess water into the sump, and dispose of the filter in the 55-gallon drum located in the center of the building labeled “Filter Bags”. Nitrile gloves should be worn during disposal and placed in waste drum. Once finished, place ring around drum and secure.

(9) Place new filter bag in the casing, and ensure the bottom of the bag is pushed to the

bottom of the casing.

(10) Place the casing with the new filter bag back into the housing with the bag filter securely inserted below the inlet opening (Figure A4).

(11) Replace the top of the housing and tighten knobs. Ensure that the lid seal stays secure when knobs are tightened to prevent leakage. As a Maintenance activity, apply PB Blaster or similar penetrating oil to bolts on filter housing to remove and prevent rust.

(12) Ensure the water release valves at the bottom of the filter housing are in the closed position.

(13) Bleed excess air in the new filter by opening the air release valve on top of the housing (Figure A3). Open all valves, wait for air to bleed out and then close. If this is not performed, the air stripper may not reset.

(14) Perform cleanup in the general area where wastewater was spilled. Spray the area, including the system components, and mop the floor to clean up (Mop and bucket located next to entrance door).

(15) If the system was shut down due to the "high high bag pressure" alarm, make sure to reset the system after the bag filter was replaced by pushing the **Alarm Reset** button on the HMI (Figure A5). This will reset the system. The Air stripper will turn on when the level in the tank is above 50%.

(16) Record name, date, time, flow information for each specific flow meter, and any comments notifying any concern on the System documentation sheet. Record the analog gauge pressure (carbon backpressure) located after the air stripper. Specific detail on recording flow data can be found in the section **Recording Flow Data.**

Air Stripper Shutoff

(1) In order to shut off the pump to the air stripper, go to the LE-103 (Level in Equalization Tank) on the HMI Control Panel (Figures A5- 6).

(2) In order for the pump to stop, the Batch Mode Stop Level must be at a level higher than the current level in the EQ Tank. For example, the Stop Level will need to be set at 70% when the level in the tank is at 69%.

(3) Once this is done, wait for the pump and air stripper to shutoff.

(4) After the air stripper is off, change the Batch Mode Stop Level back to the previous level.

(5) Proceed with changing the filters. The air stripper will reset at normal conditions after all maintenance activities are performed.

Recording Flow Data

(1) On the HMI main screen, flow information can be viewed by clicking on each flow meter individually. To record FE-101, FE-102, and FE-103, click on the Groundwater Recovery well section (Figure A7). To view FE-105 (total flow), press on the FE-105 icon on the main screen (Figure A5).

(2) To collect specific flow data, press the area labeled "flow" (highlighted in red on Figure A7). The screen in Figure A8 or similar will pop-up.

(3) Record the total flow for each FE on the Flow documentation sheet provided onsite.

<u>LogMeIn Account Access</u>

Logmein.com is used to monitor the system. It is recommended to check the status of the system every other day to carefully monitor the system and efficiently keep it up to date. The account can be accessed by the following directions:

(1) Go to logmein.com
(2) Login with the username **darrinjc@gmail.com** and password **H&ALogIn16!**
(3) This will lead to a screen listing computer "GMGTS-RA"
(4) Click on "Main Menu" next to this computer
(5) In the next screen enter **Lexington** for the computer access code
(6) The next screen includes the dashboard showing all statistics on the computer. Select **Remote Control**. This will open the new window allowing ability to control the computer screen onsite.
(7) Be patient when using the program. Do not click the screen too quickly and overload the system.
(8) Be careful when exiting to close the ENTIRE Browser Window, and not shut down the Program running on the computer. This will close the window.
(9) At the Dashboard click **DISCONNECT** when finished.

<u>General Information:</u>

(a) <u>Alarm Setpoints</u>: There are two alarm setpoints in the system, a high differential pressure & and high-high differential pressure. The high differential pressure is set to trigger at 10 psi differential and will annunciate, but not shut down the system. This alarm setpoint may be changed to provide additional warning of the bag filter starting to clog. The high-high differential pressure alarm is set at 15 psid and SHOULD NOT be raised any higher. This is the maximum differential pressure recommended by the manufacturer prior to changeout. If the high-high level is triggered (>15 psid for at least 15 seconds), the air stripper feed pump will shut down. This will start a chain of alarms through the system that will eventually shut down the well pumps.

(b) <u>Approximate timing</u>: Initial operations have shown the following basic parameters with operations in July of 2014: Differential pressure over the bag filters follows an exponential line, with low increases in differential initially, but with a rapid increase in differential pressure as the bag starts to fill with solids. Once the differential reaches approximately 10 psid, the pressure will increase approximately 1 psid each air stripper batch cycle, so that the system will shut down after 4 or 5 additional air stripper batch cycles. With (July 2014) air stripper operations approximately every three (3) hours, this provides 12-15 hours between when the "high differential pressure" alarm is activated and a system shutdown.

(c) <u>Air Locking</u>: Air locking is the process through which air bubbles become trapped in the high points of piping or equipment and cause a high back pressure in the system, due to the inability of the motive force to push the air out of the system and allow water to pass. The design of the bag filters provides the potential for air locking within the filter (e.g., there is space above the discharge line of the filter where air can become trapped, increase the back pressure on the system, and generate a high differential pressure over the bag filters, potentially leading to alarms and system shut down). There are vent valves on top of the filters for venting air from a newly changed filter. The procedure for using these is included in the operating steps.

APPENDIX B

Standard Operating Procedure
Carbon Vessel Backwash

Introduction

The following summarizes the proper process for performing the granular activated carbon (GAC) backwash maintenance procedure for Eastside Wastewater Treatment Area (EWTA) at the General Motors Components Holding LLC, Lexington Avenue facility. It is anticipated that this process will be performed every three to six months, as conditions indicate, and should be completed with **two** personnel.

Equipment

- Safety Glasses
- Chemical Resistant Steel-toed boots
- Durable Safety Gloves

Timing for Maintenance Procedure

A backwash of the GAC vessel is required when solids and sediment have built up in the carbon media to the point to which flow is restricted. There are several ways to determine if this is occurring and a backwash needs to occur:

(a) The discharge pressure of the air stripper discharge pump exceeds 30 pounds per square inch (psi); and/or

(b) The system discharge flow drops below 20 gallons per minute (gpm).

These two process variables are interconnected: As the pressure increases at the discharge point, the flow will decrease.

Eventually, the pressure will build up to a point where the flow will decrease until it is less than the influent flow (currently set at 9 gpm), and the system will shut down on a high air-stripper sump level. If this alarm shuts down the system, check the data logged trends of both discharge pressure and discharge flow rate to determine if a backwash is required.

Backwash process

The backwash process uses the clean discharge water to backwash the carbon vessel. Therefore, if the system is alarmed or shutdown, the alarms must be cleared and the system must be ready to operate in order to backwash the system.

The procedure for backwashing the carbon vessel is as follows.

(1) Turn the Hand-Off-Auto (HOA) switch for the air stripper discharge pump from AUTO into OFF Mode on the air stripper control panel (Figure B1). It doesn’t matter if the air stripper is currently running, as the pump will only be “off” for a couple of minutes.

(2) Go to the carbon vessel manifold (Figure B2). In normal operation, the handles for all four valves are in the “vertical position” (as shown in Figure B2).

(3) Switch all four valve positions so that the handles are all in a horizontal position (Figure B3). This performs the following functionality:
   - Brings the influent (flow from the air stripper) to the bottom of the vessel, rather than the top of the vessel, as it is in normal operation; and
   - Diverts the discharge of the carbon vessel the equalization tank (T-301).

(4) Return the air stripper discharge pump to AUTO mode.

(5) The air stripper must operate and for approximately one full cycle (four or five cycles of the discharge pump) to remove the solids from the air stripper. If the air stripper is not operating, adjustments can be made to the level setpoints that turn on the air stripper in order to force operation.

(6) Operate the system in backwash mode for approximately four to five discharge pump cycles. Monitor the discharge pressure at the air stripper discharge pump. The pressure should drop and eventually get to below five (5) psi. At this point, the carbon vessel has been flushed of the solids build-up.

(7) Return the HOA switch on the air stripper discharge pump to the OFF position.

(8) Go to the carbon vessel manifold and return the handles for all four valves to the vertical position (as shown in figure B2).

(9) Return the HOA switch on the air stripper discharge pump to the AUTO position.

(10) The system is now returned to normal operation. Remain with the system to ensure that discharge pressure is less than 10 psi and the discharge flow is greater than 30 gpm during normal operation.

(11) If level setpoints were changed to force the air stripper to operate during the backwash procedure, return the setpoints to their previous values.

APPENDIX C

Air Stripper Cleaning Procedures (Shallow Tray)

ShallowTray®
Low Profile Air Stripper

Installation, Operation,
&
Maintenance Manual

Serial Number:

____

BISCO Environmental-NEEP

135 Robert Treat Paine Drive, Taunton, Massachusetts 02780

Phone: 508-738-5100   Fax : 508-738-5022   Email: sales@biscoenv.com

Rev:1/27/2012

TABLE OF CONTENTS

Section 1: ShallowTray Process

1-1 THE SHALLOWTRAY TREATMENT PROCESS

The purpose of air stripping is to remove dissolved volatiles from liquids. Such dissolved volatiles include radon and carbon dioxide removed from potable well water, volatile organic compounds (VOCs) removed from contaminated groundwater plumes, and VOCs removed from industrial process and wastewater treatment streams.

The stripping mechanism of the proprietary ShallowTray low profile perforated plate air stripper is dependent on the flow of an influent liquid through a long, narrow channel on a discrete number of trays while subject to a countercurrent flow of ambient air at a fixed flowrate.

The intense formation and rupture of billions of bubbles in the confined narrow path of water flowing counter-current to multiple fresh air vents is a dynamic process that provides a mass transfer mechanism that displaces the dissolved volatiles from the aqueous stream into the vapor stream.

The ShallowTray low profile air stripper mechanism is a proprietary process protected under U.S. Patent # 5045,215 and 5,240,595.

1-2 THE SHALLOWTRAY BASIC SYSTEM

ShallowTray systems are fabricated from 304L stainless steel, 316L stainless steel, or rotationally molded polyethylene, and are provided with components to facilitate the requirements of the process, including the following:

Forced Draft Versus Induced Draft

Forced Draft (F.D.) System: The blower is installed so that the air is fed under positive pressure into the stripper sump below the stripper trays. This arrangement is used when the maximum total blower discharge pressure (air stripper plus other downstream pressure losses) does not exceed 26 inches (56cm) water column (w.c.) pressure for plastic strippers, or 32 inches (82cm) w.c. for stainless steel strippers.

Induced Draft (I.D.) System: The blower is installed such that it pulls air into the stripper sump, up through the trays, and into the blower inlet, thus subjecting the stripper interior to a slight vacuum. Removal efficiency is not changed by this arrangement. The blower is therefore sized to provide the pressure drop required for the ShallowTray, plus the pressure drop required by downstream offgas treatment devices.

High Water Flow Versus Low Water Flow

Due to increased froth heights on the trays at higher flowrates, two water flow ranges are considered in the design of the basic system, **Low Flow** and **High Flow**. The high flow system requires a blower that produces an additional 4 inches (10.2 cm) w.c. pressure drop across the stripper as compared to the low flow system blower. The Low and High water flow ranges for each ShallowTray series are listed in the table below:

ShallowTray Series	Low Water Flow Range	High Water Flow Range
1300P	0.5 - 15 gpm	N/A
1300	0.5 - 15 gpm	16 - 22.5 gpm
2300P	1 – 30 gpm	31 - 50 gpm
2300	1 - 30 gpm	31 - 45 gpm
2600	2 - 60 gpm	61 - 115 gpm
3600	3 - 90 gpm	91 - 160 gpm
31200	4 - 150 gpm	151 - 425 gpm
41200	6 - 200 gpm	201 - 550 gpm
61200	12 - 350 gpm	351 - 1000 gpm

1-3 Basic System Components

Components information sheets (“cut sheets”) from the manufacturer are included in the Components Information Section (Section 5) at the back of this manual.

Blower

The blower supplied with the ShallowTray low profile air stripper unit is typically type B spark resistant with a cast aluminum wheel, direct driven @ 3450 rpm, with motor options of Totally Enclosed Fan Cooled (TEFC) or Explosion Proof (EXP), as determined by the power available and electrical code classification of the site.

Each blower is selected to provide air flow that exceeds the minimum standard cubic feet per minute (SCFM) air flow required at the required working pressure (inches of w.c.) of the system. It is important that the blower damper be set to provide the unit with the required fresh air flow.

It is also important that water not enter the blower housing while the blower is in operation; this will damage the blower and void the warranty. During normal operation, the high water level alarm switch prevents this from happening. Confirm that this switch is installed properly.

The installed motor horsepower is selected to provide an operating range with a significant safety margin. However, there is the potential for the blower motor to overload if it is not working against sufficient pressure drop. Therefore, the blower must be protected with a thermal overload switch.

The blower damper should be set so that the blower produces the minimum stripper air flow requirement (see table below), and at the same time the motor does not exceed its nameplate amperage maximum.

Air Flow Damper

The stripper blower is fitted with an adjustable damper, used to make air flow rate (SCFM) adjustments to the stripper. Open the damper to increase air flow rate, and close the damper to decrease air flow rate. Note that air pressure may vary as the air flow rate is changed. To get an accurate air flow measurement, install an air flow meter in the air duct.

If air flow meter installation is not possible, an estimated air flow can be obtained by measuring the stripper pressure drop. At initial start-up, adjust the damper until the air pressure is at the minimum required for the system. (Refer to the pressure gauge description for minimum pressure readings).

Be aware that when making damper adjustments after the system has been operating, fouling may occur in the system, which may reduce the air flow rate and may increase the air pressure reading.

The following table gives the minimum and maximum air flow rate for each ShallowTray series:

ShallowTray Series	Air Flow Minimum	Air Flow Maximum
1300 & 1300P	150 SCFM (255 m3/hr)	180 SCFM (305 m3/hr)
2300 & 2300P	300 SCFM (510 m3/hr)	360 SCFM (610 m3/hr)
2600	600 SCFM (1020 m3/hr)	720 SCFM (1220 m3/hr)
3600	900 SCFM (1530m3hr)	1080 SCFM (1830 m3/hr)
31200	1800 SCFM (3060 m3/hr)	2160 SCFM (3670 m3/hr)
41200	2400 SCFM (4080 m3/hr)	2880 SCFM (4900 m3/hr)
61200	3600 SCFM (6120 m3/hr)	4320 SCFM (7340 m3/hr)

Mist Eliminator

A wire mesh mist eliminator is installed beneath the air exhaust port, located on the top cover of the ShallowTray. The purpose of the mist eliminator is to remove water droplets that would have blown through the vent line. It is possible, though unlikely, that the mist eliminator may become plugged or fouled. If this occurs, the mist eliminator is easily removed for cleaning. Disconnect the vent line, take off the top cover, and remove the retaining plates on the bottom of the cover. The mist eliminator can be cleaned with a pressure washer, or replaced with a new one.

Gasket

A black nitrile (or neoprene on the 2300-P) sponge is used to form an airtight/watertight seal between the sump tank, cover, and stripper trays. A replacement gasket can be glued to the sealing flange using an industrial contact adhesive. Please contact BISCO Environmental, Inc. prior to making any gasket repairs or adjustments.

Sight Tube

The sight tube provides a means of visually monitoring the water level in the sump tank. Make sure the valve to the sight tube is open during stripper operation.

Inlet Dip Tube / Spray Nozzle

An inlet spray nozzle is only installed upon request. The dip tube directs the influent water to the top tray inlet chamber.

Note: System performance is based on ShallowTray operation without a nozzle, and the performance warranty is valid whether a nozzle is installed or not.

SHALLOWTRAY ACCESSORY OPTIONS

ShallowTray System Options

ShallowTray low profile air strippers are custom built to meet site and project specifications. Please refer to the components list insert (Section 5) to see which options were selected for this system. Component information cut sheets are included in (Section 5) of this manual.

Air Blower Silencer

An air blower silencer can reduce the noise level of the blower. The size of the silencer and the type of connection used to mount it are dictated by the size of the blower, and whether the silencer is mounted horizontally or vertically. Silencers should be supported to avoid over-stressing the connections, and should be secured if exposed to high wind loads.

Air Flow Meter

An air flow meter measures the amount of air flowing through the system. It consists of a pitot tube mounted in the air duct and connected via two (2) lengths of tubing to a differential pressure gauge. The measured velocity pressure can be converted to an air flow velocity. The pitot tube must be located at least 8 1/2 pipe diameters downstream of any pipe fitting or transition, and at least 1 1/2 diameters of straight pipe upstream of the end of the duct or any elbow. The best pitot tube location is before the stripper because the air is less humid and the gauge tubing is less likely to fill with condensate.

The air flow meter typically gives readings in inches of water column, (w.c.), which is converted to feet per minute (FPM) using the provided chart or the gauge scale calibrated for the specific duct inside diameter. As stated in the damper section, the air flow meter in conjunction with the pressure gauge provides the most accurate damper adjustments, especially after initial start-up.

The table below lists the minimum vapor exhaust duct diameters.

Stripper Series	**Minimum Exhaust Duct Diameter**
1300	6 “Ø (16 cm)
2300	6 “Ø (16 cm)
2600	8 “Ø (20 cm)
3600	10 “Ø (25 cm)
31200	16 “Ø (40cm)
41200	18 “Ø (45cm)
61200	18 “Ø (45cm)

Note: Restricted airflow is the most common cause of poor removal efficiencies. An airflow meter is highly recommended to help ensure adequate air flow.

Air Pressure Gauge
The air pressure gauge reads the pressure differential across the stripper trays in inches of water column (w.c.). The gauge is connected to the system via tubing that attaches to a pressure port on the system. Instructions to connect the gauge for the types of systems are as follows:

Forced Draft System – Using tubing, connect the “High” pressure port on the gauge to the 1/8”Ø (3mm) shutoff valve/hose barb located on the air stripper sump. The “Low” pressure port on the gauge is left open to the atmosphere. The highest pressure drop is between the sump tank and the surrounding atmosphere.

Induced Draft System - Using tubing, connect the “Low” pressure port on the gauge to the hose barb located on the exhaust vent line on the air stripper. The “High” pressure port on the gauge is left open to the atmosphere. The highest pressure drop (vacuum) is between the cover exhaust and the surrounding atmosphere.

Note: there are two pairs of pressure ports on the gauge, one pair for side entry and the other pair for rear entry. One pair should be used to measure the differential pressure, and the other unused pair must be sealed with a plug.

At initial start-up, the pressure gauge can be used to measure blower damper adjustments. Adjustments should be made according to the following nominal differential air pressure table:

Nominal Differential Air Pressure

Number of trays	Low Water Flow Sys	High Water Flow System
1 tray system	4-6 in. w.c. (10-15 cm.)	7-10 in. w.c. (18-25 cm.)
2 tray system	7-10 in. w.c. (18-25 cm.)	11-14 in. w.c. (28-36 cm.)
3 tray system	11-14 in. w.c. (28-36 cm.)	16-18 in. w.c. (40-46 cm.)
4 tray system	16-18 in. w.c.(40-46 cm.)	20-22 in. w.c. (50-56 cm.)
5 tray system	20-22 in. w.c. (50-56 cm.)	24-26 in. w.c. (60-66 cm.)
6 tray system	24-26 in. w.c. (60-66 cm.)	28-30 in. w.c. (71-76 cm.)

Refer to high/low water flow range description in Section 1-3 above.

Note: The nominal differential pressures shown are for the air stripper pressure drop only and do not include additional air stream equipment pressure requirements.

After initial start-up, fouling may occur in the system, which may increase the nominal air pressure reading, and may decrease the air flow rate.

Control Panel

The control panel serves two basic functions for operation of the system. The first is to provide the necessary starting and circuit protection components for each motor load, consistent with NEC electrical code. These components include fuses, circuit breakers, motor starter contactors, overload relays, and lock-out/tag-out (LOTO) features.

The second function is to provide process control and alarm status/interlock components. Alarm circuit monitors several conditions, most basically the low air pressure alarm switch and the high water level alarm switch. If either of these alarms occurs, the alarm interlock will provide shut off signal to the incoming water source (feed or well pumps) if the appropriate interconnects have been made. Other alarm options are also available.

Control Panel: Intrinsically-Safe (I.S.) Components

ShallowTray low profile air stripper systems that operate in or near potentially explosive concentrations of vapors will require special hardware to meet code requirements for power wiring and for instrument and switch connections. In such cases, intrinsically safe (I.S.) isolation of signals to and from switches and instruments is employed to limit the energy to a level lower than the energy required to generate a spark. Typical components that need I.S. protected signals are float switches and well probes. Determination of when I.S. signals are required is the responsibility of the design engineer with knowledge of the site-specific code requirements.

Digital Water Flow Indicator/Totalizer

Water flow meters with totalization are often supplied as part of the ShallowTray air stripper. Available in several designs and sizes, flowmeters are typically installed in the water feed piping to the stripper, and usually provide a local readout of flowrate (gpm) and the totalized flow (gallons). Refer to the components list insert Section 5 to see which flowmeter was provided with this system. Component information cut sheets are included in Section 5 of this manual.

Flowmeters are sensitive mechanisms that require proper care and maintenance for reliable service. It is prudent to install a strainer or bag filter upstream of the flowmeter to protect it from mechanical damage from debris in the pipeline. If the strainer and/or flowmeter become plugged, disassemble and clean in accordance with the manufacturer’s instructions.

Feed and Discharge Pumps

If pump(s) are included by BISCO as part of your system, they have been selected to meet the required flow and pressure requirements. The pumps are typically end suction, flooded inlet, direct coupled, centrifugal pumps, with either EXP or TEFC motors. The pumps are not self-priming. Prior to initial start-up, the pumps must be primed by filling the pump impeller housing with clean water. Throttling valves are typically installed on the effluent pump discharge**.** If the pump is running wide open and it is not pumping against the required head, the pump may cavitate. This is the nature of centrifugal pumps; they must be throttled back if they are not pumping against the required head. The valve should be throttled until the motor amperage is less than the nameplate motor amps rating.

Before system start-up, it is important to check for proper rotation of the impeller. A pump rotating in the wrong direction could cause the pump impeller to spin off, causing serious damage to the pump.

Systems using discharge pumps must have the flow rates balanced so that the discharge flow rate is greater than the inlet flow rate.

Refer to the components list insert (Section 5) to see which pump(s) were provided with this system. Component information cut sheets are included in (Section 5) of this manual.

High Water Level Alarm Float Switch

The high water level alarm float switch is one of the alarm sensors that must be connected prior to system start-up. The purpose of the high water level alarm float switch is to sense an excessively high level of water in the stripper sump, and provide a signal to communicate to the upstream water source to shut off the incoming water. The high water level float switch is a normally closed microswitch that opens when the float rises approximately 3 1/2 inches (9cm) above its coupling's centerline.

Component information cut sheets for the float switch are included in (Section 5) of this manual.

Line Sampling Ports

Line sampling port(s) (when included) are provided to take water samples of incoming contaminated water and outgoing clean water. The sampling ports are typically 1/2” (1cm) ball valves.

When taking a water sample, open the valve and let the water flow for at least 1 minute prior to bottling the sample. This purges the sample port of any stagnant water.

When purging the sample ports be sure to capture the water and properly dispose of it. When starting the unit for the first time double-check that the valves on the sample ports are closed.

Low Air Pressure/Vacuum Alarm Switch

The low air pressure/Vacuum alarm switch monitors the blower for continuous water treatment. This switch is one of the alarm interlocks that must be properly connected by a licensed electrician prior to the system’s initial start-up. Please see <u>Special Precautions</u> at the beginning of Operating Instructions section for more information.

Should the blower fail, the low air pressure switch is wired to shutoff all incoming water. Using tubing, connect the switch to the hose barb on the tank (pressure system) or the hose barb in the cover exhaust duct (vacuum system).

Pressure system – The air hose is connected from the sump rank 1/8 " (3mm) hose barb (without valve) to the "high" pressure port on the switch using the provided hose barb. The "low" pressure port must be open to the atmosphere. The switch measures the differential pressure between the sump tank and the atmosphere.

Vacuum system – The air hose is connected from the exhaust piping 1/8" (3mm) hose barb to the "low" pressure port on the switch using the provided hose barb. The "high" pressure port must be open to the atmosphere. The switch measures the differential pressure between the top tray and the atmosphere.

Periodically inspect the air hose for water build-up, which will affect the switch's operation. The tubing must remain open at all times.

Test the switch at initial start-up by removing the air hose from the hose barb on the sump tank or exhaust pipe once the system is in full operation. This should set the system into an alarm condition and shut off the incoming contaminated water.

High Air Pressure/Vacuum Alarm Switch

The high air pressure/vacuum alarm switch prevents the system from exceeding its highest rated pressure/vacuum value. If the blower has the ability to produce pressure/vacuum higher than 32 inches (82cm) W.C, for stainless units or 26 inches (56cm) W.C. for plastic units then it should have a high pressure/vacuum alarm switch. Be sure to check that the setpoint for alarm shutdown is at the proper setting for the system.

Panel Disconnect Switch

The panel disconnects switch removes power from the ShallowTray low Profile air stripper control panel. Make sure a qualified licensed electrician installs the power supply into the disconnect switch. Be sure to ground the switch to the main service ground.

Water Temperature Gauge

Water temperature gauges can be installed on both the inlet and outlet piping. Influent water temperature is an important variable affecting the system's removal efficiency.

Water Pressure Gauge

Water pressure gauges can be installed on both the inlet and outlet water piping. Excessively high readings could signal that something in the piping system is plugged. Large pressure fluctuation could be a sign that the water flow rate is varying.

Section 2: Operating Instructions

2-1 Special Precautions:

It is important that a qualified licensed electrician perform these installations.

The following operations must be carried out prior to initial system start-up:

Step 1: Connect the Interlock switches.

High Water level Interlock
If the water level in the sump tank rises beyond the maximum level, it could flood the blower. This may damage the blower and void the warranty. The high water level interlock switch is used to shut off the feed water pump in an emergency situation.

Low Air Pressure/Vacuum Interlock
If the blower fails, untreated water could be discharged. The low air pressure/vacuum interlock switch will shut off the feed water pump to prevent additional water from entering the stripper.

High Air Pressure/ Vacuum Interlock
If the system has a blower capable of producing more than 32 inches (82cm) of water column (w.c.) for a stainless stripper or more than 26 inches (56cm) w.c. for a polyethylene stripper, then the system requires a high pressure/vacuum switch. If a unit fouls or pressure increases due to off-gas treatment, it may exceed the maximum pressure rating of the system and cause damage to the gaskets, sump, or trays.

Note: These interlock options might not have been provided as part BISCO's scope of supply.

Step 2: Fill the Sump Tank and each tray's inlet Chamber.

On initial start-up the sump tank must be filled with **clean water** to a height of about 5 inches (13cm). Make sure the valve to the sight tube is open. The sump tank can be filled via the clean-out ports on the end of the stainless units, or through the inlet water port located on the cover. The inlet chamber on each tray (referred to as seal pots) can be filled manually by pouring **clean water** through the 1 inch (3cm) inlet chamber filling ports, or the 4 inches (10cm) clean out ports located on the ends of the stainless units, or by disassembling the plastic units and filling the seal pots as you reassemble. The seal pots on both the plastic and stainless systems can also be filled at initial start-up by connecting a **clean water** line to the inlet water port and running the system for ten minutes with the blower on and the damper 1/4 open. For complete instructions on this method, please follow initial Start-up procedures later in this section.

Do Not Run Free-Product Through the ShallowTray Air Stripper.

Free product contaminates the unit by coating the side walls with a film of free-product. ShallowTray units are designed to remove dissolved VOC's only.

Fresh air is required for the system air intake. Air that is heavily contaminated with VOC's will significantly reduce the ShallowTray's performance.

2-2 EQUIPMENT SET-UP

Drawings: Drawings referred to in the following sections are located in Section 5.

Follow codes. The plumbing and electrical installations must be performed by qualified personnel, and must be done in accordance with local, state, and national codes.

Protect critical items from the environment. In areas that could be below freezing, the stripper should be installed in a heated building. Plastic units, control panels, and motors should be protected from direct sun. Explosion-proof motors should be protected from rain due to the absence of motor gaskets.

Install adequate supports. Since **none** of the external piping associated with the ShallowTray unit is designed to support process water lines or air piping, adequate supports must be installed.

Assemble Unit. All ShallowTray units are assembled and hydraulically tested at the factory. However, to safeguard the units from shipping damage, some components are removed prior to shipping and will require reassembly. Follow all relevant steps in this section to set-up the ShallowTray system.

Check for loose fittings. Shipping the system to the site may have caused pipe joints or assembly hardware to loosen. Re-tighten as necessary.

Bolt unit together. For shipping purposes, the ShallowTray unit may come in two sections; the blower skid assembly and the sump and tray skid assembly. Bolt the base frames together using the bolts and spacers provided. (This step is done at the factory for the 1300 and 2300 series.)

Connect Blower. For forced draft (F.D., or positive pressure) systems, install the provided rubber coupling to connect the blower outlet to the air inlet on the sump tank. (See Section 5 coupling layout drawing for air inlet location.) For induced draft (I.D., or vacuum) systems, install an exhaust duct from the stripper air exhaust located on the top cover to the blower intake. BISCO Environmental Inc. may not have provided this piping. Make sure the pipe diameter is large enough to maintain the required airflow without adding a pressure drop. Also, be sure the pipe has a suitable vacuum rating to prevent collapse.

Caution: Blower must draw air. Do not vent storage tanks that contain substances that will contaminate the air in the same room the blower draws air from. Do not duct intake air from an area that has contaminated air. Contaminated air will contaminate the water.

Assemble trays and level the ShallowTray unit. Large ShallowTrays may have the top tray and cover shipped separately. Install trays shipped separately by lining up the match-marked arrows and numbers on the trays and cover. To prevent damaging the gasket, do not drag the trays or cover across the gasket during assembly. Fasten all latches properly. The tray being installed must have the downcomers from each upper tray line up with the sealpots on the tray below. Check all the trays to make sure they are installed correctly, and not backwards. If the system is not set up properly, the water could bypass a tray allowing water to miss a large portion of the treatment path. Refer to the “basic subassembly” exploded view drawing in Section 5.

Level the ShallowTray. This is a critical step in the proper assembly of the equipment. If not level, the water depth on the trays will be uneven, causing the water to weep through the tray holes untreated.

For a gravity discharge unit (no discharge pump): Install the outlet pipe.
The plumbing components are typically shipped in a separate box. Refer to the Section 5 outlet piping drawings to assemble.

F.D. systems require a riser pipe (inverted U-trap) to compensate for the pressure generated by the blower. It is important that the riser pipe height be adjusted to create a 5 inch (13 cm) water depth in the sump tank during normal operating conditions. The provided anti-siphon valve must be installed in the high point of the riser pipe to prevent the sump from siphoning to below the 5inch depth. It is essential that the riser pipe be properly supported. Use proper pipe sealant and PVC cement for the riser pipe. We recommend running the system and adjusting the riser pipe before permanently bonding the fitting.

The purpose of having the 5 inch (13cm) water depth in the sump tank is twofold. First, it is to keep the downcomer (from the bottom tray) and the water discharge port (which elbows down internally) submerged. Both are set to a height of 2 inches (5cm) from the bottom of the sump. Keeping them submerged forms a water seal, which prevents air from escaping up the downcomer pipe or out the discharge trap.

Second, the 5 inch (13cm) depth is low enough to allow our high water level switch to reset. The switch, located in its typical position, has an approximate reset deadband of six inches, meaning the water level must drop 6 inches (15cm) below the alarm trip point before it resets. Consult BISCO for additional options or questions about float switch location or normal operating water depth.

For a unit with a discharge pump: Install the outlet pipe.
For a pumped discharge unit: Refer to the Section 5 outlet piping drawing to assemble the water line from the sump tank to the pump suction, using components delivered in a separate box. Install downstream piping to the pump discharge port. A ball valve is typically provided and should be used to adjust flow. Use proper pipe sealant or PVC cement as required. If a check valve is required,

install on discharge side of pump. To reduce pressure losses, it is recommended that the connected pipe size remain at least as large as the pump discharge fitting.

Prime the pump.
Pour clean water in the pump's inlet port until it has filled the entire pump chamber. Remove the top air bleed plug on the pump housing to let air bleed out, then replace plug.

Install the inlet piping manifold.
Install the inlet piping manifold (typically shipped in a separate box). Follow the Section 5 inlet piping diagram for proper installation.

Caution: For systems other than 31200 , 41200, and 61200, there are two inlet port couplings on the cover; one is over the discharge side of the tray and cannot be used, so it is plugged. The other coupling is the active inlet, and has the dip tube inside the top cover. The 31200, 41200, and 61200 series have three, four, and six ports respectively, and all are used. The feed must enter the inlet located above the sealpot of the top tray. Otherwise contaminated water will bypass the treatment path of the first tray and fall directly into the downcomer to the next tray. This will result in poor removal efficiency.

Install the sump drain valve and the sight tube.
Install the sump drain valve and the sight tube. Refer to the Section 5 coupling layout drawing for port locations. Be sure to open the valve to the sight tube during start-up and operation. The valve should be closed only to replace a damaged sight tube.

Connect the water lines.
If the seal pots have not yet been filled with clean water, connect a clean water line to the inlet port or piping manifold and fill the seal pots according to the steps outlined in the initial start-up section above. If the seal pots are filled with clean water, connect the process water line to the inlet piping manifold. Connect the discharge water line. Firmly support the process water lines to prevent stress on the piping and ports. The system is not designed to support the weight of the process water lines.

Connect the air pressure tubing.
Connect the tubing from the ShallowTray to the low air pressure/vacuum switch (if provided), and/or the high air pressure/vacuum gauge (if provided). Read the component description on each for detailed connection information, and also refer to the Section 5 drawings. For the air pressure gauge, be sure to install the tubing to the 1/8" (3mm) shutoff valve. Open the valve only when a reading is required. This will reduce condensation build-up in the gauge. The air pressure switch tubing should always be open for continuous sensing. The switch is designed to drain excess condensation.

Connect the air discharge line.
Connect an air exhaust duct to the air outlet, either on the top of the unit for F.D. installations, or at the blower discharge for I.D. installations. Do not use an exhaust duct with a smaller diameter that the discharge port. A smaller diameter may cause a pressure drop larger than the blower was

designed for, resulting in low air flow and poor removal efficiency. Support the vent line independently of the air stripper so that it can be easily disconnected for maintenance purposes.

Wire the electrical components.
Have a qualified licensed electrician wire the electrical components in compliance with local, state, and national codes. Make sure the safety interlocks, described in the Special Precautions section, are connected properly. If BISCO supplied the control panel, see Section 5 wiring diagrams.

Install optional items:

Air flow meter
Mount the pitot tube on the vent line per Dwyer bulletin # H-11 (located in the separate shipping box) or per the Section 5 “air flow meter assembly” drawings using the mounting hardware provided. Connect pitot tube to the 0-0.5 or 0-1.0 inches w.c.. air pressure gauge using the tubing provided. (See pitot tube mounting diagram in Section 5.) There are two air hoses required, one connects to the high pressure port on the gauge and on the pitot tube, and measures internal static pressure plus velocity pressure. The other connects to the low pressure ports on the gauge and on the pitot tube, and measures the internal static pressure only. The optimum pitot tube location is before the stripper, because the air is less humid and the tubing will be less prone to filling with condensation.

Blower Silencer:
Forced Draft system – Install the silencer on the inlet side of the blower. If the silencer is to be in the vertical position, install the piping and elbow as shown on the Section 5 silencer diagram. If the silencer is in the horizontal position, attach it directly to the blower inlet using a rubber coupling.

Induced Draft system – Install the silencer on the blower. The standard silencer’s maximum pressure/vacuum rating is 20 inches (50cm) w.c. Be sure not to exceed the silencer’s limit

Water flow meter

Install the water flow meter into the inlet piping per the Section 5 water inlet piping diagrams. The flow meter owner’s manual was sent with the unit. Be sure to refer to it when installing the meter. It is prudent to install a strainer in the incoming process water line prior to the water flow meter. This will prevent rotor jamming.

Note: There may be other optional equipment that requires installation or assembly. Please refer to the Section 5 specification sheet and drawings for more information.

2-3 INITIAL SYSTEM START UP

Upon completion of the equipment set-up and mechanical/electrical installation, proceed with the following steps:

Step 1: Check all connections and close drain and sample valves.
Double check that all electrical, water, and vent connections are properly made. Close drain port and sample valves. Be sure that the sight valve is open.

Step 2: Power up.
Turn all panel control switches to the 'OFF' position, then turn 'ON' the panel disconnect switch. Systems with intermittent operation feature will show an alarm condition (low air pressure) five seconds after power is applied because the blower is not operating. Once the blower is supplying proper pressure, the alarm low air pressure condition will reset. Some systems may require pushing an 'Alarm Reset' button.

Step 3: Check the blower rotation.
Check the blower rotation by momentarily switching 'ON' (bumping) the blower switch and observing whether the blades turn in the direction of the arrow on the blower casing. You can also observe the motor's cooling fan blades for proper rotation. If system panel has the intermittent operation feature, the blower motor must be bumped in the 'Hand" position. Refer to the Routine Operation Section for a description of "intermittent operation". If blower rotates in the wrong direction, turn the main disconnect off and have a electrician make wiring changes to correct the rotation.

Step 4: Attach clean water line to the inlet.
If you did not fill the seal pots on each tray manually, fill them now by attaching a (clean) water line to the water inlet piping manifold or port, and then follow Step 5. If you have already filled the seal pots manually, skip Step 5 and go to Step 6.

Step 5: Fill the seal pots (inlet chamber) with clean water.
Use clean water when filling the seal pots. If contaminated water is used it will go through the system untreated.

To fill the seal pots (inlet chambers), set the blower damper to 1/4 open, and start the blower and the clean water flow to the unit. Let the blower and clean water run for about five to ten minutes, then shut them off. Setting the damper at 1/4 open reduces the air flow enough to allow the water to flow through the downcomers and into the seal pots.

If the system has the intermittent operation feature, the blower must be started in the 'Hand" position for this procedure. If you have trouble filling the seal pots by this method you can fill them manually, either by using the one inch sealpot filling ports (stainless units only), or by spraying a stream of clean water through the clean-out ports (stainless units only). The stream of water must be directed into the sealpots on the opposite side of the unit, until the sealpot is full. For plastic units you must remove the trays and fill the sealpots manually.

Step 6: Connect contaminated feed water line.
Connect contaminated feed line. Install all piping allowing provision for future removal for maintenance or repair. Make sure piping is supported independently of the ShallowTray. Start system with the blower damper 1/2 open. For systems with intermittent operation, you must turn ’OFF’ the power at the panel disconnect, turn all control switches to the auto position, and then reapply panel disconnect power. All motors will start automatically based on control function. Each control panel is custom designed for each site. Become familiar with the panel logic and proper operation before attempting to start the system. The panel might have been provided by a panel manufacturer other then BISCO.

Step 7: Check the air pressure reading and set damper.
Run the unit for 5 minutes, and then adjust the blower damper setting to produce the required air pressure/vacuum reading on the pressure gauge. Since the blowers provided by BISCO are selected and tested to exceed the minimum flow requirements of the system, you can use the table in Section 1-3 to set the damper during initial start-up.

Double check pressure reading after system has been running for about 1/2 hour. Adjust damper again if needed. Also check the airflow meter for proper airflow rate. Pressure readings may vary somewhat depending on your venting system.

The System is ready for operation.
It is not necessary to perform initial start-up procedures each time the system is shut down. However, note that anytime water is completely removed from the seal pots or sump tank, the initial start-up procedure must be done again. For example, after the system has been taken apart for cleaning, or after an extended shutdown where the water have may evaporated from the tank or seal pots.

2-4 Routine Operation

From the tables in Section 1-3 adjust the airflow to within the required operating range in SCFM. The airflow must be a least the minimum shown for proper stripping efficiency.

Adjust water flow rate by setting the water throttle valves. Now that the system has been primed per the initial start-up procedures, it is ready for fine tuning. Adjust throttle valves on inlet and outlet piping to obtain the desired water flow rates and minimum pump cycles, if applicable. Refer to the Section 5 specification sheet for your systems design and maximum water flow rates. To prevent a high water level alarm, it is critical that the discharge pump flow rate exceed the influent water flow rate.

Pumps provided by BISCO have throttle valves on the discharge side of the pump. Once the desired water flow rate is achieved, check the amp draw of the motor. It must not exceed the pump nameplate amp draw.

High water level alarm switch: The switch is typically installed in the middle of three half inch switch ports located on the front of the unit (refer to the Section 5 coupling layout drawings). If the float is moved to the highest port and the discharge line plugs or the discharge pump fails, the water level could rise above the air inlet port, allowing water to drain into the F.D. blower housing or onto the floor. The blower may become damaged if it is running while water is in the blower housing. Be sure to check that the 1/8"Ø (3mm) coupling in the bottom of the blower housing is open to allow for drainage of water that may get into the housing.

Section 3: Cleaning Procedures

Minerals dissolved in high concentrations tend to precipitate out of groundwater during air stripping processes. These minerals form insoluble deposits commonly referred to as 'fouling.' Although the ShallowTray low profile air stripper system is designed to be fouling resistant, proper steps must be taken when treating water with high mineral concentrations. Deposits from iron-rich feed water can be reduced by pretreating the feed stream with sequestering agents. The recommended cleaning procedure for deposits is pressure washing with detailed instructions as follows:

Equipment Required:

Pressure Washer: 2 gpm minimum flow at 900 psig (minimum). Equipment rental companies can usually supply electric or gasoline driven units on a daily rental basis.

Washer Wand: Washer wand with spray nozzle, (obtainable from BISCO as an option) and an adapter to connect the wand to the pressure washer hose end. All washer connections are 1/4" (6mm) NPT.

Clean Water Supply: Clean water supply with a capacity of at least 2 gpm at 20 psig. Connect to the pressure washer using an ordinary garden hose.

System Shut Down:
Shut feed water off.
Shut off the water feed to the system.
Wait 5 minutes to allow the water in the stripper trays to be completely treated, then shut off the blower. Treated water in the trays will drain into the sump tank, so it is important to keep the outlet pump in "auto" to remove this extra water.
Shut off the power at the main disconnect switch if the shutdown is more than temporary.

Caution: If proper shut down procedures are not followed, contaminated water will drain into the sump tank. This will contaminate the water that has been collected in the tank. Therefore, always allow the blower to run an additional 5 minutes after the feed water is shut-off.

Cleaning the Unit:

Step 1: Turn off equipment.
Turn off the feed water to the stripper.

Step 2: Provide for Waste Disposal.
Make provisions for disposing of the sludge and waste generated during cleaning. A wet/dry vacuum may be required, or possibly the outlet pump (if provided) can pump out to a storage tank. Be aware that large pieces of debris might possibly clog the outlet pump or check valve.

Step 3: Remove cleanout port covers.
Remove all cleanout port covers.

Step 4: Turn on water and pressure washer.
Turn on the water supply to the pressure washer. Then, turn on the pressure washer. Wear protective goggles or face shield while spraying.

Step 5: Insert wand and start pressure washer water flow.
Insert the wand all the way through the 8” (20cm) cleanout port on the sump tank. Have the spray nozzle pointed up toward the bottom of the bottom tray. Holding the wand tightly, pull the trigger to start the pressurized water flow. Expect the wand to kick back as flow starts.

Step 6: Move wand side to side.
Move the wand side to side at a rate of about 1 inch (3cm) per second. Be sure to cover the entire tray bottom area. Recommended cleaning times for one side of one tray are given below:

Model 1300	2 min
Model 2300	4 min
Model 2600	8 min
Model 3600	12 min
Model 31200	23 min
Model 41200	32 min
Model 61200	48 min

Step 7: Inspect cleaned area.
Periodically stop the cleaning operation and inspect the cleaned area by shining a light into the unit. The area is clean when there are no deposits in or around the stripper tray holes.

Step 8: Clean top side of tray.
When the bottom surface appears clean, move the wand to the top side of the same tray by inserting it in the next highest cleanout port. Continue spraying with the nozzle pointed down onto the top surface of the tray. Remove all visible deposits from the tray baffles and the walls of the unit.

Step 9: Repeat for all trays.
Repeat the procedure for the bottom of the next higher tray, etc., working up to the top tray.

Step 10: Rinse.
After the cleaning operation is finished, rinse the trays, baffles, and walls with the pressure sprayer. Work down from the top tray to the sump tank. Make sure the surfaces are clean and the holes are not blocked by loosened debris.

Step 11: Clean cover.
Remove the top cover. Flip it over, and wash the bottom side. Inspect spray nozzle and the wire mesh mist eliminator pad for fouling. Clean the spray nozzle and the mist eliminator pad.

Step 12: Replace the mist eliminator pad.
Mist eliminator pads that are excessively plugged should be replaced. The old pad is removed by loosening the retainer plates on the corners of the pad. Reinstall the new pad in the same orientation as the old one.

Section 4: Trouble Shooting

Note: A competent electrician should perform any work inside the electrical control panel. Do not perform troubleshooting if you are not familiar with the procedures or the equipment.

Problem Blower Won't Start Or Run

No power to blower

Check that all switches are in "ON" or "AUTO" position.
Position main disconnect switch to "ON" position. Turn control switches to" on" or "AUTO".

Blown Fuse

Check to see if fuses are ok.
Check fuses in main disconnect switch and in control panel. If blown, replace with fuse of the same size and rating to avoid the risk of fire or electrical shock.

Overload relay Trips

Locate reset button on blower overload relay.
Push reset button in. Reasons for tripping; incorrect line voltage, motor wired incorrectly, inadequate ventilation, worn bearings.

Tubing to air pressure switch plugged

Remove tubing from air pressure switch and blow into it towards tank. Clean or replace tubing if plugged or kinked.

Blower dose not rotate freely.

TURN OFF ALL POWER to the system. Try to spin wheel by hand. Wheel should rotate freely. If not, call BISCO.

Problem Outlet Pump Won't Shut Off

Suction or Discharge piping to pump is clogged.

Check water flow from discharge pipe. Piping should be clean inside. Look for narrowing caused by scale or iron accumulation. Remove piping. Inspect, clean, or replace as necessary.

Float switch in tank is stuck in down position.

Remove 8"Ø or 12"Ø (30cm) inspection cap and check that all floats are floating on the water. Clean all deposits from float. Replace float if necessary.

Normal Operation: Water level in sump is OK. Pump will stop when water level reaches pre-determined height in tank. Allow water level to decrease until pump turns off. Let water level reach predetermined lower level, which will cause outlet pump to turn off. Water level may be just below the bottom of clear sight tube before pump shuts off – this is normal.

Problem	**Outlet Pump Won't Run or Pump Water**
No power to Pump	**Check that all switches are in "ON' or "AUTO" position.** Position panel disconnect switch to "ON position. Turn control switches to "ON" or "AUTO."
Blown fuse	**Check to see if fuses are ok.** Check fuses in main disconnect Switch and in control panel. If blown, replace with fuse of the sane size and rating to avoid the risk of fire or electrical shock.
Overload relay trips	**Locate reset button on pump overload relay.** Push reset button in. Reasons for tripping; incorrect line voltage, motor wired incorrectly, inadequate ventilation, worn bearings.

Normal operation: Water level in sump is OK. Pump will start when water level reaches predetermined height in tank. Allow water level to increase until pump turns on. Be sure pump switch is in "AUTO" position. Let water level reach predetermined upper level, which will cause outlet pump to turn on.

Level switch in tank is wired incorrectly in control panel

Check wiring circuit against diagram. See that all connections are tight and no short circuits exist because of worn insulation, crossed wires, etc. Rewire any incorrect circuits. Tighten connections, replace defective wires.

Pump does not rotate freely

TURN OFF ALL POWER TO THE SYSTEM. Try to turn impeller by hand. If impeller won't turn, remove housing and locate source of binding. It could be due to impeller, seal, or bearing damage, or excessive fouling.

Impeller or check valve is fouled.

TURN OFF POWER**.** Remove pump outer housing and inspect impeller for blocked openings. Be sure to have a new housing gasket kit available before removing housing. Remove check valve from line and inspect for stuck or fouled valve. Clean or replace impeller or check valve as necessary.

Problem Low Air Pressure/Vacuum in Stripper Tank

Blower damper closed.

Visually check position of damper on inlet of blower. Open damper to get proper reading on pressure gauge. Firmly tighten damper set screw.

Motor rotation backwards

Watch rotation of blower wheel at slow speed. It must match direction of the rotation arrow on the blower housing. Have electrician reconnect wiring for proper rotation as per motor diagram.

Gravity discharge trap installed incorrectly

Trap should be positioned vertically, as an "upside down U." Install discharge trap per outlet plumbing drawings located in Section 5.

Inlet chamber (sealpot) in each tray not full of water.

Remove 4"Ø (10cm) rubber caps, or slide tray aside and look at water level in chambers. Remove 4 inch (10cm) rubber caps on end of trays. Fill up inlet chambers with a hose, or follow the sealpot fill procedure as described in the initial Start Up section.

Rubber clean out caps not in place.

All cleanout ports must have a rubber cap installed. Tighten clamps on all rubber caps.

Tubing to pressure gauge

Remove tubing from pressure gauge and blow into it towards tank. Clean or replace tubing if plugged or kinked.

Gravity feed not flowing

Unit has gravity feed and inlet pipe on inside of ShallowTray cover is not submerged in inlet chamber water. Remove cover and measure length of piping hanging from inside of cover. Length is to be about 10 1/2 inches (27cm) from cover surface. Adjust length of inlet pipe on inside of cover until total length is about 10 1/2 inches (27cm). DO NOT INSTALL NOZZLE ON A GRAVITY FEED UNIT.

Blocked blower intake

Look at blower intake screen. Remove debris from screen.

Normal operation: When inlet pump starts, the blower will start and air pressure will increase to required operational level. No action necessary.

Problem High Pressure/Vacuum in Stripper

Air exhaust is restricted

Check vent piping for bird nest or other obstructions. Check that vent pipe diameter does not decrease. Intake or exhaust air pipe diameter must be at least as big as the cover vent or blower intake diameters.

Air holes in trays plugged

Remove inspection and cleanout caps and visually inspect holes. For iron fouling, clean out the unit with a pressure washer. For scaling, scrape or bang the scale from all surfaces, then use a pressure washer to open the 3/16 inch (5mm) diameter holes. Consider using a sequestering agent to prevent scaling.

Mist eliminator is plugged

Remove cover from ShallowTray and inspect the bottom of the mist eliminator pad in the cover. Remove mist eliminator pad from cover and clean. If fouled, replace with a new mist eliminator.

Problem Water Won't Flow Into Unit

Inlet/well pump function

Allow water level to rise in well pump, which will turn on the inlet pump and start water flow to system. No action necessary.

Stripper air pressure in low alarm condition

Read sump tank air pressure from pressure gauge. System should be in alarm condition if pressure is below about 2" inches (5cm) w.c. Check that blower is operating properly, and has correct rotation. Check that all rubber caps are in place on end of trays.

Inlet piping plugged

Remove cover and inspect nozzle and piping for debris and buildup. Clean or replace clogged parts.

Problem Iron Fouling Is a Problem

Iron build-up

Iron precipitates out of water when treated with an air stripper, causing iron build up in unit. Remove cleanout caps and inspect inside of tray for buildup/fouling. Clean out unit with pressure washer on a routine basis. Pre-treat incoming water to reduce fouling problems in stripper. Meter a sequestering agent into the water.

Problem VOC Removal Is Less Than Expected

There are many possible reasons for poor stripper efficiency. Review the following list of questions to troubleshoot what the problem might be.

1. Have the trays been taken apart? Are they put back together as supplied from the factory, i.e., dip tube over sealpot, downcomers from each tray underwater in the sealpot of the tray below?

2. What is the sump tank air pressure reading? Is it steady, slowly changing over time, or rapidly fluctuating?

3. What is the flow rate through the stripper? How is it measured? Where is the sensor mounted?

4. What is the air intake and exhaust piping design (size of ducts, number of elbows, length of pipe run, GAC, heaters, other restrictions)? Are sample ports installed on each tray to verify pre-tray removal efficiency?

5. Is sump tank contaminated? Where are effluent samples taken from?

6. Are sample ports purged for 30 seconds-1 minute before taking sample?

7. Are samples being taken, stored, and tested per approved methods?

8. Are seal pots on each tray full of water?

9. Dose the sump tank have at least 4 inches (10cm) of water at all times?

10. Is the water suction elbow in the tank pointing down and always underwater?

11. What is the inlet water temperature?

12. What else is in the water besides the contaminates in question?

13. Are there occasional slugs of free product, or much higher than normal contaminant concentrations that could enter the stripper?

14. Is inlet water supplied as a continuous stream (as from an electric pump.)? Or is the flow pulsed (as from a pneumatic pump)?

15. Are their surfactants, detergents, greases, fats, etc. in the water that are causing foaming in the stripper?

16. Is there equipment near the blower intake that could be contaminating the air?

17.Has the air entering the blower been tested for VOCs?

18. How far away from each other are the air intake and air exhaust points? Is the air intake downwind of upwind from the exhaust? Is it possible for contaminated air to be sucked back into the stripper air intake?

19. Is the blower spinning in the correct direction (top of blower wheel spinning towards tank)? Watch wheel when it is almost stopped.

20. Is there air coming out of the discharge pipe?

21. Is outlet piping siphoning all water out of the sump tank, until it sucks air from tank?

22. What is the outlet plumbing design (gravity discharge, pumped discharge, uphill, downhill, other equipment in-line, size of piping. etc.)?

23. What do the bubbles look like in each tray? Install view ports to see.

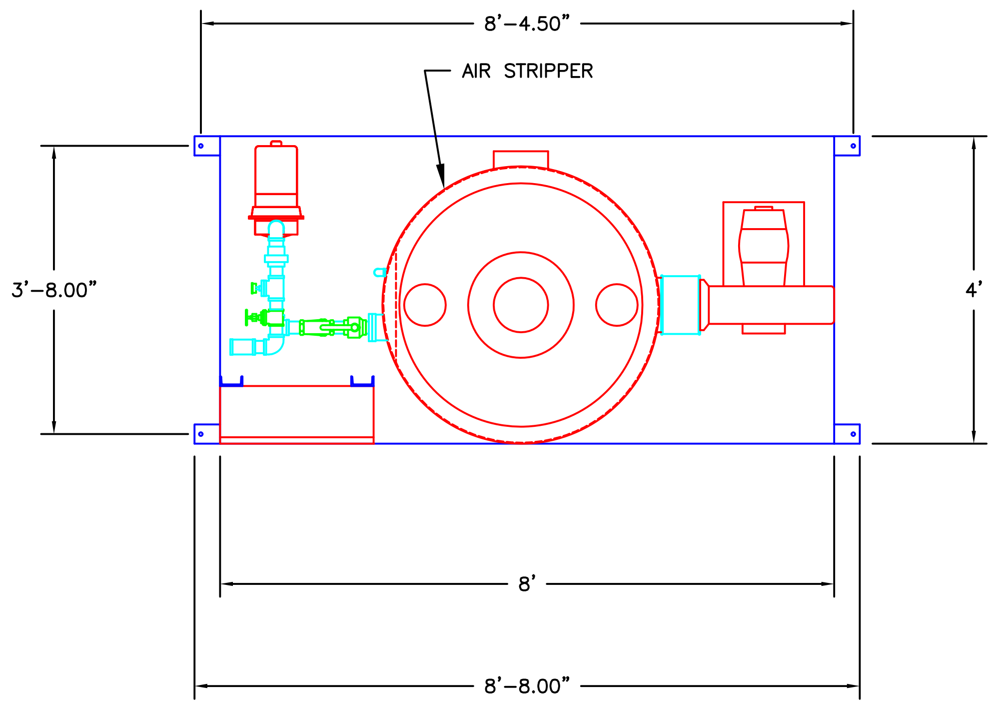
24. Are the undersides of the trays free of drips and drizzles?

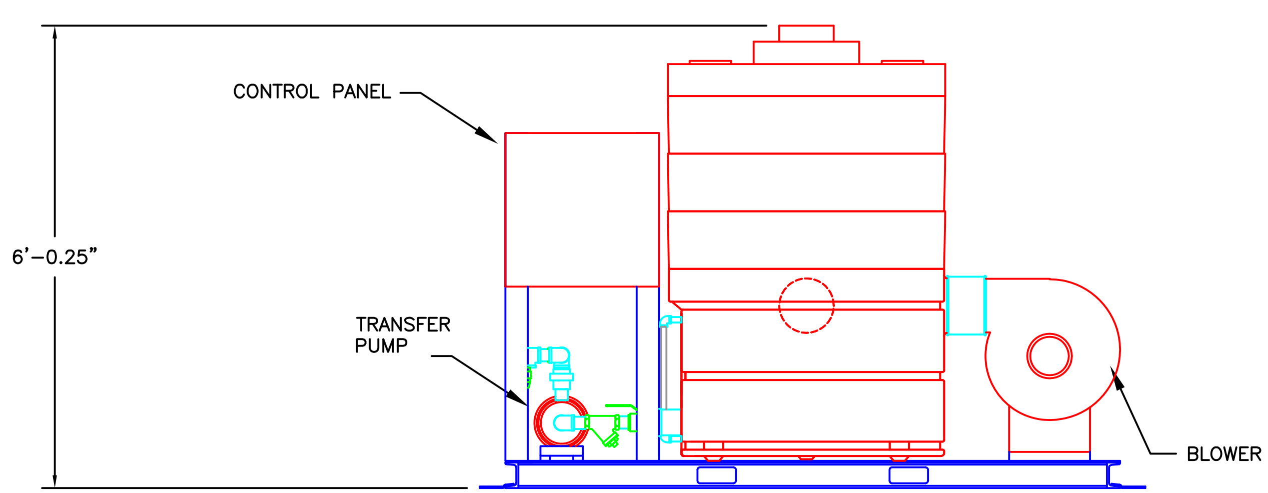
25. Are tray holes closed or plugged? Is there any scaling or fouling on the trays?

26. Is the system level and plumb?

27. When shutting system down, is inlet water shut off, blower allowed to operate for an additional 5 minutes, then blower shut off?

Section 5: Components List, Drawings, & Cut Sheets





REVISIONS			
1	ADDED MOUNTING DIMENSIONS	1/15/13	NVC

CONFIDENTIALITY NOTE:
The information contained in this drawing is intended for use only by BISCO Environmental and Haley & Aldrich. The information is confidential and any copying, distribution or dissemination without the consent of BISCO Environmental is STRICTLY PROHIBITED.

BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

TITLE
AIR STRIPPER SKID LAYOUT

DRWN BY NVC	DATE 11/05/13
CHK BY	DATE
APPR BY	DATE

HALEY & ALDRICH
ROCHESTER, NY PROJECT

JOB NO. 13057

SCALE	SIZE	DWG NO.	SHEET	REV
1"=30"	B	13057LML	1 OF 1	1

Manual LNAPL Recovery and Measurement Procedure

Introduction

The following summarizes the equipment and procedures necessary to complete manual LNAPL recovery at the GM Components Holdings LLC, Rochester Operations facility. There is also information about measuring LNAPL in the appropriate wells and drums.

Equipment List

- **Buy/ Rent**
    - 100 ft oil water interface probe-
        - Eco-Rental Solutions-75 Rockwood St, Rochester, NY 14610,
        - (585) 625-2323 or (855) 326-7368
    - 5 gallons of distilled water
    - Hand Wipes/Adsorbent Pads

- **H&A Field Lab**
    - Spill Buddy Pump with extra charged battery
    - 2 five gallon plastic buckets for decontamination
    - At least 30 pairs of nitrile gloves
    - Alconox Soap or equivalent
    - Drum Wrench to open up drums
    - At least 3 extra bailers 2 inch
    - At least 10 Sorbent Pads
    - Zip lock bags
    - Garbage Bags- 30 gallon, heavy duty
    - Bailer String
    - Paper towel
    - Spray bottle/ cleaning product to wipe down oil/water probe
    - Cart to carry equipment around
    - Water level probe
- **GM Facility**
    - Carrying Cart located in Eastside GW Treatment Plant Building
    - Funnel
    - Oil Waste bucket
- **Safety Gear**
    - Safety Glasses
    - Hard Hat
    - Tyvek Coveralls
    - Steel/Composite toed boots
    - High Visibility safety/traffic Vest

- **General**
  - Tools consisting of screwdriver, socket set, cutters, wrench
  - Site Specific HASP
  - Clipboard/Binder
  - Pens/Pencils/ Sharpie
  - Blank DFR
  - Print out of GM Monthly Baildown/Recovery sheets to record gauging data
  - Site Map with wells marked
  - Bedrock well Installation Reports for wells to be bailed

Standard Operating Procedure

- **Before Event**

1. Prior to Event, charge spill buddy pump batteries in field lab for approximately one hour. Make sure spill buddy pump is working properly by testing with canola oil.
2. Rent equipment from Eco-Rental Solutions. Schedule the use of company truck or rental vehicle from Enterprise.
3. Collect equipment and confirm with Project Manager and the list of wells to gauge and perform LNAPL Recovery.
4. Confirm that the HASP will be onsite during event.

- **Onsite-Preparation**

1. Enter GM CH Facility through the North End shipping entrance on Driving Point Park Avenue and sign in with Site Security.
   Note Initial visit will require sign in at the front office to watch the safety video and obtain the annual safety card.
2. Go to East side Treatment plant building and gather equipment. A green cart is located inside the building consisting of sorbent pads, paper towel, cleaning product, Tyvek, Etc.
3. Fill one bucket with 2-3 gallons of distilled water and one bucket with 2-3 gallons of distilled water and alconox soap. Carry one of these around with equipment.
4. The Cart should be filled with the following materials carried to each well:
   - Spill buddy pump
   - Extra Bailer
   - Oil Waste Bucket- Can be found next to waste drum located near R-309
   - Oil Water Probe
   - String, socket set, sorbent pads, spray bottle, paper towel, gloves, clipboard with data sheets and site figure, tools, distilled water bucket, garbage bags
5. Cart will be used to carry equipment from well to well. It is recommended to start with wells located inside the facility.
6. In high traffic areas, place a cone or high visibility object by well area to alert plant personnel of your presence (specifically SR-313 and SR-312).

- **At each Well- Spill Buddy**

1. Open the well and measure the depth to product and depth to water using the oil/water interface probe. Record the time and data on field forms. Wipe the probe using sorbent pad.
2. Prepare the spill buddy pump for product removal. Connect the discharge tube to the waste oil bucket and turn the petcock to the open position.
3. Place one or two sorbent pads on the ground underneath the pump.
4. Turn pump on and drop down the well opening using a fishing technique. The pump will respond with a continuous beep when contacting water. The pump should be placed approximately 5 inches above the water level. This will ensure about 5 inches of product level left in the well for easier recharge of product.

   Note When reeling the pump into the well, be careful not to catch the probe on the well screen or blockage in the pipe. This could cause the cap to loosen and disconnect from the probe, losing the pump in the well.

5. When pump is at the correct level, switch the pump to the PUMP ON toggle and the pump should begin.
6. When finished pumping, wipe product from the hose and pump using sorbent pads and rinse the pump in distilled water bucket.
7. Measure the depth to water/product again and record the data on the field forms. Measure and record the approximate gallons of product recovered in waste oil bucket.
8. Decon the oil/water probe with distilled water or cleaning product and paper towel. Decon all necessary equipment before moving on to next well.
9. Carefully transfer product waste bucket to 55 gallon waste drum located near R-309 using the funnel.
10. Dispose of all spent sorbent pads, paper towels, gloves, ETC in garbage bag and ensure nothing drips or spills on the floor.
11. Repeat steps 1-11 for each well.

   Note Make sure an open bed truck is used to transport waste product from outside wells SR-318 and SR-102

- **Alternative Using Bailers**

1. It is recommended that a bailer be used for SR-318 and SR-312 due to disturbances in the riser pipes
2. From the previous directions, step 1 and 7-10 should be repeated.
3. While using a bailer, tie sufficient string to the bailer in order to reach down to the product level in the well.
4. When the string is fastened tight to the top of the well, lower the bailer down in the well, pulling up and down using a fishing motion. This will collect product in the bailer.
5. Remove product from the bailer into the bucket by pushing up on the ball plug at the bottom of the bailer.
6. When bailing is completed, leave the bailer in the well and tie off close to the top of the well riser.

- **Measuring Oil Drums**

1. Using the oil/water probe, measure the amount of oil in each LNAPL recovery drum.
2. Record the amount of oil in each drum on the product recovery form.

- **Finish up/Cleanup**

1. After completing all LNAPL Recovery, dump all waste oil product recovered in the 55-gallon waste drum and clean area.
2. Bring cart with all equipment back to the Treatment plant for cleanup and decon.
3. Add 3 gallons of distilled water to bucket and add 1 packet of alconox cleaning soap.
4. Wash the oil/water probe in decon bucket and dry.
5. To wash the spill buddy pump, disconnect the cap, spring and pump from the probe and scrub them in the decon bucket individually. Dry each component and reconnect.
6. To get rid of moisture in the pump, pump canola oil through the pump. This is important because it will prevent rust and damage to the pump.
7. Make sure all equipment used is decontaminated and cleaned.
8. Leave cart in treatment building with excess supply of sorbent pads, Tyvek suit, garbage bags, gloves, paper towel.
9. Dispose of garbage bag with waste in dumpster back at the Plant.
10. Return all rental equipment.
11. Report events on DFR. Include any unexpected events.
12. Email DFR and field forms to Project Manager.

Example of field form to document oil recovery:

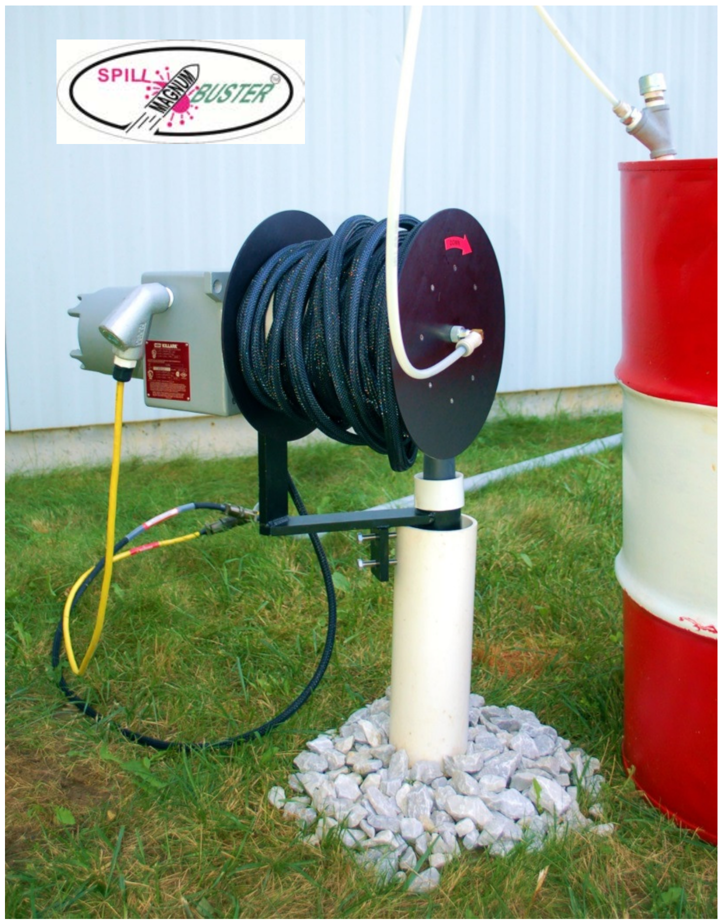
Name: ______________________

Date:

Site ID: 828064		General Motors Components Holdings			1000 Lexington Ave. Rochester, NY	
Well ID	Depth to Product (DTP) (ft)	Depth to Water (DTW) (ft)	NAPL Thickness (ft)	Product Recovered (gal)	Recovery Drum	Comment
SR-309						
R-309						
SR-310						
SR-312						
SR-313						
SR-326						
SR-503						
R-235						
R-236						
SR-102						
LR-2						
LR-3						

Field Comments

Magnum Spill Buster
Product Recovery System



Operator’s Manual
PN 3013

Rev- Initial Release

REVISIONS			
REV	DESCRIPTION	INITIALS	DATE
	Initial Release	DFB	11/8/13

Magnum Spill Buster Limited Warranty

All references to the customer herein shall mean the Purchaser or the Lessee as applicable. CLEAN EARTH TECHNOLOGY, INC. (CET) warrants the Magnum Spill Buster System to be free of substantial defects in material and workmanship for one year from the date of shipment. Pumps are warrantied for 90 days. CET's sole responsibility under this warranty shall be to either repair or replace, at its option, any component which fails during the applicable warranty period because of defect in workmanship or material. No other liabilities shall be assumed by the manufacturer or its agents, nor are they expressed or implied.

This warranty is contingent upon proper use of the Magnum Spill Buster System by the Customer in accordance with CET's published specifications. This warranty shall not be valid if the alleged defect is the result of abuse, misuse, accident, alteration, neglect, unauthorized repair, or acts of nature. Any repair shall be deemed unauthorized unless it is made by CET or with the written consent of CET. This warranty is the sole warranty made by CET to the Customer and is in lieu of all other warranties or obligations, expressed or implied.

System upgrades will be made available to customers as they are completed. Clean Earth Technology, Inc. is not obligated to provide those upgrades without cost.

WARNING: Logic board dip switch settings other than those shown herein are not approved by Clean Earth Technology, Inc., and may cause spillage of product. Please consult the factory for alternate settings.

WARNING: In the event that equipment is returned to the factory for any reason, a complete decontamination must be done before shipment. See page 89 of this manual for the decontamination procedure. Shipping hazardous materials improperly may be a Federal offense.

WARNING: Unauthorized user modifications or application beyond the published specifications may result in electrical shock hazards or improper operation. Clean Earth Technology, Inc. will not be responsible for any injuries sustained due to unauthorized equipment modifications.

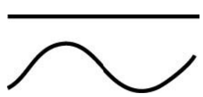
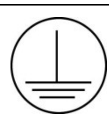
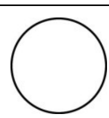
Restrictions and Liabilities

Information in this document is subject to change and does not represent a commitment by Clean Earth Technology, Inc. Changes made to the information in this document will be incorporated in new editions of the publication. No responsibility is assumed by Clean Earth Technology, Inc. for the use or reliability of software or equipment that is not supplied by Clean Earth Technology, Inc. or by its affiliated dealers.

Safety Considerations

Use of this instrument is restricted to qualified personnel who recognize shock hazards and are familiar with safety precautions used when operating electrical equipment. Read the manual carefully before operating the Magnum Spill Buster.

The following warnings and informational symbols may be found on the Magnum Spill Buster and/or in this manual:

Symbol	Description
	Caution: Risk of electric shock
	Direct / Alternating Current
	Direct Current
	Alternating Current
	Protective Earth (ground)
	Warning: Refer to accompanying documentation
	Off (Power: disconnection from Mains)
	On (Power: Connection to Mains)

Hazard Warnings

- Warning! Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

- Warning! Explosive Vapors. The control panel and Standard Auto Seeker are not explosion proof or intrinsically safe, and should be located outside of any classified hazardous areas where explosive vapors may be present.

- Warning! Electrical Shock. Correct grounding is absolutely necessary for the system to work properly and safely. Failure to do so may result in damage to the system and/or electrical shock, which may result in serious injury or death.

- Warning! Electrical Shock. All AC Power wiring must be done by a qualified electrician. Disconnect AC power at its source prior to connecting/disconnecting any wires at the terminal block. Electrical shock may result in serious injury or death.

- Warning! Chemical Incompatibility. Due to possible adverse reactions with some of the materials used in the standard Magnum Spill Buster, it should not be used to pump any Halogenated Hydrocarbon (HHC) solvent containing any of the following elements (examples are not all inclusive):

    - Flourine (f) "-flour-" Examples: Dichloroflouromethane, Trichloroflouromethane.
    - Bromine (Br) "-bromo-" Examples: Methyl bromine, Ethylene dibromide.
    - Chlorine (C1) "-chloro-" Examples: Perchloroethylene, Trichloroethane, Dichloromethane.
    - Iodine (I) "-iodi-" Examples: N-butyl Iodide, Methyl Iodide.

  If remediation of an HHC solvent is required, we can build the Magnum with an epoxy probe in place of standard materials and an alternate pump. Failure to heed this warning could result in severe damage to the system and the resultant possibility of injury to personnel and damage to the surrounding site.

Any chemical of concern (COC) that may be present on a site must be disclosed to Clean Earth Technology at the time of all requests for quotes. Disclosure of COCs must also be made if a system is moved from its original site to another where COCs are present.

Precautions

The following precautions are provided to help you avoid damaging the system:

- **Caution: Service.** Authorized service personnel should service the Magnum Spill Buster. Only qualified technical personnel should perform troubleshooting and service procedures on internal components.
- **Caution: Site Security.** Access to the site and to the Magnum Spill Buster System must be controlled at all times. The equipment is specialized and must only be operated by qualified and trained personnel. Locked sheds, vaults, and fenced enclosures are

good examples of a secured site. Clean Earth Technology does not warranty damage to equipment due to vandalism or negligence.

- **Caution: Proper Grounding.** It is absolutely necessary to ground every system, whether powered by AC or battery-operated. Always call the factory if you have any questions about the proper way to ground your Magnum.
- **Caution: Regular Maintenance.** The down-well probe and pump should be regularly inspected and maintained, as detailed in Section 5.0, page 65 . The frequency of maintenance will depend on your site conditions. We recommend that you start with weekly checks of the pump and probe until experience dictates that a lengthier interval will suffice. Failure to provide regular maintenance will damage your Magnum and may result in unsafe operating conditions. Clean Earth Technology is not responsible for damage to equipment or injury to personnel resulting from improper maintenance practices.

The policy below applies to both equipment sales and repair orders. For a Return Material Authorization number, please call our Service Department. (802) 425-3710

Clean Earth Technology, Inc.

Environmental Equipment Return Policy

This policy refers to ANY EQUIPMENT OR PARTS being returned to Clean Earth Technology, Inc. (CET), whether:

- Customer owned, leased, or rented.
- In warranty or out of warranty

NO equipment or parts should be shipped to CET without first contacting our service department for a Return Material Authorization number (RMA). Contact our service department at **(802) 425-3710** to be assigned an RMA number.

- CET reserves the right to refuse delivery of any equipment without a CET RMA number clearly displayed on the exterior of the package(s).
- CET reserves the right to refuse delivery of any equipment improperly decontaminated.
- CET reserves the right to add a fee of $500.00 to the repair invoice of any equipment or parts not decontaminated to the satisfaction of CET.

Environmental Equipment Return Guidelines

- All equipment must be thoroughly cleaned, purged of product and decontaminated prior to shipment to CET. NOTE: CET recommends the use of Personal Protective Equipment, level C or D, as defined in OSHA 29 CFR 1910.120.

- CAREFULLY FOLLOW THE EQUIPMENT DECONTAMINATION PROCEDURES FOUND ON PAGE 89 OF THIS MANUAL

Any equipment or parts shipped to CET must include the following documentation:
CET RMA/Repair Order form completed by customer. An “RMA number/REPAIR ORDER” form to copy is found on page 93.

- Description/name of product pumped.
- Reason for return.
- The CET RMA number clearly marked on the outside of ALL packages and paperwork.

All items being returned (including all warranty-claim shipments) must be sent freight prepaid to our factory location:

Clean Earth Technology, Inc.
445 Long Point Road
N. Ferrisburgh, VT. 05473

When you ship an item to CET, we recommend using UPS, FedEx, or another reputable shipper. We also recommend that you insure your shipment for its actual replacement cost. Clean Earth Technology will not be responsible for lost shipments or instruments that are received in damaged condition due to improper packaging or handling.

Use the original carton and packaging material for shipment. If they are not available, we recommend the following guide for repackaging:

- Use a double walled carton of sufficient strength for the weight being shipped.
- Use sufficient industry approved, shock-absorbent packing material to protect all surfaces and projecting parts. The items packed should not be able to slide or shift their position within the box.

CONTENTS

Product Introduction

The Magnum Spill Buster™ family of equipment is an automated free phase petroleum contamination pumping system. It is specifically designed to remove NAPL petroleum product from the water table via a 2″ or larger diameter well. Its unique auto-seeking device allows the pump intake to automatically follow the elevation of the oil/water interface as it fluctuates throughout the entire length of the well. The Magnum Spill Buster will not pump any amount of water.

Control Boxes mounted in a NEMA enclosure

The Magnum Spill Buster is composed of three interactive modules: The Control Box, the Auto Seeker, and the down well Probe.

The **Control Box** coordinates and displays the condition of the system operation and also allows certain system parameters to be varied.

Magnum Control Box with protective cover removed

Standard Auto Seeker

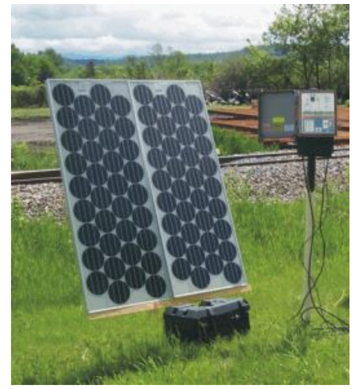
The **Auto Seeker** is a small, motorized, reel assembly that automatically raises and lowers the probe to follow the NAPL interface through the entire depth of the well.

The 1.93” diameter **Probe** contains the patented ALPHA ARRAY™ interface sensors, as well as a small but powerful 12vdc electric product pump.

Magnum Spill Buster Probe

“Exploded” view of the Probe,
Showing the pump, filter, spring and end cap

The Spill Buster may also be used in a dual pump mode by adding a water depression control box and water pump (See page 53).



The Magnum Spill Buster has several options for its power source. Where electrical connection is available, the system can be hard wired for 115/230 VAC at 60 Hz. The operating system will also automatically adjust to European 230 VAC at 50 Hz. Battery power is also an option via two deep cycle 12V batteries in series for 24 VDC power. On remote sites where power is not available, the Magnum can run on solar power (See pages 52).

The Magnum Spill Buster can be used on a wide variety of groundwater remediation sites. Many of these sites contain classified hazardous areas with restrictions on the type of equipment that can be used within them. It is very important for the operator to be aware of all applicable codes on their site and confirm that their planned use of the Magnum Spill Buster is in compliance. Please note that we offer a range of options for meeting the requirements on different kinds of site situations, including versions that mount the Auto Seeker and/or Control Box in explosion proof containers for use in Class 1, Division 1, hazardous zones.

Control Box mounted inside explosion proof enclosure

The following section on the terms “Intrinsic Safety” and “Explosion Proof” provides more detail on the differences between the two and gives examples of how the Magnum Spill Buster systems’ design incorporates them.

NEC 2011 compliant explosion proof Auto Seeker

Explosion Proof and Intrinsic Safety 101

Portions of the standard Spill Buster system operate in various “classified” flammable or explosive vapor zones or areas as defined in the US under the NEC codes. The location of the equipment on the site must be designed properly; or the equipment must be enclosed in appropriate enclosures, to prevent ignition of these vapors should the failure of a component occur. Since this is such an important topic we will present a few basics in this manual to help you or your customers understand the meaning of the various terms defining safe use when planning or installing our equipment. Please note that what we have written here is not meant to supersede anything that may be written in detail in the NEC codes or applicable local codes. ***It is your responsibility*** **and the responsibility of the <u>Authority Having Jurisdiction</u>** to study and follow these codes.

The Magnum Spill Buster system may need to be partially or completely located in areas that are classified as “Class 1, Division 1, Hazardous Atmospheres” as defined in the NEC code section 500. A Class 1, Division 1, safety rating is the highest rating in the US for flammable and combustible zones. There are several methods to insure that electrical systems are safe to operate in these areas. The Standard Spill Buster system can be modified when required to utilize two of these basic methods to achieve safe operations in these atmospheres per NEC 2011 electrical codes: the Intrinsically Safe method, and the Explosion Proof Enclosure method.

The sections below provide a brief explanation of these two methods and the different ways in which they make an electrical system safe for operation in Class 1 Div. 1 areas.

Intrinsic Safety

Intrinsic safety (IS) is a protection technique for safe operation of electrical equipment in hazardous areas by limiting the energy available for ignition of explosive well gases. The concept of (IS) circuits was originally driven by some devastating coal mine explosions in Europe due to “firedamp” gases being ignited by “electrical shorts” in the wiring of early communication devices such as the electric telegraph.

In signal and control circuits that can operate with low currents and voltages, the intrinsic safety approach simplifies circuits and reduces installation costs over other protection methods. High-power circuits such as electric motors or lighting cannot use intrinsic safety methods for protection.

One of the most common methods for protection is to limit the current by using multiple series resistors (assuming that resistors always fail open); and to limit the voltage with multiple Zener devices to ground (assuming diodes always fail shorted). Approval standards for intrinsic safety barriers require that the barrier maintains approved levels of voltage and current to the specified components. This is accomplished by preventing ignition of the protected device and stopping sparking of damaged wiring to the protected components.

An example of an Intrinsically Safe (IS) certified Zener barrier is shown here. Signals going to an electrical device located in a classified zone are wired into one end of the modular barrier and then wired out into the classified zone. These can be purchased off the shelf and are certified Intrinsically Safe by various 3rd body testing laboratories.

Explosion Proof Enclosures

Explosion Proof (EXP) enclosures are not intended to seal the electrical equipment they contain from the entry of explosive atmospheres that may be outside the enclosure. Instead, they prevent any explosion that might occur within the enclosure from initiating a secondary fire or explosion in the surrounding area outside of the enclosure. Since they are not tightly sealed, liquids and gases may flow into the enclosure.

EXP enclosures are usually made of heavy cast aluminum or stainless steel and are of sufficient thermal mass and mechanical strength to safely contain an explosion should ignition of the flammable material occur within the housing. These enclosures are typically produced with wide, flat, flanges but may not have a gasket between those flanges. Should an explosive mixture ignite inside the enclosure because of an electrical short or an overheated component, the design of the flanges cools down any hot gases escaping between them enough to prevent the ignition of the external combustive atmosphere.

This is important to understand because it means that by design these enclosures are neither completely air tight nor waterproof. The EXP enclosure that can be used with the Magnum's control box includes a window to allow the operator to see the instrument panel. We strongly recommend that these enclosures be mounted in an upright position and raised off of the ground to prevent possible internal flooding. If the housing must be at ground level, and especially if it is laid flat with the control panel window in the horizontal position, a protective cover should be used to keep rain from leaking inside the enclosure and flooding the control box electronics.

Another example of the Explosion Proof methodology would be the manner in which electrical wire is fed through piping. Per the NEC electrical code spelled out in section 500, cabling fed through piping usually utilizes tapered pipe threads. The code requires a minimum engagement of six threads; and since it is tapered, the spaces between the threads get tighter as the pipe is tightened up. There still is the potential for vapors to leak through these threads, but once again any hot gases escaping through the threads are cooled enough to prevent a secondary explosion.

A third example of EXP methodology would be the use of a multi-conductor cable feed through. The feed through fittings are once again designed to be strong enough to contain an explosion.

These fittings leave sufficient room to provide for stripping the outermost wire jacket and enough room for separating the individual wires from each other. A powdered mixture is then mixed together with water and poured in through an access plug to completely surround each conductor. A common material used is a compound from Cooper Crouse-Hinds called Chico®, which cures to a cement-like consistency. In the event of an internal explosion, any hot, explosive gases escaping through the hardened Chico are cooled before entering the explosive atmosphere outside.

Here are examples of these two types of enclosures:

Flammability and Combustible Liquids Definitions 101

When using a Spill Buster system it is important to understand the difference between the definition of flammable liquids and combustible liquids. All flammable and combustible liquids will vaporize into flammable gases at certain temperatures and pressures. The temperature point at which a liquid turns to a gas vapor is referred to as the “flashpoint” of the liquid. The determination of the flashpoint for each flammable or combustible liquid is done by performing what is commonly known as the “closed cup” flashpoint test.

It should be mentioned that flashpoint was selected as the basis for classification of flammable and combustible liquids because it is directly related to a liquid's ability to generate vapor, i.e., its volatility. ***Since it is the vapor of the liquid, not the liquid itself that burns, vapor generation becomes the primary factor in determining the fire or explosive hazard.***

Furthermore, the liquids vapor pressure is an important factor and is a measure of a liquid's propensity to evaporate. The higher the vapor pressure, the more volatile the liquid and, thus, the more readily the liquid gives off flammable or explosive vapors.

The results of flashpoint testing have been used to help regulating bodies determine the temperatures at which potentially combustible liquids turn into a vapor, creating a flammable or explosive gas.

Hazardous locations are further defined by means of the class/division system and have been formulated by the NEC, CSA, OSHA, and the National Fire Protection Association (NFPA). These definitions are as follows:

Flammable Liquids

Flammable fluids are defined as liquids having closed cup flash points below 100°F (37°C). Flammable liquids are referred to as Class I liquids.

◆ A class IA flammable liquid is a liquid with a flashpoint below 73ºF (22.8ºC) and a boiling point below 100ºF (37.8ºC). An example of a class IA liquid is n-pentane, since its flashpoint and boiling point are 56ºF (49ºC) and 97ºF (36ºC), respectively.

◆ A class IB flammable liquid is a liquid with a flashpoint below 73ºF (22.8ºC) and a boiling point at or above 100ºF (37.8ºC). An example of a class IB liquid is acetone, since

its flashpoint and boiling point are 0ºF (18ºC) and 133ºF (56ºC), respectively.

◆ A class IC flammable liquid is a liquid with a flashpoint at or above 73ºF (22.8ºC) and

below 100ºF (37.8ºC). An example of a class IC liquid is turpentine, since its flashpoint

lies in the range from 95 to 102ºF (35 to 39ºC).

Combustible Liquids

Combustible fluids are defined as liquids having closed cup flash points at or above 100°F (37°C). Combustible liquids are referred to as Class II or Class III liquids.

◆ Class II liquids - flash points at or above 100°F (37.8°C) and below 140°F (60°C).

◆ Class IIIA liquids - flash points at or above 140°F (60°C) and below 200°F (93.4°C). c.

◆ Class IIIB liquids - flash points at or above 200°F (93.4°C).

An example of a Combustible liquid is the Lamplight® Ultra Pure Red Paraffin Lamp Oil that CET uses for testing new and repaired units before shipment. This material has a flashpoint of 250F (121C) making it a class III liquid. Furthermore, its low toxicity makes it a safe testing fluid due to its high ignition temperature and the lack of chemicals that are listed in the CERCLA Hazardous Substance list. CET uses a red colored fluid but it also can be found in clear, or colored green or blue.

This fluid is easily found and can also be used as a pump priming fluid as defined on page 71.

1.0 System Installation

8 Easy Installation Steps

Time: Set-up time for the complete system should take from 30 to 60 minutes after connection to the power source is complete.

System Equipment List

NEMA 4 weatherproof main Control Box (NON-Explosion proof)
(For a complete Explosion Proof system, Control Box can be mounted in a Class 1 Div. 1 rated enclosure.)

For a Standard Magnum System: Auto Seeker System (NON Explosion proof) with 30 foot power cable extension
For a Magnum System w/Explosion Proof Auto Seeker: Auto Seeker System mounted in Class 1, Div. 1 rated explosion proof enclosure with 30 foot power cable extension

NEC 2011 section 500 compliant Product Probe with 50 foot probe product tube. Longer probe cable lengths available upon request.

Product Tank Inlet Fitting

50 foot nylon product discharge tube

NEC 2011 section 500 compliant Product Tank Override Probe with bung and 30 foot cable

30 foot Probe signal and power cable extension. Longer extension cables available upon request.

30 foot Auto Seeker power cable extension. Longer extension cables available upon request.

One Pump Flooding Kit per order consisting of syringe, o-ring, and tubing.

Site Security

Warning

Access to the site and to the Magnum Spill Buster System must be controlled at all times. The equipment is specialized and must only be operated by qualified and trained personnel.

Secure every site. Locked sheds, vaults and fenced enclosures are good examples of a secured site. Clean Earth Technology does not warranty damage to equipment due to vandalism or negligence.

Control Box Installation

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

The standard Control Panel in its NEMA-4 enclosure is not rated for use in any classified explosive locations, as determined by the Authority Having Jurisdiction (AHJ). The control box can be used with an Explosion Proof (XP) Auto Seeker and meet all Class 1, Div 1 requirements as long as the panel is mounted in a nonhazardous area.

Standard Control Box with covers off

Standard Control Box with covers on

Location

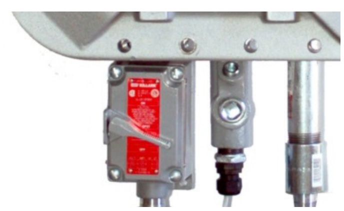
Mount the Control Box in a suitable non classified location (refer to all safety codes applicable to your site). Typical installations are in sheds, vaults, on the side of a building, or on a utility type pedestal mount. If the control panel is mounted vertically and the box door is latched with the I/O Extension cover correctly installed, the unit is weatherproof.

If the Control Box must be located in a Class 1, Div 1 or 2 areas, Clean Earth Technology can provide an explosion proof enclosure. This type of enclosed Control Box looks like the units shown in the figures below.

> **Warning**
>
> Control Box must be located outside of any classified hazardous areas. This includes explosive atmospheres or vapors. Refer to all applicable codes.

Standard Control Box mounted in an Explosion Proof enclosure with cover removed.

Standard Control Box mounted in an XP enclosure. Note the optional XP power switch box located at bottom left.



The optional XP power switch box located at bottom left.

Without the optional XP power switch, the XP Control Box must be turned on and off at the circuit breaker panel for the input power.

1. Ensure the unit is de-energized. Mount the Control Box in a suitable location (refer to all safety codes applicable to your site). Typical installations are in sheds, vaults, on the side of a building, interior of a building or on a utility type pedestal mount.

2. If the Control Box is installed in an explosion proof enclosure, it must be mounted in a vertical orientation to prevent the potential of rain water leakage and accumulation within the enclosure. (See “Explosion Proof 101” on page 5 for an explanation of the enclosure’s design in regards to weather proofing).

3. To meet the Intrinsically Safe (IS) requirements of this unit, a grounding circuit of one (1) ohm or less to the grounding electrode is required.

4. If the extension cables leading from the Control Box to the Auto Seeker and/or Override Probe must pass through an unclassified area the cables must be must be sealed at each boundary in accordance with NEC & local code requirements to prevent migration of combustible vapors within the cable. It is the responsibility of the AHJ and the local installer to meet the requirements of the local area.

5. For the initial installation of a Control Box mounted in an explosion proof enclosure, do not close the door or secure the bolts around the flange until after the initial pump power test has been performed (See page 32).

Installing the Standard Auto Seeker

If installing an Explosion Proof Auto Seeker, skip to page 14.

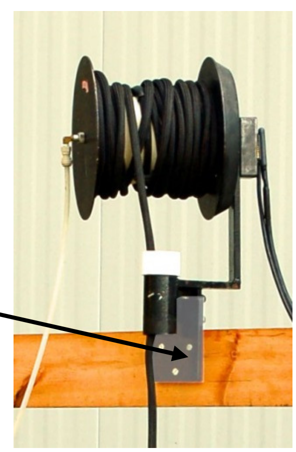
The Auto Seeker system is an integral part of the Magnum Spill Buster system. It is turned ON and OFF with the System Power switch on the Control Panel. The Auto Seeker is controlled by the Product Recovery Cycle (PRC) control switch.

The Standard Auto Seeker is not rated explosion proof or intrinsically safe. It should be mounted outside of all classified hazardous zones. (See Section 1.1 for information on installing an Auto Seeker with an Explosion Proof enclosure). Refer to all applicable NEC and local codes to determine how and where the Auto Seeker should be installed on your site.

On many sites it is possible to move the Standard Auto Seeker from the classified hazardous area by raising it above the well head. For example, the use of a wood or metal scaffolds such as the one pictured here may accomplish this.

Installation

For the example shown above a custom adapter clamp plate was bolted to the wooden cross support as shown to the right. Slide the Auto Seeker mounting bracket clamp on to the adaptor plate and then thread the 2 clamping bolts in all the way until the ends engage the adapter plate. Then using a wrench to tighten the bolts until the Auto Seeker is securely supported on the adapter plate. Finally, carefully guide the probe through the white PVC collar and steel tube on the mounting bracket and let it hang there until the system is fully installed.



Custom Adapter

"Home" Position

The Standard Auto Seeker system is shipped from the factory with the Probe fully wound on the reel. This is its "home" position. It is critical that the Probe NOT be unwound from the reel except by use of the motorized reel. The position of the Probe on the reel is synchronized with a cable inside the reel housing. Refer to “Unwinding the Probe Manually” on page 32 for the correct way to advance or retract the Probe by hand so that synchronization is maintained.

Product Seeking

After the system is fully installed and the system is turned ON, the Auto Seeker will automatically track the water table. [See 2.0 System Operation - Magnum Spill Buster System Cycle, page 38]

NOTE: Always perform the pump flooding procedure found on page 34 before lowering probe inside well.

Installing the Explosion Proof Auto Seeker

The Explosion Proof Auto Seeker system is an integral part of the Magnum Spill Buster system. It is turned ON and OFF with the System Power switch on the Control Panel. The Auto Seeker is controlled by the Product Recovery Cycle (PRC) control switch.

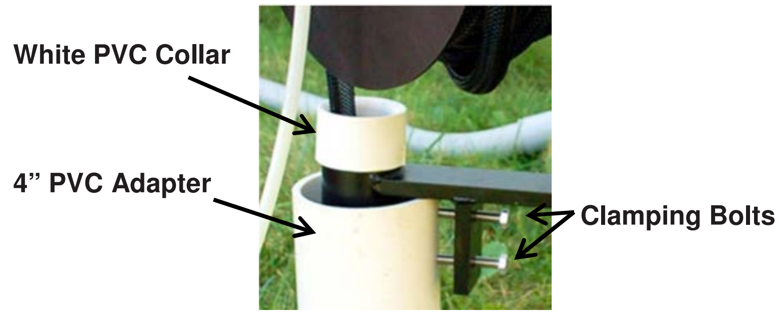
Adapters

The well head adapter bracket provides a reinforced area to mount the Explosion Proof Auto Seeker unit and also locates the Auto Seeker reel and Probe directly over the well for proper operation. PVC fittings are available to accommodate well head diameters from 2” to 8”. Use PVC adhesive and install the appropriate fittings to reduce the well head to a 2” diameter.

If you did not receive the appropriate fittings for your application, please contact the factory for advice or to order preassembled fittings. These fittings can also be built up from standard PVC fittings found in most hardware and plumbing stores. The clamp incorporated into the Auto Seeker bracket can also be used for steel well heads 3” and larger, if applicable. An example of an XP Auto Seeker mounted on a 3’ metal culvert recovery well is shown to the right.

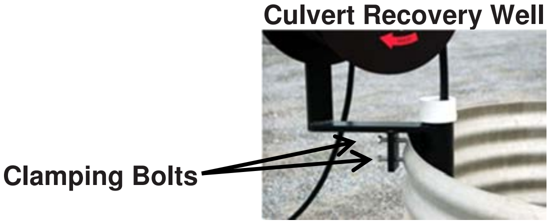
Installation

Position the Explosion Proof Auto Seeker over the well and slide the Auto Seeker mounting bracket steel tube down fully into the well head adapter. Thread the 2 clamp bolts in towards the adapter until they press against the PVC adapter and then using a wrench tighten the clamp bolts firmly until the AS is fully secured. Finally, guide the probe through the white PVC tube collar and steel mounting tube of the mounting the bracket and slide it down into the well itself. Make sure the probe slides freely in the recovery well.



Clamping Details on a PVC Well Head

Clamping Details on a Metal Culvert Recovery Well



For culvert type of recovery wells, position the Explosion Proof Auto Seeker over the well and slide the Auto Seeker mounting bracket over the culvert wall as shown above. Thread the 2 clamp bolts in towards the well until they press against the metal and then, using a wrench, tighten the clamp bolts firmly until the Auto Seeker is fully secured. Finally, guide the probe through the white PVC tube collar and steel mounting tube of the mounting the bracket and slide it down into the well itself. Make sure the probe slides freely in the recovery well.

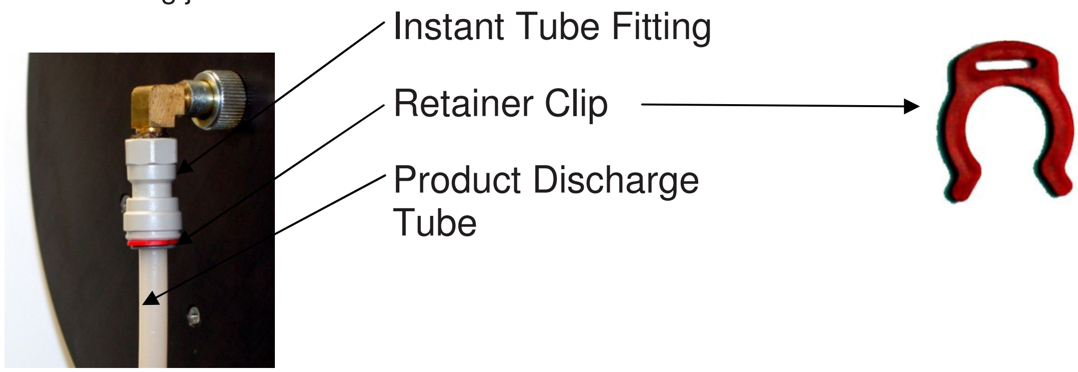
Product Seeking

After the system is fully installed and the system is turned ON, the Auto Seeker will automatically track the water table. [See 2.0 System Operation - Magnum Spill Buster System Cycle, page 38]

NOTE: Always perform the pump flooding procedure found on page 34 before lowering probe inside well.

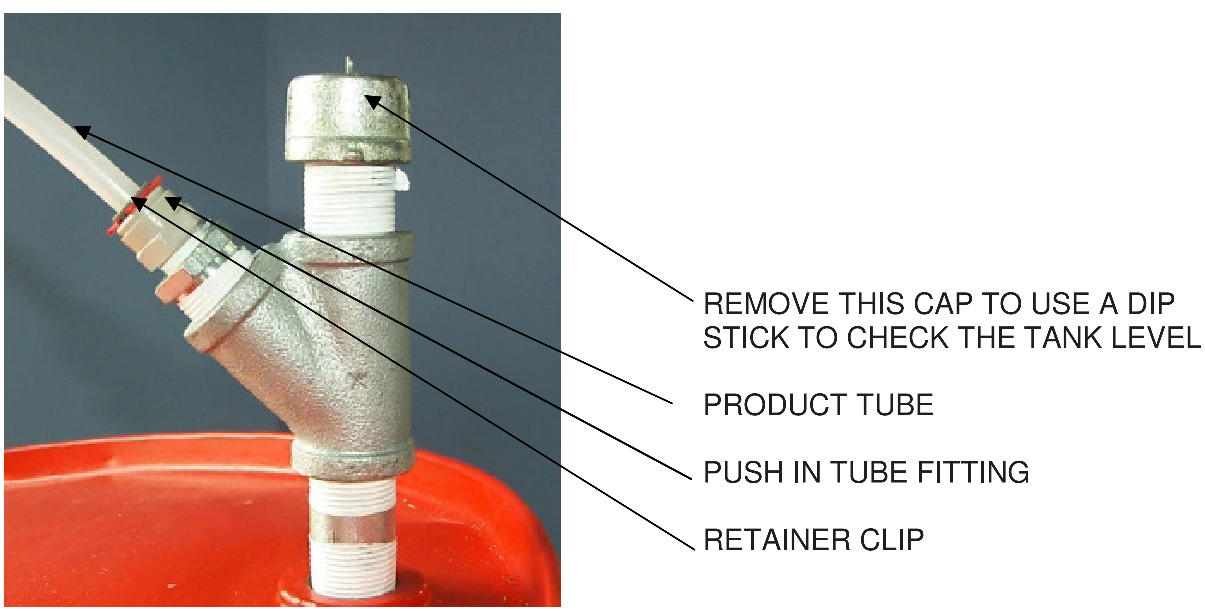
Product Discharge Tubing

Connect the Product Discharge Tubing to the Instant tube fitting on the front of the Auto Seeker reel unit by pushing the tube firmly into the fitting until it “snaps”. Secure with a retainer clip. To remove tubing, remove retainer clip and push locking sleeve of fitting squarely into the fitting while pulling on tube.] NOTE: The retainer clip is an integral part of the Instant Tube Fitting and must be in place to maintain the integrity of the fitting. Failure to install the retainer clip could cause a leaking joint.



Product Tank Inlet Fitting

The Product Tank Inlet Fitting screws into a standard 3/4” NPT fitting. Connect the product discharge tube coming from the Auto Seeker to the inlet fitting using the Instant Tube fitting supplied on the fitting assembly. First remove the red retainer clip on the fitting. Push the product discharge tube firmly into the fitting until it “snaps” into place. Re-install the retainer clip. NOTE: The retainer clip MUST be installed to insure against leaks. The product tank level can be checked manually by unscrewing the cap from the top of the fitting and inserting a dipstick into the product tank. The cap also contains a small vent. In the case of multiple recovery systems using one product tank the fittings can be stacked.



Product Tank Override Probe

The Product Tank Override Probe must be connected to the control box prior to system operation. There is an electrical interlock to prevent the product pump from operation without having the Product Tank Override Probe connected. Dip Switch S2-4 will override this interlock when turned ON. **However, on this setting a tank full condition is not detected and a secondary spill may occur.**

Install the product tank override probe in the product tank and plug the cable into the slot marked INHIBIT in the I/O Extension of the Control Box [Second slot from lower left]. The tank fitting screws into a standard 2” bung threaded hole. Other options are available such as a “splitter” to allow use of multiple recovery systems using one product tank override probe.

The Product Tank Override Probe fitting screws into a 2” bung.

Product Tanks

Product tanks are NOT part of the Magnum Spill Buster system. Suitable receptacles for recovered product should be sized for the specific job and site, and should be monitored at regular intervals, along with the rest of the system. **Recovered product should be labeled and disposed of in an appropriate manner.**

System Grounding

A proper ground is not an option! Correct grounding is absolutely necessary for the system to work properly and safely!

WARNING
CORRECT GROUNDING IS ABSOLUTELY NECESSARY FOR THE SYSTEM TO WORK PROPERLY, AND TO ENSURE ELECTRICAL SAFETY. ONLY A QUALIFIED ELECTRICIAN SHOULD INSTALL THE SYSTEM.

The interface sensors take advantage of the RF shielding effect of ground water normally present in the well. To enable the control to properly sense this shielding effect, its logic circuits must be referenced to ground. Grounding procedures are described in the following sections for five different installations:

1. Standard utility connection.

2. Remote power installations (with a portable AC generator).

3. Bench testing where the test water is not connected to earth ground.

4. 24 VDC battery operation.

5. 24 volt solar operation.

Note: A missing ground connection is indicated when the HI and LOW LIMITS lights stay off even when the probe is immersed in water.

Warning! All power and grounding wiring should be performed by a qualified electrician. All wiring must meet the latest NEC and all applicable local codes.

Grounding a Utility Connection

When connecting to a utility power source, the green grounding wire must be connected to the power input ground terminal in the control box. This connection is marked on the overlay below the power input terminal block. A three-prong plug with a three-lead cable must be used for system power; typically a black “hot” lead, a white “neutral” lead, and a green grounding lead. However, in some cases due to site-specific conditions, it may be necessary to install a grounding rod, as described below.

A grounding rod employing a 5/8” copper rod, 8 gauge wire and copper clamp.

Installing a Grounding Rod

The metal casing of a driven well can be used as the ground. Where this is not possible, a grounding rod can be constructed as follows:

- Drive a copper rod approximately 8 feet into undisturbed soil; use a 5/8” Copperweld type rod.

- Connect a No. 8 or larger copper wire from the ground rod to the power source (a generator, battery, or control box).

- Make certain all connections are free of corrosion or oxidation.

Grounding a Portable Generator

A three-lead cable must be run from the generator to the control box; typically, a black “hot” lead, a white “neutral” lead, and a green grounding lead. In addition, the generator must be bonded to an earth ground (See “Installing a Grounding Rod” above).

> Note: All connections must be clean without any oxidized layers.

Grounding for Battery Operation

Magnum Spill Buster systems operated from a battery must have the negative terminal of the battery grounded directly to a copper rod driven into the ground (See “Installing a Grounding Rod” above). In addition, a 12 gauge or larger copper wire must run from the negative lug on the battery to the grounding lug on the terminal block in the control box.

Some examples of battery locations requiring a ground rod and cable for operation are as follows:

- a vehicle battery, whether in or out of a vehicle.
- a battery inside an Immediate Response Box (whether on the ground, in a truck, etc.)
- a battery with a solar (photovoltaic) panel

> Note: For proper system operation, it is absolutely necessary to ground every battery operated system!

Grounding for Lab or Bench Testing

For temporary operation in a lab or on the bench, where the test water is not connected to earth ground, the water must be grounded. This can be accomplished by submerging at least 6 inches of bare copper wire in the water and attaching the other end to the green grounding terminal of the control box.

Installing System Extension Cables for a Standard Auto Seeker Magnum

If installing system extension cables for an Explosion Proof Auto Seeker system, skip to page 22.

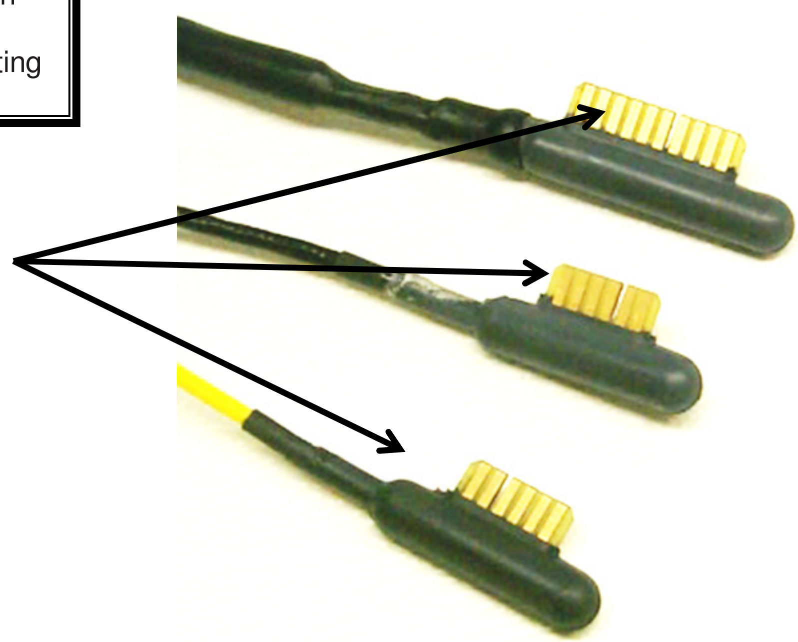
- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

Make sure all cable connectors are free of dirt and debris before making connection. The standard extension cable lengths are 30 feet, but custom length cables are available up to 400 feet. If PVC conduit pipe is run between the control box and the well head, see “Pulling System Cables Through Conduit” on page 24.

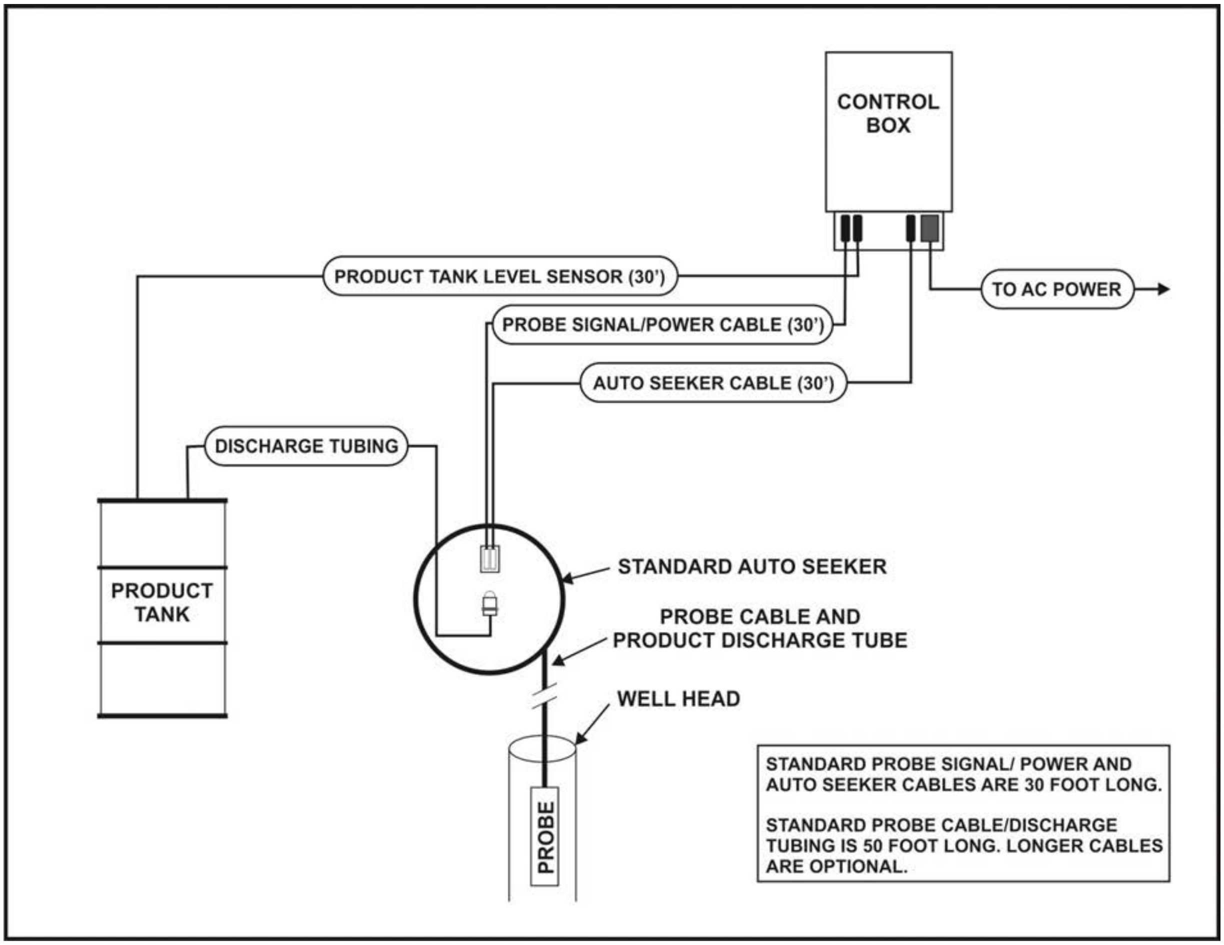
Cable Connectors

NOTE: ALWAYS turn off power before removing or connecting cables

Slim-line™
CONNECTORS



Standard System Wiring Diagram



TYPICAL CABLE CONFIGURATION FOR A STANDARD MAGNUM SPILL BUSTER

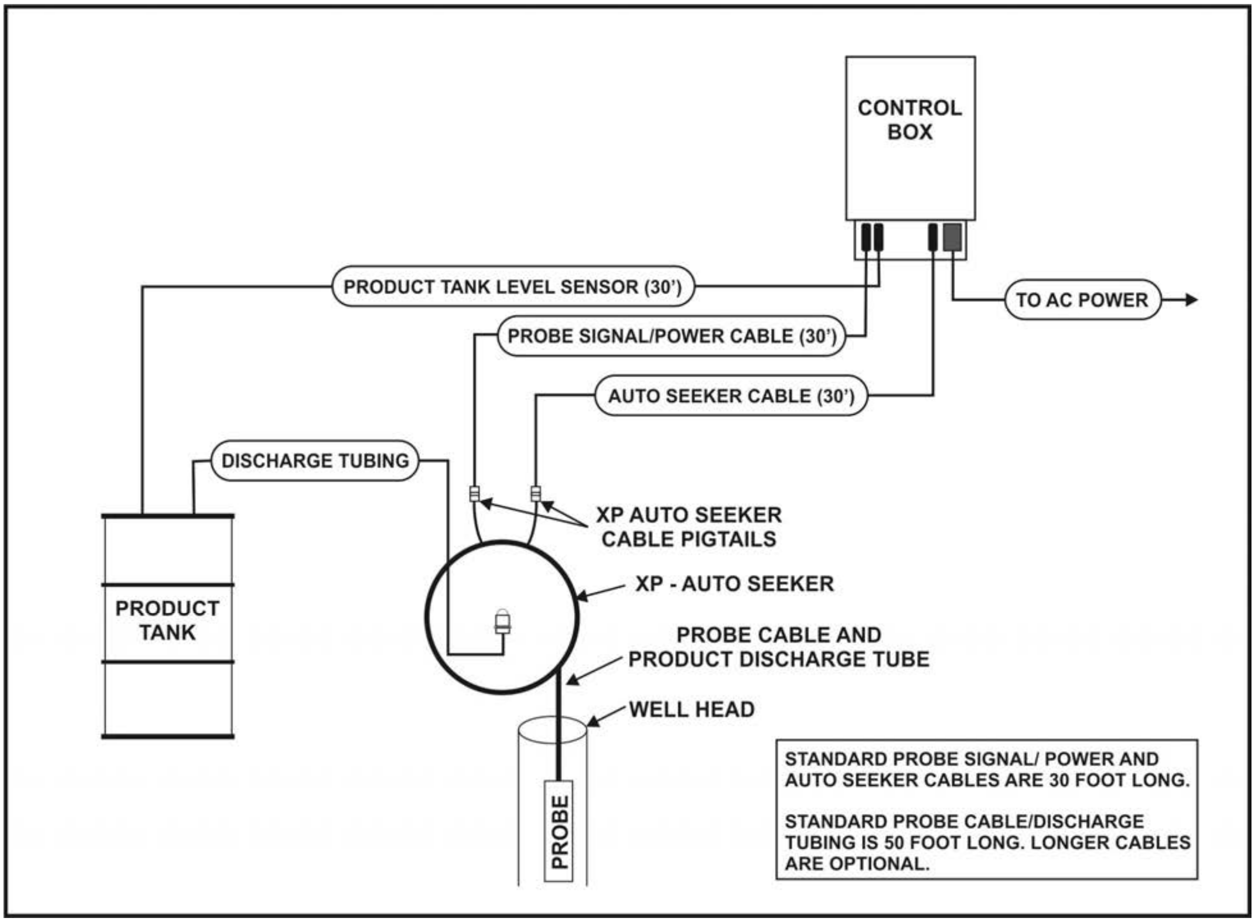
Alternate cable lengths are readily available for deeper wells and control box placement further than 30 feet from the well head. The maximum allowable total cable length from the probe to the control box is 400 feet.

Installing System Extension Cables for an Explosion Proof Auto Seeker Magnum

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.

- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

Explosion Proof System Wiring Diagram



TYPICAL CABLE CONFIGURATION FOR AN EXPLOSION PROOF MAGNUM SPILL BUSTER

Installing the XP System Cables

If the extension cables pass through an unclassified area the cables must be must be sealed at each boundary in accordance with NEC & local regulations requirements to prevent migration of combustible vapors within the cable. It is the responsibility of the local installer to meet the requirements of the local area. A typical cable with coupled connectors is shown below.

Typical cable extension joined to an Auto Seeker cable pigtail.

Make sure all cable connectors are free of dirt and debris before making connection. The standard cable lengths are 30 feet, but custom length cables are available up to 400 feet. If PVC conduit pipe is used, see “Pulling System Cables Through Conduit” on page 24.

Note: Cable extensions for an Explosion Proof Auto Seeker system have slim line connectors on one end. These cable ends should be pulled through any conduits to end nearest the Control Box and NOT the ends with Circular-Mil Spec connectors. This helps prevent debris or other contaminants from getting into the pins of the Mil-Spec Connector receptacles and prevent the degradation of system performance. If there is no way to pull cables from the Auto Seeker side of the conduit then a secure covering should be used over the connectors while pulling the cables through.

Cable extensions showing the female socket receptacles.

> ⚠ **Turn off power before removing or connecting cables.**

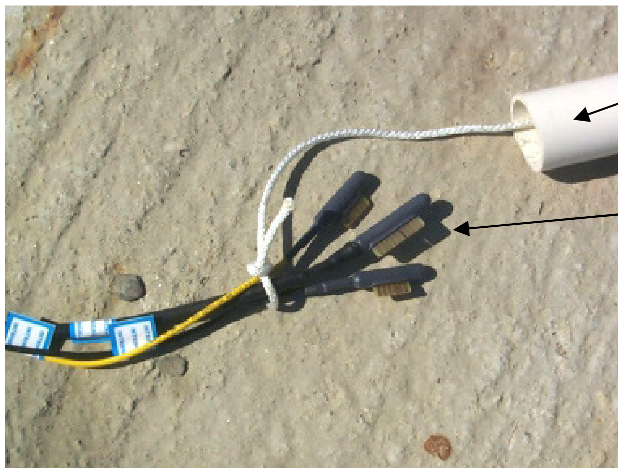
Cable extensions for an Explosion Proof Auto Seeker will have a Slim-line™ connector on the Control Box side and a Mil- Spec circular connector one the other.

Pulling System Cables Through Conduit

The minimum recommended diameter is 4” pipe. Use long “sweep” type elbows in a conduit installation. This will help prevent any damage to system cabling caused by forcing cable connections through a smaller diameter pipe. Excess cable from the installation should be coiled and stored in a protected area.

Typical Cable Segment

THE WRONG WAY TO PULL CABLES THROUGH A PIPE



Do not use smaller than 4” PVC.

Do not leave connectors exposed to contamination, especially during cable pulling operations.

THE RIGHT WAY TO DO IT!

Use 4” diameter pipe or larger. Tape the pull rope in place on the cable to prevent it from sliding up to the connectors. Tape the connectors to prevent contamination. Distribute the connectors over a few feet; don’t bunch them in one place.

Connecting Cables at a Non-XP Control Box

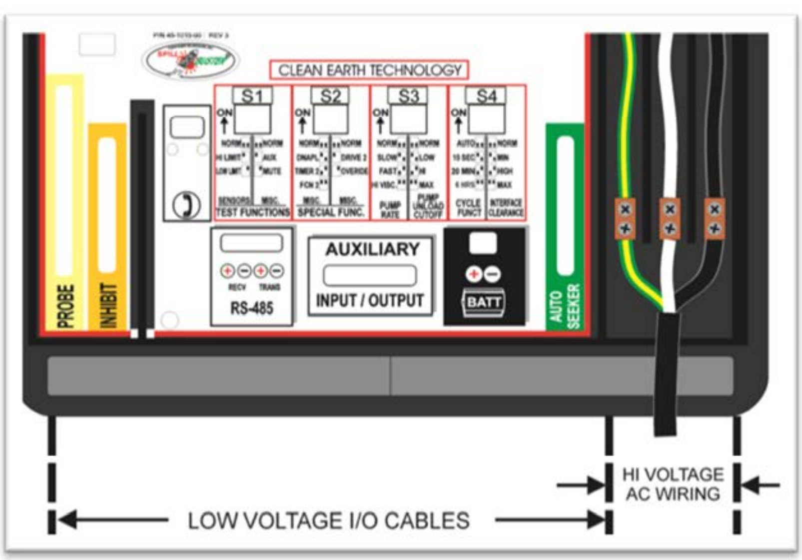
If connecting a Control Box mounted in an XP Enclosure, skip to page26.

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

I/O Extension Pouch

Remove screws to access the I/O Extension Pouch

All cables enter the Control Box via the I/O Extension Pouch (or I/O Pouch), which makes up the bottom portion of the control box. Access into the I/O Pouch is gained by loosening the two screws on the front of the I/O Pouch and removing the lid. The Slim-line™ connector cables and power cable for the system feed through the bottom of the I/O Pouch.



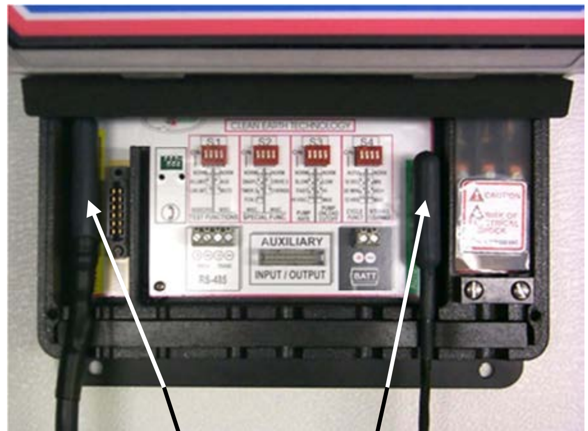
I/O Board and Terminal Block inside I/O Extension

Connecting Probe, Auto Seeker, and Override Cables

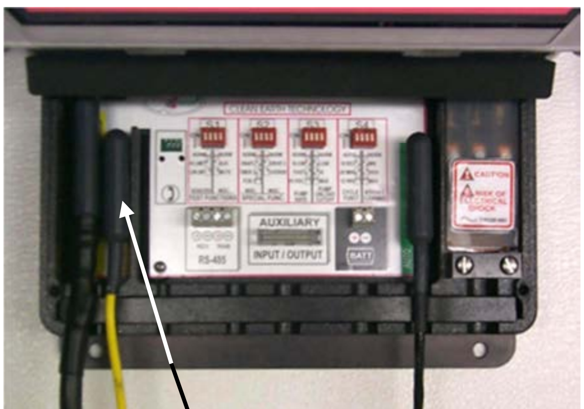
Connect Slim-line™ connectors to receptacles, as labeled. Slim-line™ connector receptacles are keyed to help facilitate proper placement of plugs.

The power cable connects to the terminal block inside the I/O Pouch. See "Control Box Terminal Block" on page 27.

NOTE: The System must be properly grounded for correct operation.



PROBE CONNECTOR
AUTO SEEKER CONNECTOR



OVERRIDE PROBE CONNECTOR

Next, plug in the Override Probe connector as shown. **NOTE:** The Magnum Spill Buster system will not function unless the Override Probe is connected or the Override dip switch (S2-4) is ON. [See Dip Switches, page 44].

Connecting Cables at an Explosion Proof Control Box

When cabling from system components are connected to the Control Panel through an XP Housing, sealed and potted XP feed-throughs must be threaded into the threaded holes provided in the XP enclosure. These feed-through fittings will typically look like the picture shown below.

Example of a control box XP enclosure housing cable feed through.

These cable feed-throughs should be threaded tightly into the bottom of the XP enclosure. There will be three of these fittings. Two will have Slim-line connectors, and one will not have any cable potted in. This last one will need to have the power wiring fed through it by the electrician and potted per NEC or local codes for explosive atmospheres.

Once the fittings are threaded in tightly and the power cable is installed and potted, attach all of them into the I/O section of the control panel as detailed in "Connecting Probe, Auto Seeker, and Override Cables" on page 26. Upon completion of these connections install the I/O pouch cover. In these installations the control box main cover has been removed so that the front panel LED lights can be viewed during operation.

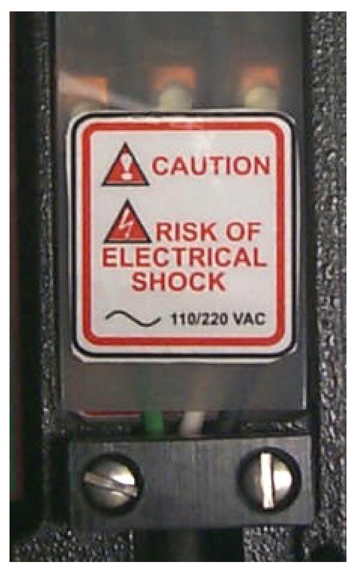
Control Box Terminal Block

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

Hardwiring AC Power

The Magnum Spill Buster is designed to run either 115 or 230 VAC Power without any modifications to the internal wiring. Attach hardwiring to the Control Box as shown on the Power Cable overlay. The incoming power cable must be able to handle a minimum of 10 Amps.

Terminal Block shown with the protective cover removed



115/230 Volt Terminal Block with the protective cover attached.

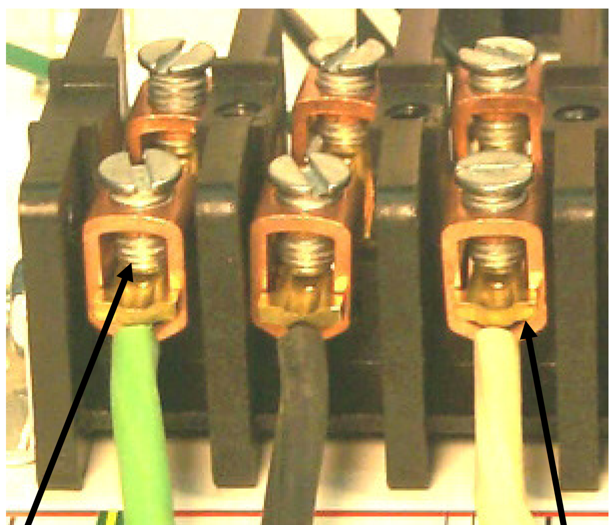
Correct Terminal Block Connections

This view looking at the side of the terminal block shows the correct location to insert the AC supply wire.

PLACE WIRE IN THIS HOLE (UNDER PLATE)

CORRECT INSTALLATION

Installing the AC supply wire in the terminal block. **The wire must be installed correctly as shown.**

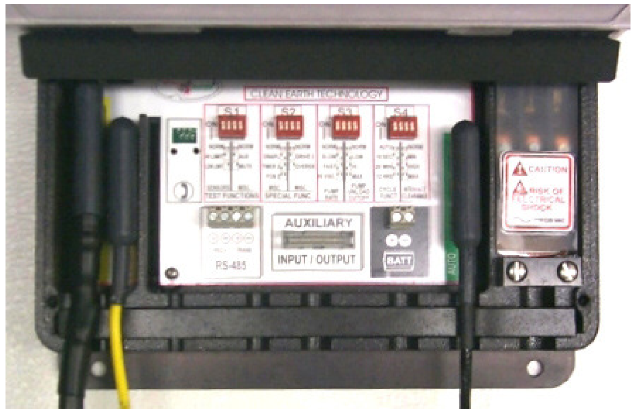


DO NOT PLACE WIRE DIRECTLY UNDER SCREW!

CORRECT INSTALLATION (UNDER PLATE)

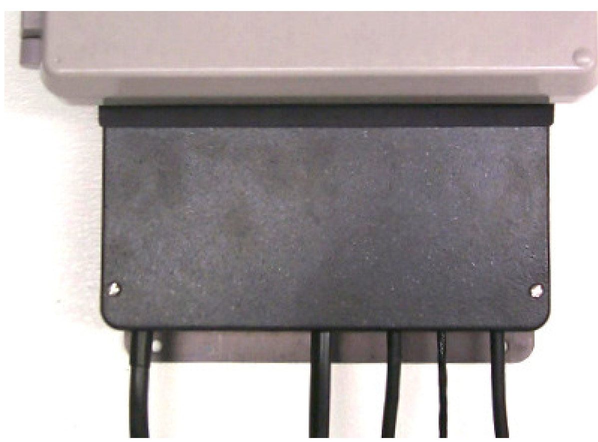
> NOTE: Always replace the protective cover on the terminal block after installation or prior to providing power to the system. See page 29.

Sealed I/O Extension with Cables Installed



I/O EXTENSION RUBBER GASKET SEAL

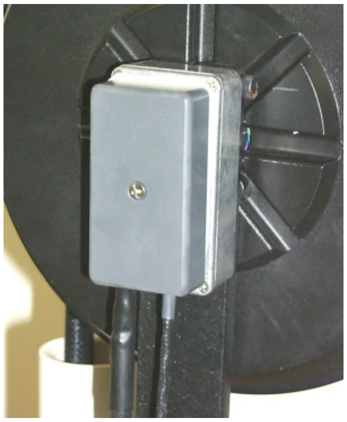
All cables must exit the I/O Extension through the appropriate sized slot in the bottom of the pouch in order to create a dust- and weather-proof seal. The perimeter of the lid and body of the I/O extension is lined with a foam rubber gasket that serves as weather stripping. The weather stripping will cause the lid to seal automatically against the cables when the lid is closed and fastened with the screws. The weather stripping will seal holes in the I/O Box, whether they contain cables or not.



I/O extension must be closed and sealed for safety and weatherization!

Connecting the Standard Auto Seeker Cables

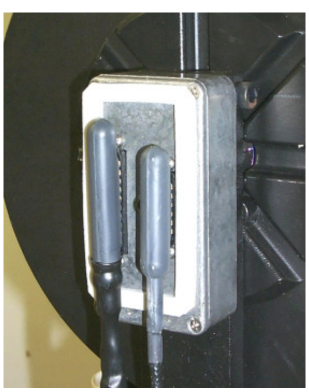
If connecting an Explosion Proof Auto Seeker, skip to "Connecting the XP Auto Seeker Cables" on page 31.



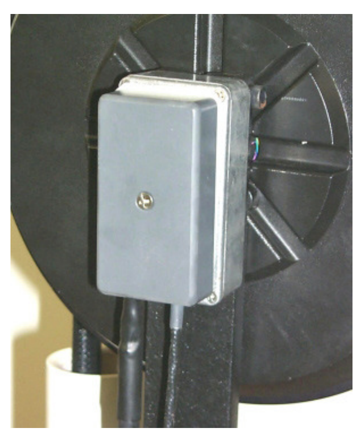
Remove safety cover from Slim-line™ connector box.

Use Probe and Auto Seeker Slim-line™ connectors with rubber gaskets affixed.

Plug in Slim-line™ connectors to size-coded receptacles.



Replace safety cover over connector box and tighten screw down snugly.

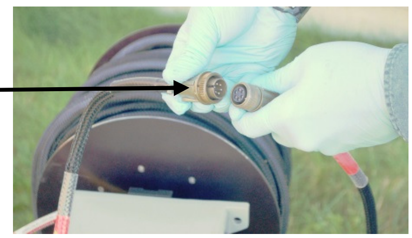


Connecting the XP Auto Seeker Cables

The XP Auto Seeker has two 5 foot long pigtail cables terminated with Circular Mil-Spec connectors (see below). The respective cable extensions are connected to the pigtails as shown and each threaded locking collar should be firmly seated to insure an environmentally tight seal.

NOTE: These connectors should not be laid directly on the ground or vault. While they are weather resistant, they are **not** rated for direct water immersion. We recommend hanging the cables such that the connectors are above any potential water flooding areas.

Threaded Locking Collar



Probe Cable Connector

Note the rotational locking key slot.

Warning:
Always de-energize system power before connecting or disconnecting cables!

Auto Seeker Power Cable Connector

Initial Pump Power Test

When all cabling and system components are connected, the system ground is installed, and power is supplied to the system, it is preferable to test the product pump for operation prior to putting the probe in the well. It is convenient to have two people for this operation; one near the Auto Seeker system to listen to the pump in the Probe, and one to operate the control box. ***NOTE: The Probe should be held outside of any classified zone around the well head while this test is being performed.*** This might be accomplished by manually unwinding enough of the Probe cable from the Auto Seeker to reach an unclassified zone if the zone is close enough. The proper procedure for doing this is as follows:

Unwinding the Probe Manually

Disconnect the Auto Seeker cable from the Auto Seeker or the Control Box, whichever is more convenient. Once disconnected, the Auto Seeker's reel may be turned by hand without disrupting the synchronization built into the Auto Seeker assembly. The probe may be rewound by turning the reel in the opposite direction. To prepare to resume normal operation, rewind the Probe up to its home position (but no farther - stop when reel becomes difficult to turn). Then reconnect the Auto Seeker cable.

Pump Power Test Procedure

(Refer to drawing below). The System Power Switch governs all power to the system when it is connected to an AC power source, including the Control Box, Probe, and Auto Seeker. A yellow lamp will light indicating that the system power is ON.

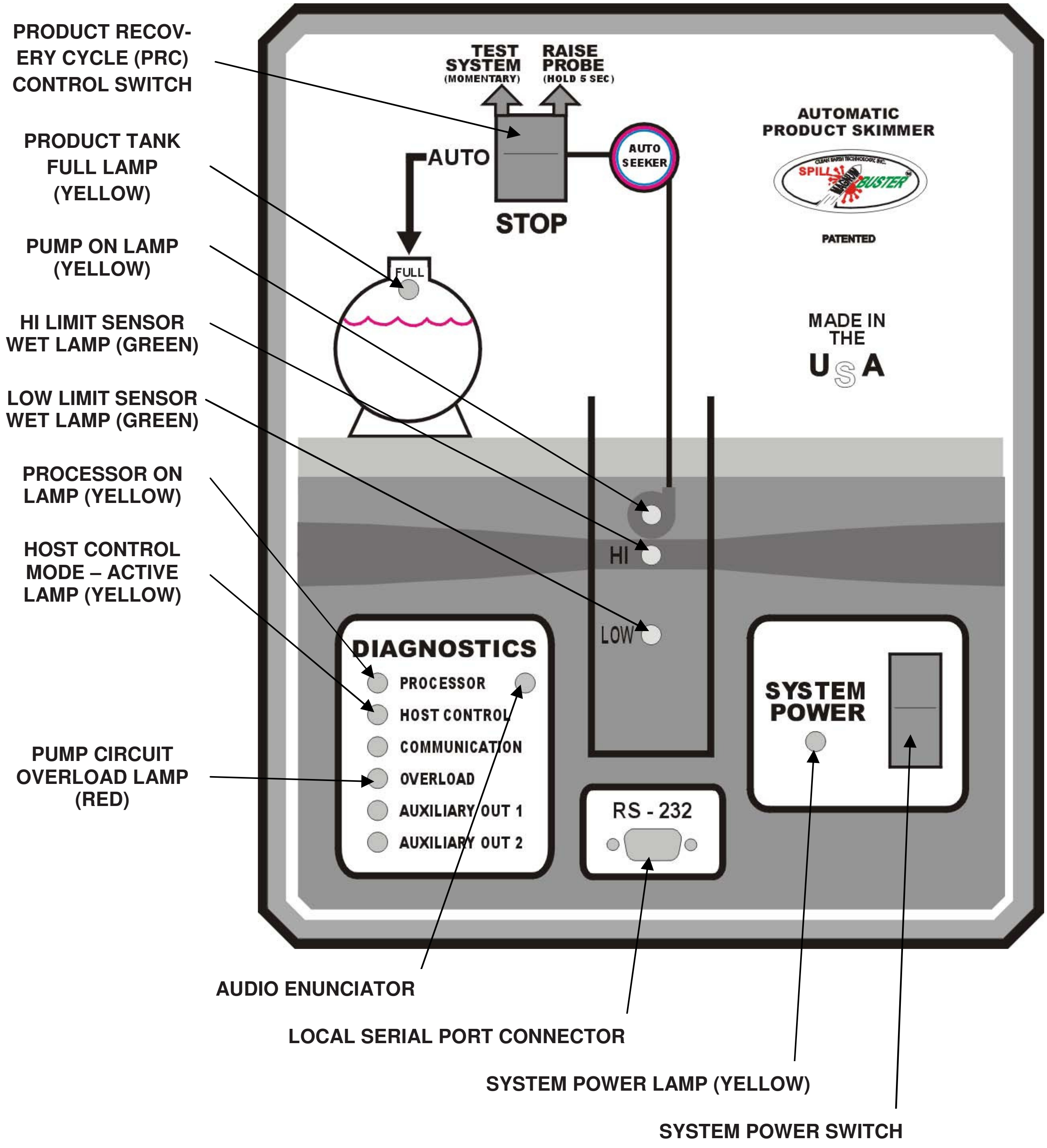
1. Turn the System Power switch ON. The System Power lamp, and Processor lamp, on the control panel will turn ON, and the audio tone in the control box will begin to beep once every 2 seconds.

2. Press and release quickly the TEST SYSTEM side of the Product Recovery Cycle (PRC) control switch. The product pump (in the probe) will operate for approximately 5 seconds and then stop. The yellow product pump lamp on the control panel will light and the audio tone in the control box will produce a warbling tone while the pump is ON. Simultaneously, along with the audible motor sound, starting the pump usually causes the entire probe and cable to visibly twist and jerk as a result of the pump torque reaction.

3. Immediately after the test, push STOP at the PRC switch. Otherwise, Auto Seeker will begin to cycle and unwind Probe cabling off the reel.

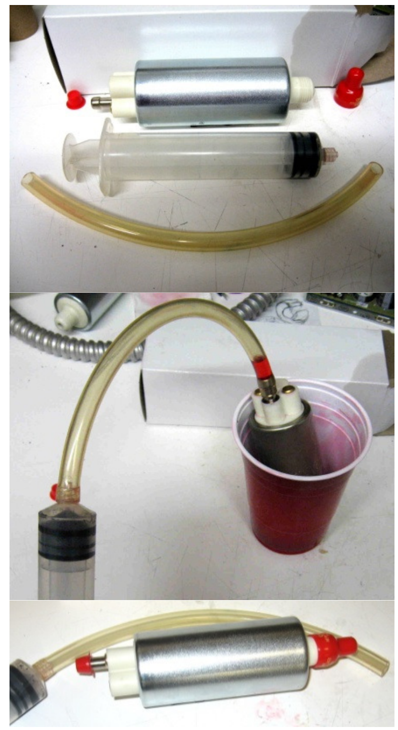
4. Turn the System Power switch to OFF.

NOTE: You must remove the pump from the Probe (See "Removing the Product Pump" on page 69) and perform the Pump Flooding Procedure (page 34) before lowering the Probe into the well.


PRODUCT RECOV-ERY CYCLE (PRC) CONTROL SWITCH
PRODUCT TANK FULL LAMP (YELLOW)
PUMP ON LAMP (YELLOW)
HI LIMIT SENSOR WET LAMP (GREEN)
LOW LIMIT SENSOR WET LAMP (GREEN)
PROCESSOR ON LAMP (YELLOW)
HOST CONTROL MODE – ACTIVE LAMP (YELLOW)
PUMP CIRCUIT OVERLOAD LAMP (RED)
TEST SYSTEM (MOMENTARY)
RAISE PROBE (HOLD 5 SEC)
AUTO
STOP
AUTO SEEKER
FULL
AUTOMATIC PRODUCT SKIMMER
SPILL BUSTER
PATENTED
MADE IN THE USA
HI
LOW
DIAGNOSTICS
PROCESSOR
HOST CONTROL
COMMUNICATION
OVERLOAD
AUXILIARY OUT 1
AUXILIARY OUT 2
RS - 232
SYSTEM POWER
AUDIO ENUNCIATOR
LOCAL SERIAL PORT CONNECTOR
SYSTEM POWER LAMP (YELLOW)
SYSTEM POWER SWITCH

Pump Flooding Procedure

Before a probe can be installed down the well (or re-installed after servicing), the pump must be flooded. The purpose of this procedure is to displace oxygen and vapors from within the pump body. Once the system is installed, the added fluid will be pumped out to the recovery container during the first recovery cycle. **Note:** CET does not ship new or serviced systems with the pump pre-flooded.



Required Equipment:

- A suction device, such as syringe pictured at right. **NOTE:** If purchasing device separately, any O-ring included should be replaced with a Viton ® O-ring to prevent swelling.
- Suitable container for the fluid
- Approximately 8 fl oz of flooding fluid, such as Ultra-Pure Paraffin Lamp Oil, mineral oil, material from the subject well, or similar non combustive fluid. DO NOT USE WATER, the pump internals are NOT corrosion resistant.
- Approximately 12”of 3/8 fuel line
- A product pump, CET P/N 90-1318-019

Flood the pump

- Attach the fuel line to the discharge side of the pump.
- Attach the other end of the fuel line to the suction device.
- Place the pump inlet in the container of fluid.
- Pull the fluid into the pump until it is observed in the fuel line.
- Remove the fuel line from the pump.
- Install (or re-install) the flooded pump into the probe (reference the “Pump Installation” section of the Maintenance Operations chapter of the Operator’s Manual).
- If the pump is not immediately installed in the probe, replace the red intake and discharge caps. The pump can then be bagged for later use or storage.

Note: Always save the red caps from installed pumps for future use.

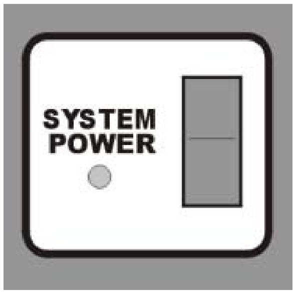
Once the flooded pump has been replaced in the Probe (See “Pump Installation” on page 68), check through all the installation steps in this chapter to confirm that all have been completed properly. You are now ready to begin system operations.

If the Control Box is mounted in an explosion proof enclosure, make sure power at the circuit breaker panel is switched OFF. Then at the Control Box, turn the System Power switch to ON and set the PRC switch on Auto. Then close the enclosure door and install the fasteners around the flange. Torque the bolts to 30 ft. lbs. When ready to begin system operation, turn the power back on at the circuit breaker panel.

2.0 Spill Buster System Operations

7 Easy Operation Steps

Initial Power Up

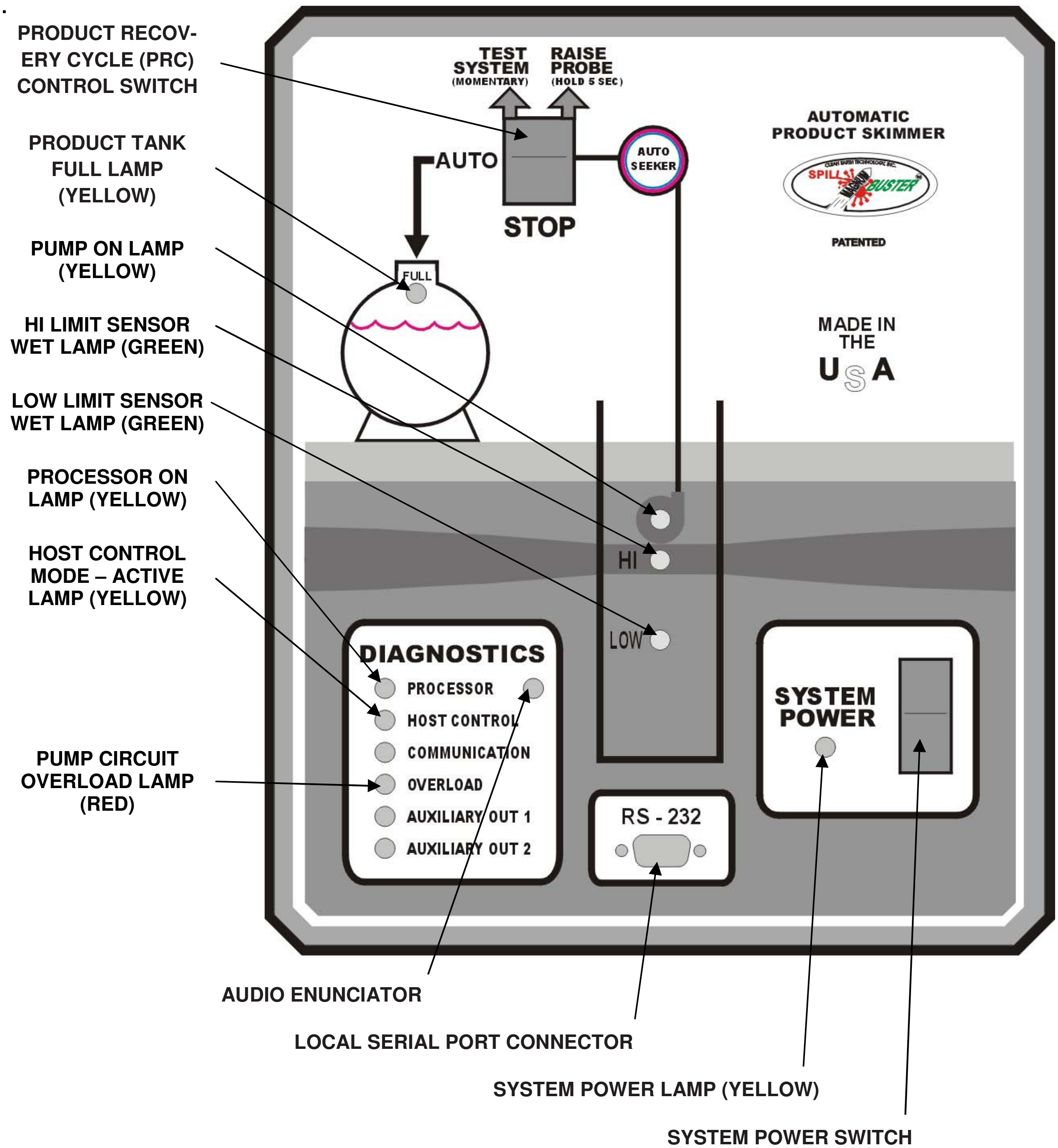


System Power Switch

The System Power Switch governs all power to the system when it is connected to an AC power source, including the Control Box, Probe, and Auto Seeker. A yellow lamp will light indicating that the system power is ON. NOTE: When the system is connected to a battery, the function of the switch is overridden. After the system is turned ON and the PRC switch is in the AUTO position, the system will begin its cycle after a 5 second delay.

NOTE: Audio tones operate for approx. 5 minutes after the system power is turned ON and when re-starting the Auto Cycle (PRC Switch). See charts for Indicator Lamps and Audio Indicators on page 32. The tones can be turned OFF altogether by altering DIP Switch S1-4 in the I/O Extension.
[See Dip Switch Settings, page 44]

Magnum Spill Buster Front Panel



Magnum Spill Buster System Cycle

Seeking the Interface

There is a 5 second delay between the time that the System Power switch is turned ON and the moment the cycle begins. The system will begin to automatically seek the water table by lowering the Probe. The Audio Enunciator in the Control Box will beep every 2 seconds. The Probe will pass through the layer of product and seek the level of water in the well. When the Low Limit sensor contacts the water, the Low Limit lamp will light, and the system will beep 2 times per second. When the HI Limit sensor contacts water, the HI Limit lamp will also light, and the Audio Enunciator will emit a continuous tone. When the HI limit sensor gets wet, the Auto Seeker will raise the Probe until the HI limit band is above the water table PLUS an additional amount as determined by the "Interface Clearance" dip switch S4-3 and S4-4. [See Dip Switch Settings, page 44] The HI limit lamp will go out when the sensor becomes dry.

Many system parameters including cycle time, pump rate, and probe interface clearance, may be altered by changing dip switches. See DIP Switch Settings, page 44

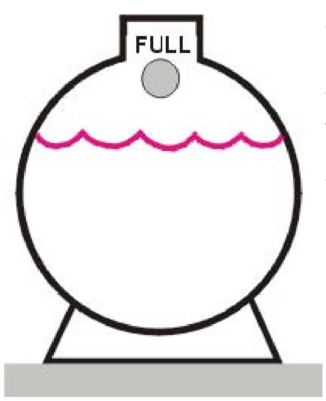
Pump Cycle

The pump will begin to pump product, the yellow Pump lamp will light, and the system will emit a warbling tone. The pump will continue to operate until it pumps air (or unloads).

Cycle Delay Time

The system cycle enters a time delay to allow more product to flow into -or recharge- the well. The Magnum Spill Buster system will automatically adjust the delay time interval from 10 seconds to up to 6 hours based on the length of the pump cycle, according to the standard factory configuration of the dip switches. The system cycle delay time is a function of the recharge rate. [See Dip Switch Settings, page 44]

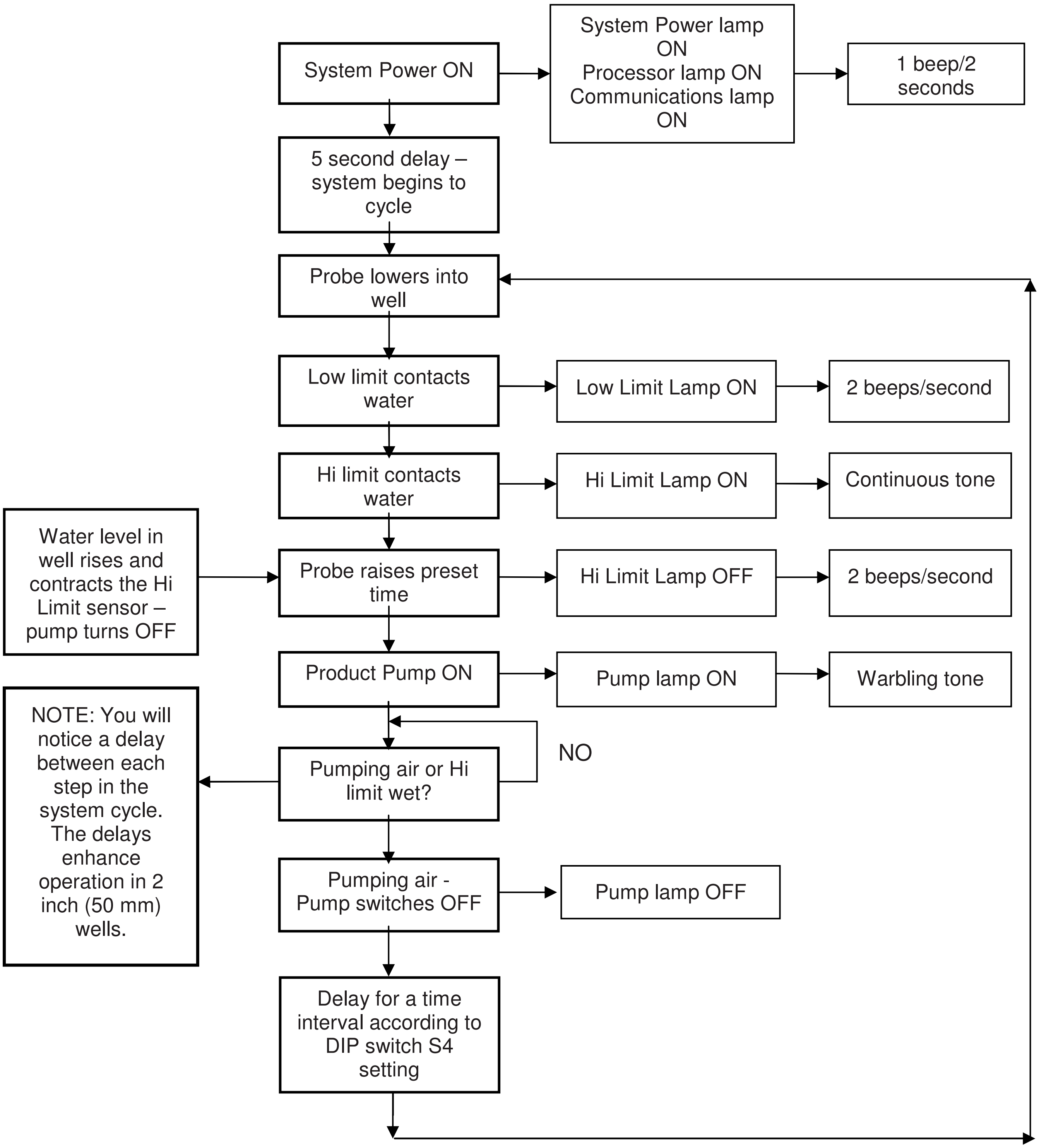
Pump Override



The Magnum Spill Buster system is configured with a Product Tank Override Probe. This Override Probe will inhibit pump operation when the product tank is full, or when the Product Tank Override Probe is missing. When one of these two conditions exists, the "full" lamp will light in the product tank on the Control Panel. A Dip Switch (S2-4) is available to override this function when a Product Tank Override Probe is not used. [See Dip Switches Settings, page 44]

NOTE: The Product Tank Lamp should not light when the system is turned on, unless the Product Tank is full, or the product tank override probe is not connected.

System Cycle Schematic with Auto Seeker



Indicator Lamps

Label	Color	Indication
System Power	yellow	ON when unit has been switched ON
Overload	yellow	ON when a pump overload condition has occurred
Full	yellow	ON when product tank is full (float switch closed) or when Product Tank Override Probe is not connected to Control Panel
Pump ON	yellow	On when product pump is energized
HI	green	On when the high limit probe sensor is contacting water
LO	green	ON when the low limit probe sensor is contacting water
Processor	yellow	ON indicates normal control function. Blinks when (a) pump circuit overloaded (e.g. failed pump) or (b) pump circuit is open

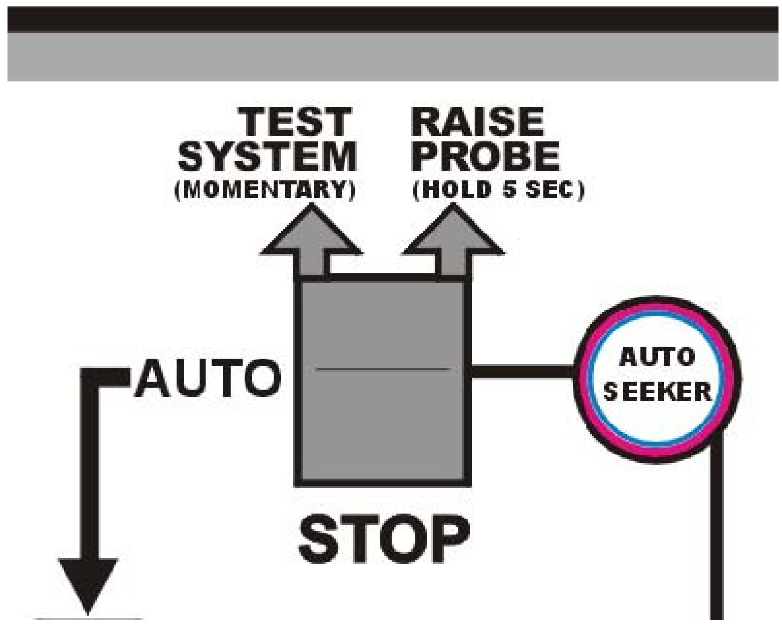
Audible Indicators

Tone Sequence	Indication	Priority
Continuous tone	Hi limit sensor is contacting water	highest
Warbling tone	Product Pump is operating	***
2 beeps/second	LO limit sensor is contacting water	***
1 beep every 2 seconds	System Power is ON	lowest

Product Recovery Cycle (PRC) Control Switch

The PRC is a 3-way rocker switch, and is located on the upper left-hand corner of the Control Panel.

Auto



At system power up, the PRC switch is in AUTO (its rest position), which allows the system to cycle automatically; that is, the Auto Seeker will lower the probe into the well after 5 seconds, etc. The system will start to lengthen its cycle time depending on the amount of product being pumped; i.e. a shorter cycle time for faster recharge rate. When depressed, this switch performs a test cycle, raises the probe, or stops the system from operating. **NOTE: System Power remains ON.**

Test System

A momentary push on the top of the PRC Control switch causes the pump to run for 5 seconds; then the system will initiate a new cycle (i.e. the probe will seek the product/water interface and start to pump the product. This Test System cycle is typically used during system installation while holding onto the probe to determine if the pump is functioning properly, prior to lowering the probe into the well. After testing, press STOP to prevent the system from beginning to cycle, or AUTO to leave system operating.

Raise Probe

If the top of the PRC Control switch is depressed and held for more than 5 seconds, the Auto Seeker will raise the probe to its upper limit for ease of Auto Seeker/probe removal. The system will not start normal operations again until the switch is moved to STOP and then to AUTO.

Stop

Depressing the Stop side of the PRC switch will stop the product pump or the Auto Seeker mid-cycle. **NOTE: System Power will remain ON**. Returning the switch to the AUTO position will initiate a new cycle after 5 seconds. Pressing STOP will also reset the Automatic Cycle Timer to 10 seconds if dip switches S4-1 and S4-2 are set for AUTO (both OFF). Refer to section 3, Dip Switches.

System Cycle Operation (no Auto Seeker)

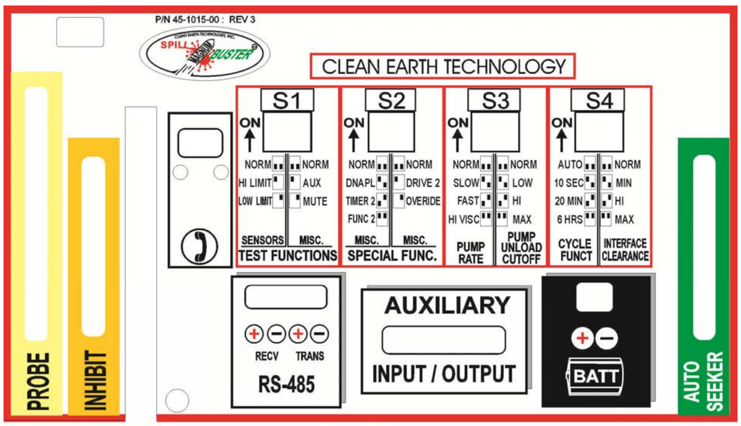
The Auto Seeker is not used in the Magnum Spill Buster system in three modes as follows:

- In a water depression mode, where the Magnum Spill Buster is set up in tandem with a Water Depression Module,
- In a DNAPLs or “sinkers” mode, where the probe intake will be positioned as close to the bottom of the well as practicable,
- When there is no water in the well. [See OPTIONS: Magnum Spill Buster used for DNAPLS, page 46].

The Magnum Spill Buster system will automatically recognize that no Auto Seeker is plugged in. The pump will continuously pump product until there is no more product to pump, and it starts pumping air. The pump will cycle periodically (according to DIP Switch S4-1 and S4-2 settings, page 44) if the Hi sensor is not contacting water. The pump will also cycle whenever the Hi sensor goes through a transition from wet to dry.

When a Water Depression Interface is connected to the Magnum Spill Buster, the Auto Seeker is not moved up or down, but rather the probe is fixed at the desired water level. The depression pump will move the water/product interface past the product pump intake causing the product pump to cycle.

3.0 Spill Buster Advanced System Operations



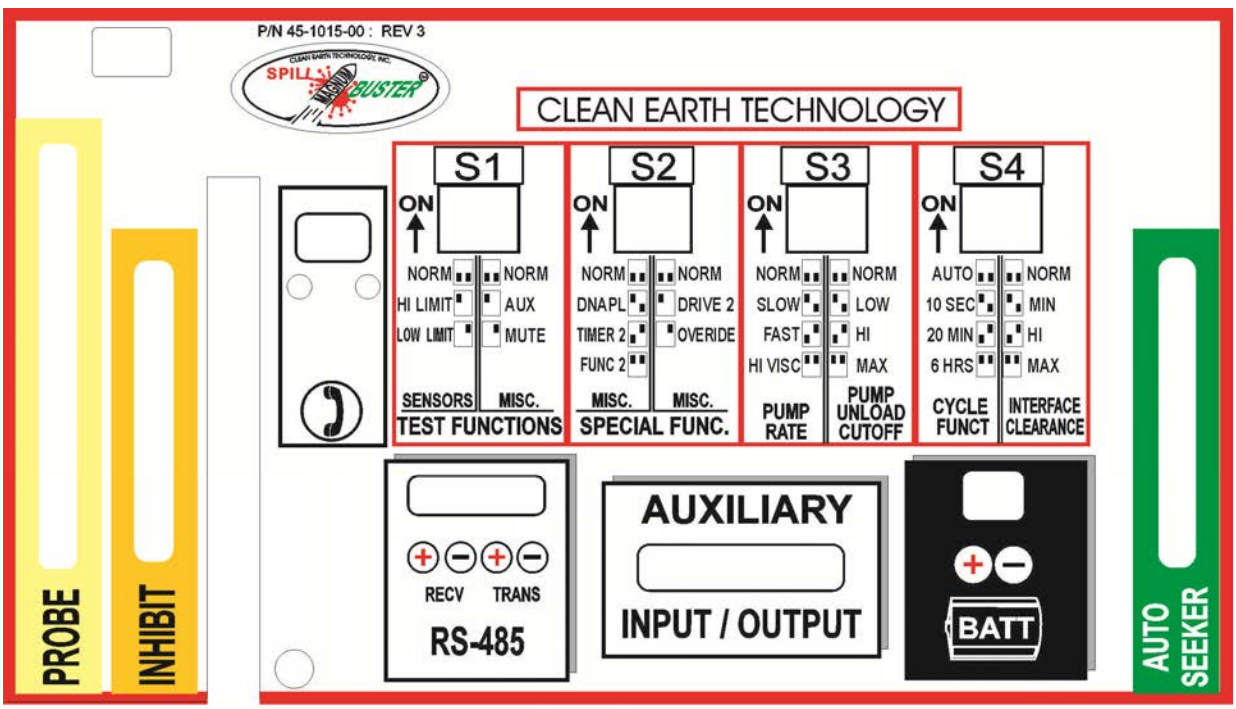
Advanced operations are defined as operating modes that are not set at the factory before shipment of the unit to customers and/or field sites. Modifying the standard operating modes is usually accomplished by changing the DIP Switch settings, which are located on the I/O panel located underneath the main Control Box enclosure.

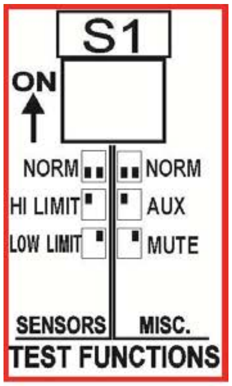
DIP Switches

To access the DIP Switches, unscrew the two screws on the bottom corners of the I/O Extension and remove the cover.

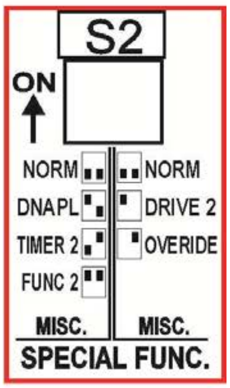
DIP Switches S3 and S4 are used to adjust and customize the Magnum Spill Buster system to individual sites and applications. The Magnum Spill Buster comes from the factory with DIP Switches preset to a standard configuration which automatically adjusts the cycle delay time interval from 10 seconds up to 6 hours [12 hours for versions previous to V.4], according to the recharge rate. This configuration will work for most sites. In some cases, changing DIP Switches from the standard configuration may increase the rate of product recovery or may increase pump life, depending upon the specific site conditions.

DIP Switches S1-1, S1-2, S1-3, S2-2, & S2-3 are used for factory testing and troubleshooting. These DIP Switches should **NOT** be changed unless directly requested by Clean Earth Technology personnel. DIP Switch Set Nos. 3 thru 4 control user functions of the system, and affect probe actions, including probe height above interface, pump speed, and pump cutoff. The DIP Switch functions are discussed below. For further help and instruction with the DIP Switches and the improvements they may make to your site, please call the factory.

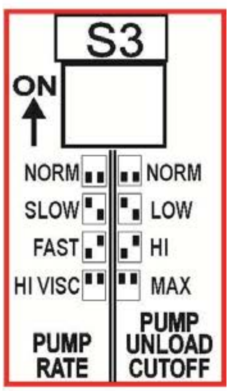




S1 - The group of switches labeled **S1** and **TEST FUNCTIONS** are all for CET test functions, with the exception of S1-4. This switch silences all audible indicators in the Magnum Spill Buster system. Normal setting is all four switches OFF.

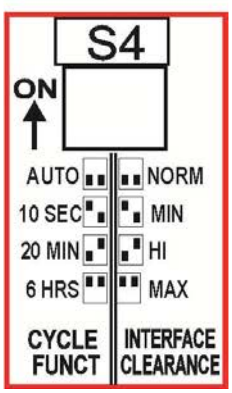


S2 - The group of switches labeled **S2** and **SPECIAL FUNCTIONS** contains more CET test functions with two exceptions: **S2-1**, which enables the Magnum Spill Buster system to pump DNAPLs; and **S2-4**, which allows the Magnum to operate without the product tank override probe connected. Normal setting is all four switches set to OFF. WARNING: WITHOUT OVERRIDE PROBE CONNECTED, FULL TANK IS NOT DETECTED AND SECONDARY SPILL MAY OCCUR.



S3-1 & S3-2 - The group of switches labeled **S3** and **PUMP RATE (S3-1 & S3-2)** controls the pump motor speed. Slow is the lowest speed and may be used when the product layer is thin. A thin product layer may create foam when pumped too quickly. Normal is a middle speed, and fast is for maximum speed. Fast may be used when dealing with either medium viscosity product, or greater back pressure in the product tube, or greater well depth. High viscosity products are most effectively pumped using our High Viscosity Magnum Spill Buster system.

S3-3 & S3-4 - The group of switches labeled **S3** and **PUMP UNLOAD CUTOFF** selects pump current cutoff threshold. The system should be started at normal. If the Magnum pumps air and doesn't cut off, or if the pump cuts off prematurely (i.e., product remains in the well that should be pumped out), then change switches **S3-3** and **S3-4** as follows: if cutoff is premature, decrease the setting; if the pump does not cut off while pumping air, increase the setting. Allow the Spill Buster to run through 2 or 3 cycles between changes in cutoff switch settings. Any change in PUMP RATE settings (**S3-1 and S3-2**) will affect **PUMP UNLOAD CUTOFF. Be sure the pump cuts off within 15 seconds when pumping air. Continued dry pumping will damage the pump. NOTE: MAX setting is intended for set up/demo use ONLY, and in most cases will not result in a desirable recovery rate.**



S4-1 & S4-2 - The group of switches labeled **S4** and **CYCLE FUNCTIONS** determines the time delay interval between pump cycles. Automatic is the normal setting, directing the Magnum control to vary the delay time interval according to the amount of product pumped. The other three settings are fixed time intervals: 10 sec., 20 min., & 6 hrs. **NOTES: The fixed time intervals will override the automatic delay time adjustment feature of the Magnum system, and it will continuously cycle at the time delays specified. The 10 second setting is for test, and it may be useful when setting up the Magnum system. If left in the 10 second setting, the pump will automatically switch to the 20 minute interval after 20 cycles.**

S4-3 & S4-4 - The group of switches labeled **S4 and INTERFACE CLEARANCE** determines how high the pump intake will be raised above the product/water interface. These settings are useful to avoid biological growth that accumulates at the product/water interface in some wells. The MIN setting is recommended in a well with no biological growth and will result in the maximum recovery of product and minimum product thickness (approximately 0.1" (0.25mm). NORMAL will give a greater distance from the interface, with MAX being the highest (approx. 2").

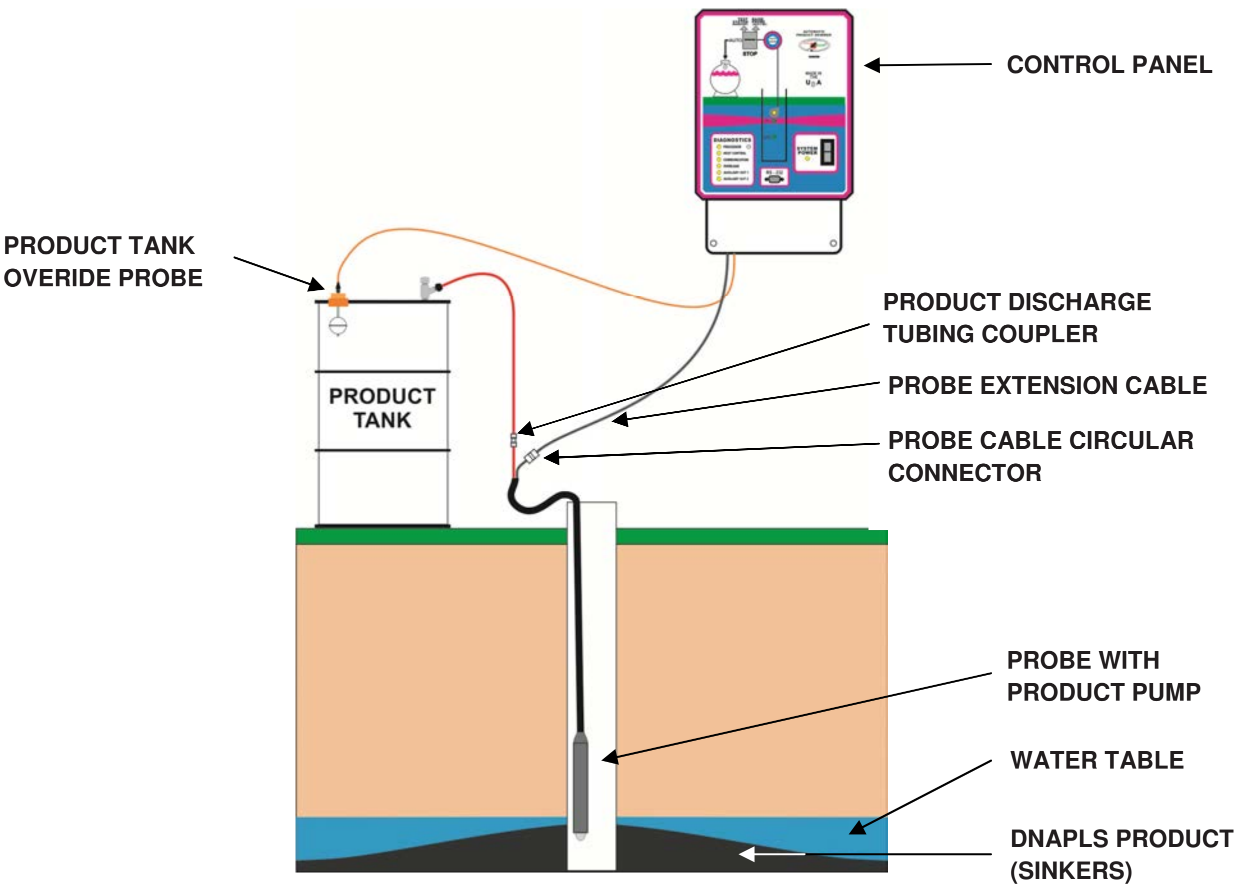
DNAPLs Operation

General Description

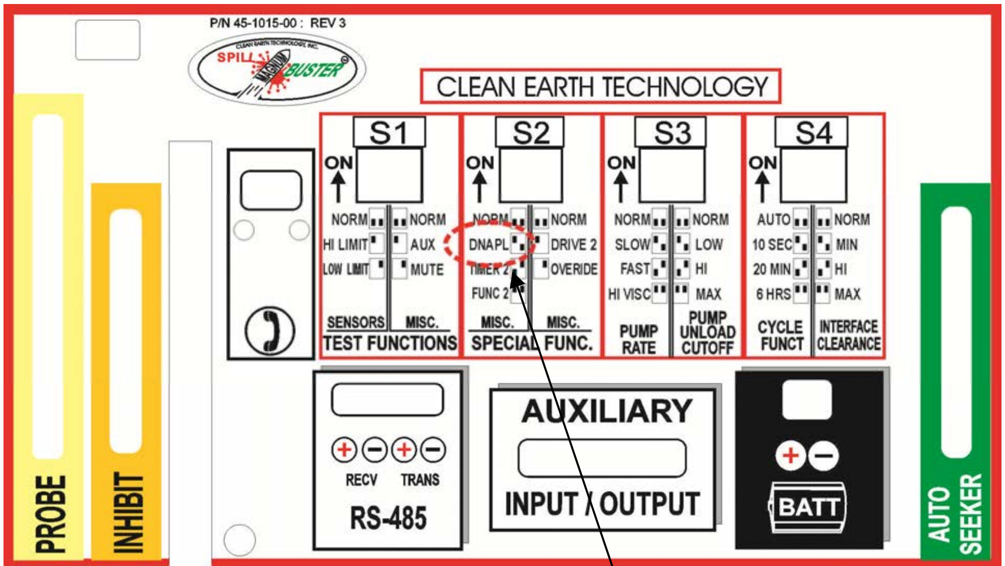
DNAPLs (or “Sinkers”) refer to those products that are heavier than the water and therefore are found below the water layer rather than above, as in the case of floating product. By following the procedure below, the Magnum Spill Buster may be adjusted to automatically pump low viscosity sinkers from a 2” well from depths of up to 150(?) feet.

DNAPLs Procedure

The system should be run with no Auto Seeker or with Auto Seeker disconnected. **Set I/O board DIP Switches S2-1 to ON and S2-2 to OFF.** Lower the probe into the well to a point 3” - 4” above the bottom. This positions the probe to avoid sediment and sludge which could clog the intake.

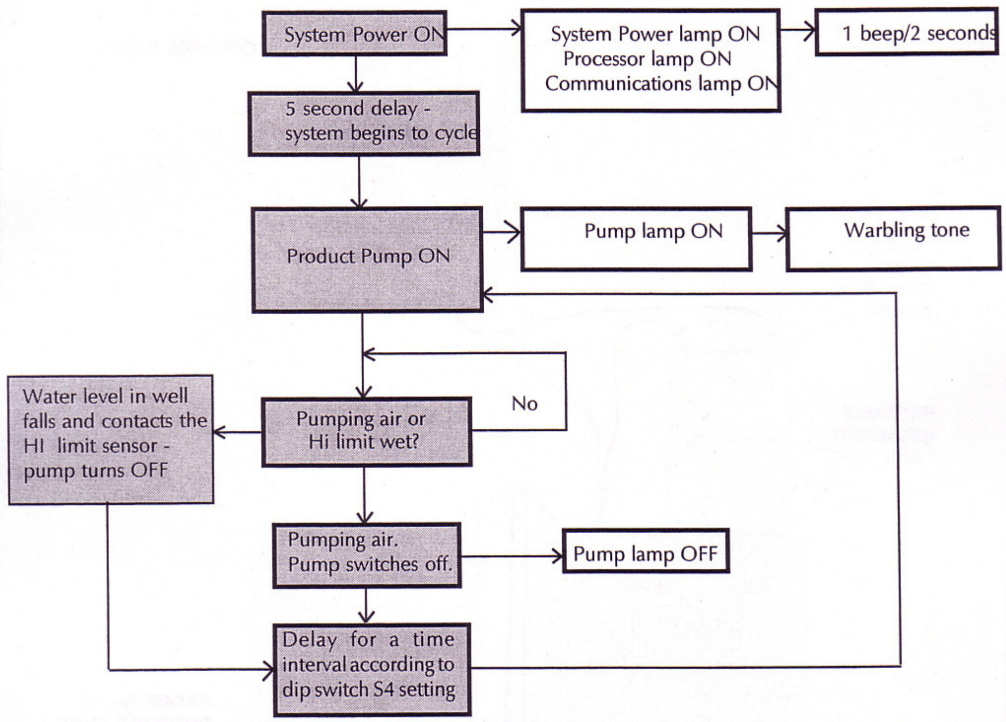


In the DNAPLs mode, the product recovery cycle differs somewhat from the standard cycle. The pump will run periodically according to the DIP switch **S4-1** and **S4-2** setting, as long as the HI limit sensor is not contacting water. As the sinker product is pumped off, the water/product interface will drop. When the HI limit sensor contacts water, the pump will stop and a delay will occur before the next cycle. If water is not present in the well, the pump will be stopped when it begins to pump air.



I/O board DIP switch setting
for DNAPL operation

DNAPLs System Cycle without Auto Seeker



4.0 Other Options

Immediate Response Box

The Immediate Response Box (I.R. Box) is a rugged plastic box that contains a Standard Magnum Spill Buster system. The I.R. Box provides an extremely portable system to start removal of product in a 2" or larger well with minimal equipment set-up. A large forged shackle is attached on the left end of the box for security. Since the I.R. Box contains a standard control box, it can be used with any other Spill Buster options.

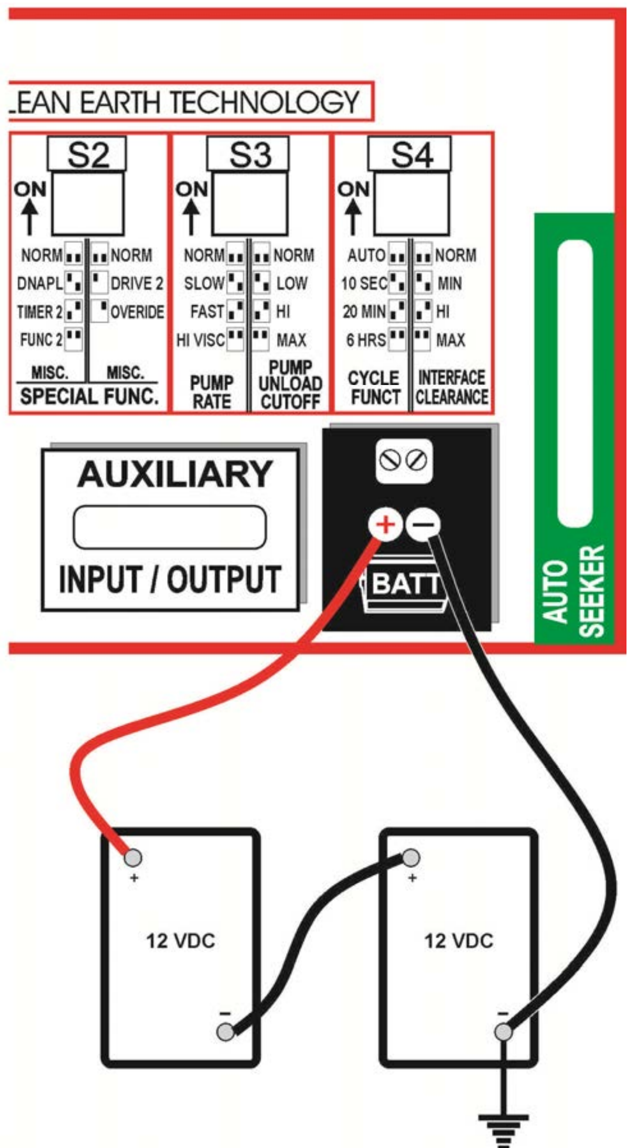
WARNING
Control Box and Standard Auto Seeker must be located outside of any classified hazardous areas. Refer to applicable codes

The I.R. box can easily be carried in a small pick-up truck or van. The basic setup involves mounting the Auto Seeker outside of any classified hazardous atmospheres (on many sites it is possible to move the Auto Seeker from the classified hazardous zone by raising it above the well head); then connecting the product tank discharge tube and overflow sensor to the product tank, and connecting the Auto Seeker cable and the probe signal cable.

The system is powered by 115VAC from an extension cord (see pg. 63 for extension sizing). In addition, cables can be provided to operate the system from a 24 volt deep cycle battery. See page 51 for battery operation of system.

Battery Operation

For sites with no utility connection available, batteries can be used. It is necessary to ground EVERY battery operated system. [See page 18]. The batteries should be deep cycle type. [NOTE use two 12 volt batteries in series for 24 volt power]. Use 12 AWG wire. One end of the cables will connect to the Control Box inside the I/O extension on the terminal block labeled "Batt". Connect the other end to the battery, making sure that the polarity is correct. NOTE: hooking up a battery will bypass the power system switch. When the Magnum Spill Buster is hooked up to the battery, the system will activate, as if the power switch were turned on. No dip switch settings or board changes are necessary with battery operation. Battery life will be a function of the battery size, well depth, product viscosity and many other factors.



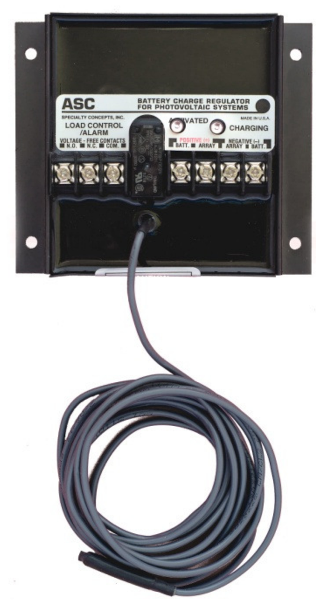
NOTE:
When operating the Magnum Spill Buster on battery power, remember to ground the system properly. Refer to page 18 for proper grounding procedures.

Solar Panel Charging Operation

For sites with no utility connection available, batteries with a photovoltaic recharging system (solar panels) can be supplied. These systems are 24 VDC and work in conjunction with 2 or more Solar Panels. The solar system can be integrated with an Immediate Response box if desired.

The Solar Panel Charging system includes a heavy-duty frame and mounting hardware for 2 or more Solar Panels (depending on your site power requirements and geographic location relative to available sun power), 2 12VDC Deep cycle batteries, a fully potted waterproof control regulator, and custom cabling. A secondary condition on panel sizing is the amount of product present at the site to determine the duty cycle or percentage of time the system will run.

As with all Clean Earth Technology products, the Solar Panel Charging system features an easy set-up and operation. Complete wiring directions are supplied with each system and CET is available to assist if desired. Please contact your Clean Earth Technology products distributor for a quote specific to your site.



Clean Earth Technology currently uses the Specialty Concepts ASC line of Charge Controllers which are UL listed, FM and CSA rated for Class 1, Div. 2, Groups A, B, C, D hazardous locations. These controllers are fully encapsulated and thus are water proof. We do however, recommend that they be placed out of direct exposure to the environment along with the batteries and associated wiring.

The model specifically matched for operation with the Magnum Spill Buster is ASC 24/16 AE. Please confirm that this is the model received with your solar system upon delivery from the solar power manufacturer.

NOTE:
When operating the Magnum Spill Buster on battery power, remember to ground the system properly. Refer to page 18 for proper grounding procedures.

Water Depression

Dual pump product recovery operation can be accomplished with the Magnum Spill Buster System plus a Clean Earth Technology Water Depression Control Module and a Grundfos Redi-Flo 3 SQE-NE pump sized to your well. The Magnum Water Depression system is designed specifically to take advantage of all the features of the Grundfos Redi-Flo 3 SQE-NE pump. This Module obtains its water level signals and control logic from the Magnum system control box and in turn controls water flow by using the soft start feature of the Grundfos pump to turn it on and off. This line of Grundfos pumps is upgraded to safely bring the high level AC voltage through the recovery zone to the pump without the need for specialized fittings.

A set of normally open contacts are provided for use with a safety override probe, which will shut down the water pump when closed.

Typical installation of a Water Depression Control Module

alongside a Magnum Spill Buster Control Panel

Water Depression Specifications

Input Power	115 VAC or 230 VAC, 30 AMPS maximum
Operating Temperature Range	40 to +140 degrees F or -40 to +60 degrees C
Pumping Rate	0 to 33 GPM depending on water pump sizing
Standard Well Depth	50’ max
Maximum Well Depth	150’ on special order with 175’ water pump power cable.

Control Box Dimensions: 9” wide x 10.5” high x 6.5” deep. An additional 10” clearance is required below for cable exit and an additional 9” clearance is required in front and to the left for door swing.

Auxiliary Override Terminal Block: Provides wire termination for an Auxillary set of Normally Open switch contacts. Used for emergency water depression pump shutoff if there is a water treatment failure. Switch contacts need to be rated for 1 Amp at 12 VDC minimum.

Total Water Depression System Weight (w/o pump): 8 lbs.

Pump Requirements

Due to the inherent design features of both the Magnum Water Depression System and the pump, the Grundfos Redi-Flo 3 SQE-NE Submersible Environmental Pump is the only acceptable water pump.

120 VAC or 240 VAC motors are available
Standard flow ranges are as follow:

3 to 15 GPM
7 to 33 GPM

1/2 and 3/4 horse power motors available depending on head pressure.

WARNING!
The Grundfos Redi-Flo 3 SQE-NE is the only water pump approved for use with the Magnum Water Depression System.

Options

Power Cable Lengths.
Standard length is 80’ from control box to water pump.
Other lengths available on special order.

Water Depression Control Panel (WDCP)

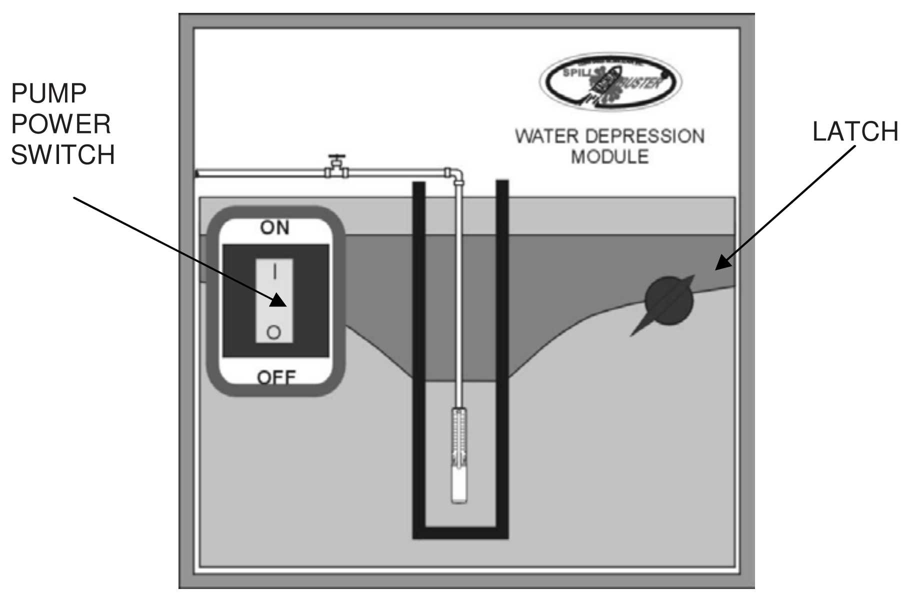
The Water Control Module is a NEMA 4 UL approved enclosure containing the water pump control solid state relay and the I/O wiring terminal blocks. The control box door should be kept latched at all times when not in use, and excessive moisture (e.g. rain) should not be allowed to enter the box. **Although there are no open contacts, this is not an explosion-proof enclosure; locate the Control Module in a non-hazardous location!**

Front Panel

The Control Panel is accessible by opening the front door of the Control Box. The Control Panel contains the main power switch for the depression pump. This switch also is a backup circuit breaker for the water pump, and is rated 25 Amps at 230 VAC.

The first (lower) position of the switch is water pump OFF. Once the switch is turned on the water system is enabled to follow orders from the Magnum Spill Buster control box, which gets its water level information from the product probe sensors. The Magnum control box will send signals to turn the water depression pump on and off as required to maintain the desired water depression level. All product skimming functions are still controlled by the Magnum Spill Buster control box as before.

WARNING!
This is not an explosion-proof enclosure; locate the Control Module in a non-hazardous location!



Installation of the Water Depression Pump

The WDP should be installed near the bottom of the screened section of the recovery well, but should not rest on the bottom of the well. Placing the WDP on the bottom of the well may result in pumping sediment that collects on the bottom of the well.

- Determine the distance from the well head to the WDP intake. Cut a length of pipe that is 0.25 m longer than the distance from the well head to the WDP intake. We recommend that 1.25" flexible plastic piping is used. thread the WDP power cord through the pipe.
- Attach the pipe to the pump, using an appropriate fitting. At the well head end of the pipe, thread the WDP power cable through the "Y" fitting ("Y" fitting will be provided by CET). Thread the wire so that it enters the "Y" fitting at the bottom, and exits through the watertight seal. Attach the wellhead end of the pipe to the bottom of the "Y" fitting, using a 1.25" male NPT/1.25" barbed fitting. Secure the pipe to the barbed fitting, using two hose clamps.
- Secure the WDP at the desired depth, using a steel cable, nylon rope, or chain. Secure the cable, rope, or chain to the WDP, using the stainless steel loop at the top end of the pump housing. Lower the WDP into the well using the cable, rope or chain. Secure the cable, rope or chain at the wellhead to ensure that the pipe is not bearing the weight of the pump.
- Install pipe from "Y" fitting to the water treatment system. It is important to install a manual flow control valve in the water discharge line between the "Y" fitting and the water treatment system. The flow control valve is used to adjust the rate at which water is being pumped from the well. Doing so "sizes" the pump better to the actual well conditions. This will help maximize pump on/off cycle time, thereby extending the life of the pump motor. This will also tighten and smooth out depression level control.

Installation of the Water Depression Control Module (WDCM)

Mount the Control Panel in a suitable location (outside of any classified hazardous area) within a few feet of the Magnum Spill Buster Control box. Typical installations are in sheds, on the side of buildings, or on a utility type pedestal mount.

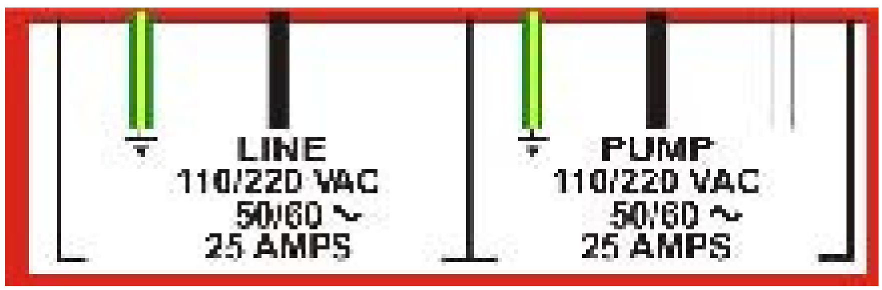
Connect the 20 pin cable from the panel to the Auxillary I/O outlet in the MSB control box.

Hard Wiring the Water Depression Control Panel

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

The Water Depression Control (WDC) Module is designed to operate on either 115 or 220 VAC Power just by making the appropriate hook ups into the terminal block. Wiring to the module will be routed to the 120 VAC or 220 VAC portions of the terminal block depending on the voltage of the pump. It should be noted that the power into the box should be rated the same voltage and amperage as the rating for the depression pump.

The cabling coming out of the well head should be long enough that it can be run directly to the WDC Module box. Excess cable can be coiled up at the well head or control shed. Next have a certified electrician wire AC power into the control box and to the appropriate spots on the terminal box as follows:



- Feed the WDC Power Cord thru the Control Panel bulkhead strain relief.
- Connect each of the three wires in the pump power cord to the connections (green, black, white) in the control panel at the space labeled “PUMP”.
- Connect the power supply cord from the circuit breaker to the WDC panel. Starting from a 25 Amp., 110 V or 220 V circuit breaker in the distribution box, run the cord (green, black, white) to the appropriate connections labeled “LINE”.

Probe Installation for a Standard System

NO AUTO SEEKER CONNECTOR USED WITH A STANDARD MAGNUM SYSTEM

- The probe signal cable is hooked to the signal cable extension via the “No Auto Seeker Connector”. Insert both plugs into the connector and tightly bolt together with hardware provided. Connect the other end of the signal cable to the WDC Module control panel.

- Hook the product discharge tube to the probe termination module and to the recovery tank using the fittings provided.

- Lower probe into well until the HI/LO lights on the control panel just come on. This signifies that the probe is at the static product / water interface. Now lower the probe by the amount of depression desired (Example: To depress 1 foot, lower probe 1 more foot) and secure.

Probe Installation for an Explosion Proof System

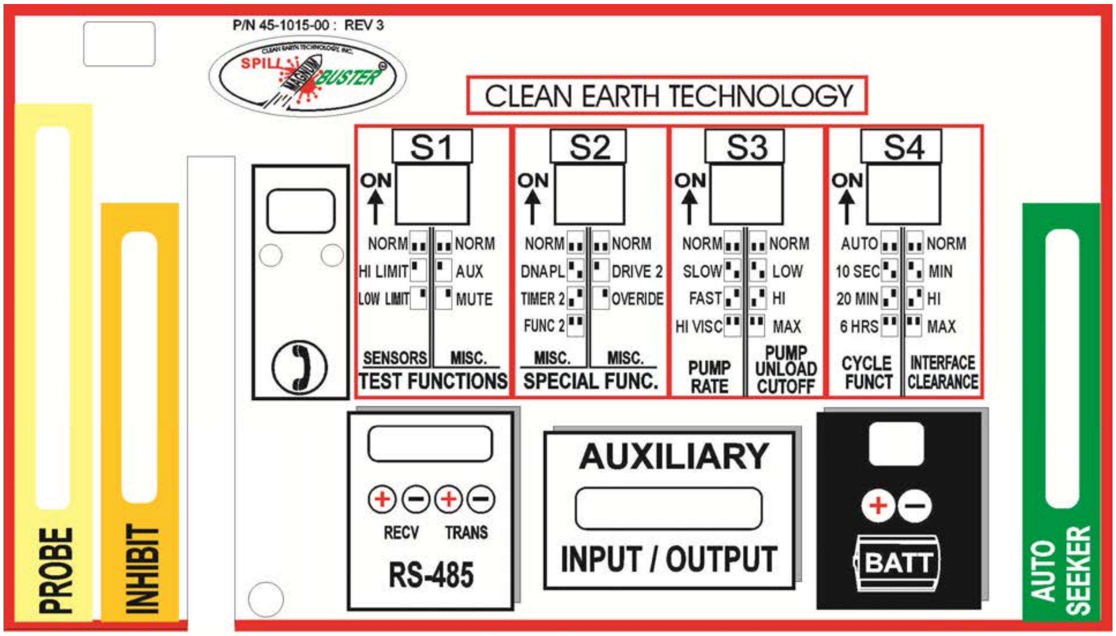
- The probe signal cable is hooked to the signal cable extension via the Mil-Spec connectors. Match polarity key on the connectors, push together and tighten connection nut Connect the other end of the signal cable to the WDC Module control panel.

- Hook the product discharge tube to the probe termination module and to the recovery tank using the fittings provided.

- Lower probe into well until the HI/LO lights on the control panel just come on. This signifies that the probe is at the static product / water interface. Now lower the probe by the amount of depression desired (Example: To depress 1 foot, lower probe 1 more foot) and secure.

Dip Switch Settings

In order for the Water Depression Module to work in configuration with the main Magnum Control Box, it is necessary to put DIP switches 1 and 2 on S2 in the UP position and all DIP switches on S4 in the DOWN position in the Magnum Control Box.

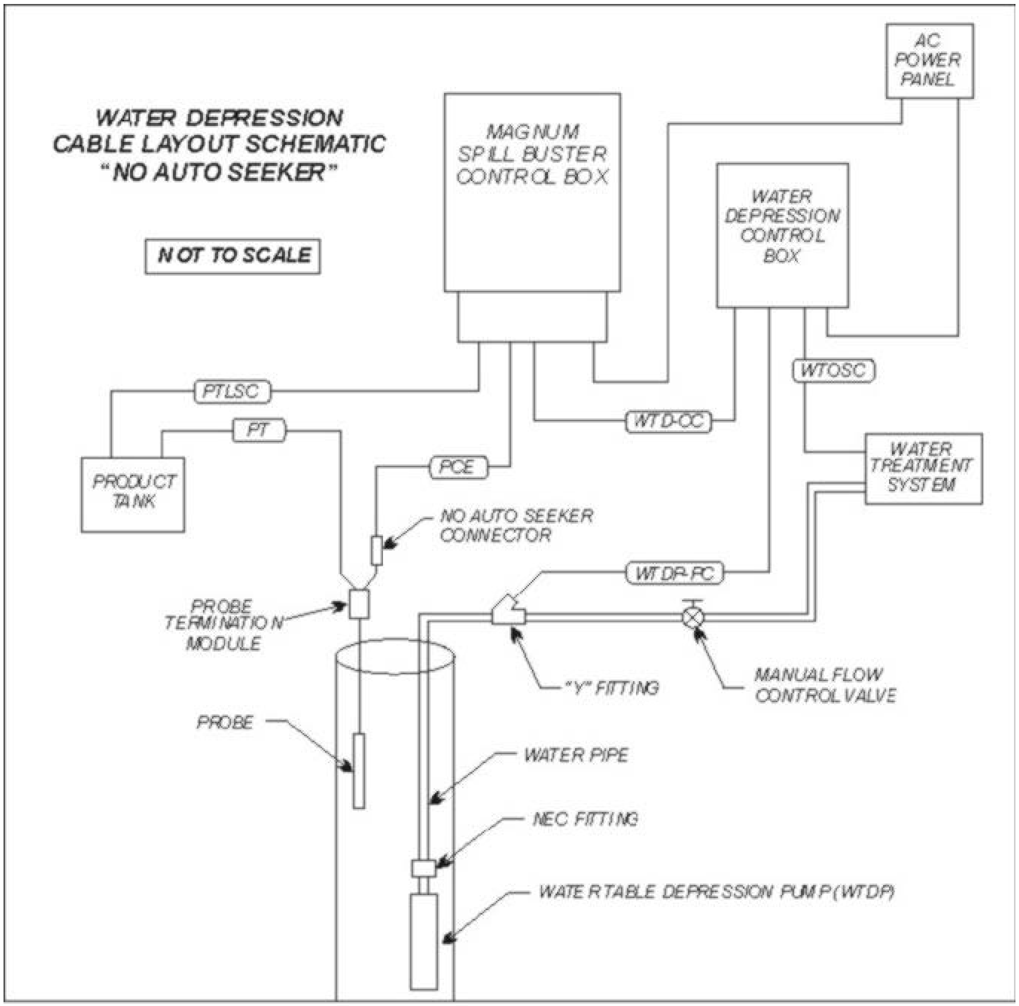


Start Up

- Turn the power on in the MSB Control Panel. Observe that the HI/LO lights on the MSB control panel are on. When used with the WTD option, it is necessary to put dip switches 1 and 2 on S2 in the UP position to enable the product pump to come on each time the HI light goes off.

- Turn the power on in the WTD Control Panel. Watch for proper cycling to develop between the HI and LO lights. When the oil/water interface is pumped to the level of the High level sensor, the HI limit light will go out. The product pump will then start pumping product. The water pump will continue to pump until the LO level light goes out, and then the water pump shuts off. When the oil/water interface rebounds to the level of the high sensor band on the MSB probe, the water pump will automatically restart and the product pump will shut off briefly until the high level sensor goes out again. Throttle the water flow control between the pump restart and shut-off. This will help minimize pump on/off cycling, thus tightening depression level control and extending the life of the pump motor. Occasionally adjust further as the cone of depression develops or there are seasonal flow rate influences.

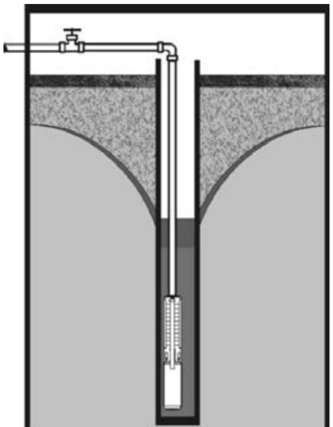
System Schematic



LABEL DESCRIPTIONS		STANDARD LENGTHS	STANDARD OPTIONS
PCE	PROBE CABLE EXTENTION	25'	50', 75', 100
WTD-CC	WATER TABLE DEPRESSION CONTROL CABLE	5'	N/A
PTLSC	PRODUCT TANK LEVEL SENSOR CABLE	25'	SPECIAL ORDER
WTDP-PC	WATER TABLE DEPRESSION PUMP POWER CABLE	80' (FROM PUMP)	SPECIAL ORDER
PT	PRODUCT TUBING	100'	100' LENGTHS
WTOSC	WATER TREATMENT OVERRIDE SWITCH CABLE	CUSTOMER SUPPLIED	N/A

Development of a Hydraulic Cone of Depression: Tips and Good Practices

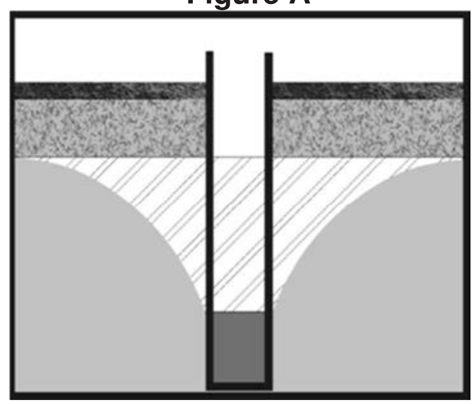
Proper development of a Hydraulic Cone of Depression is not as straight forward as it might seem. An attempt to rapidly depress to full desired depth during the initial startup can cause emulsification. The following information is offered to help you understand some of the basic principles of water depression and the development of a hydraulic cone. Be aware that no two sites are the same and all sites will behave differently from one another with respect to time and conditions.



In the event a depression level of a foot or more is required for the site, the depression should be started with a depression level of 1 foot or less. Then, over a period of several days, the depression should be increased a foot or less at a time.

INITIAL WATER REMOVAL

Figure A



When initially developing a depression cone, take into consideration that the initial flow rates required will be much greater during steady state operation. This is due to the fact that initially the water located in the depression cone (hatched area in figure A to the right) must be pumped in addition to the normal recharge of water. This would be like pumping water out of a swimming pool while more water is being pumped in at the same time. Only when the pool is empty - and only then - will the pumping rate equal the recharge rate of the water.

This water can amount to a large quantity and can take days or weeks to pump out. For instance, a five foot depression with a radius of influence of fifty feet would require the removal of roughly 150,000 gallons of water! A five G.P.M. pump would require over twenty days to pump this much water without any recharge water coming in.

If a significant depression level (say several feet) is attempted all at once, many days/weeks may be required to get the depression level down to the intake of the pump. If product starts to accumulate during the time that the product pump intake is flooded, no product recovery will be achieved even when significant product accumulations occur. For this reason alone it is a much better practice to depress the water table in stages of 1/2’ to 1 foot at a time, so that accumulated product can be pumped off sooner.

Avoiding Cascading Water

It's important to understand how a hydraulic cone of depression typically develops, and the problems that can occur if it is not done properly.

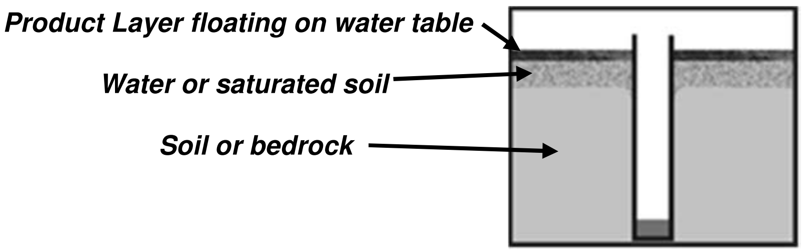


Figure B

When a deep level of depression is first initiated, the hydraulic cone should be developed in a progressive fashion similar to the one depicted in Figures B, C, and D. Figure E shows what happens if the water depression level is developed too quickly: when the water is initially up against the well screen for most of the depression height it can lead to water cascading into the well down to the product water level.

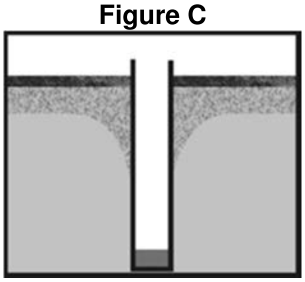
Figure C


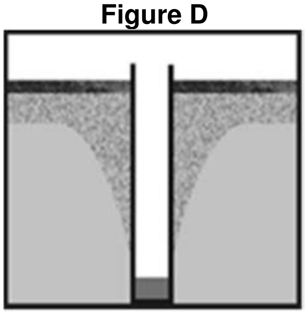
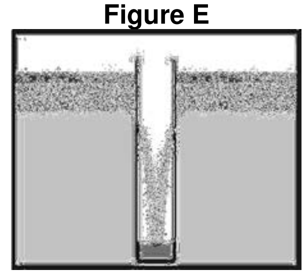
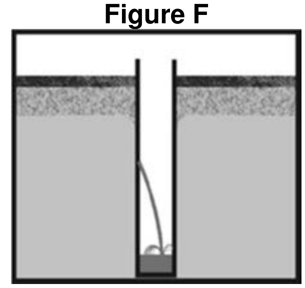
Figure D


Figure E


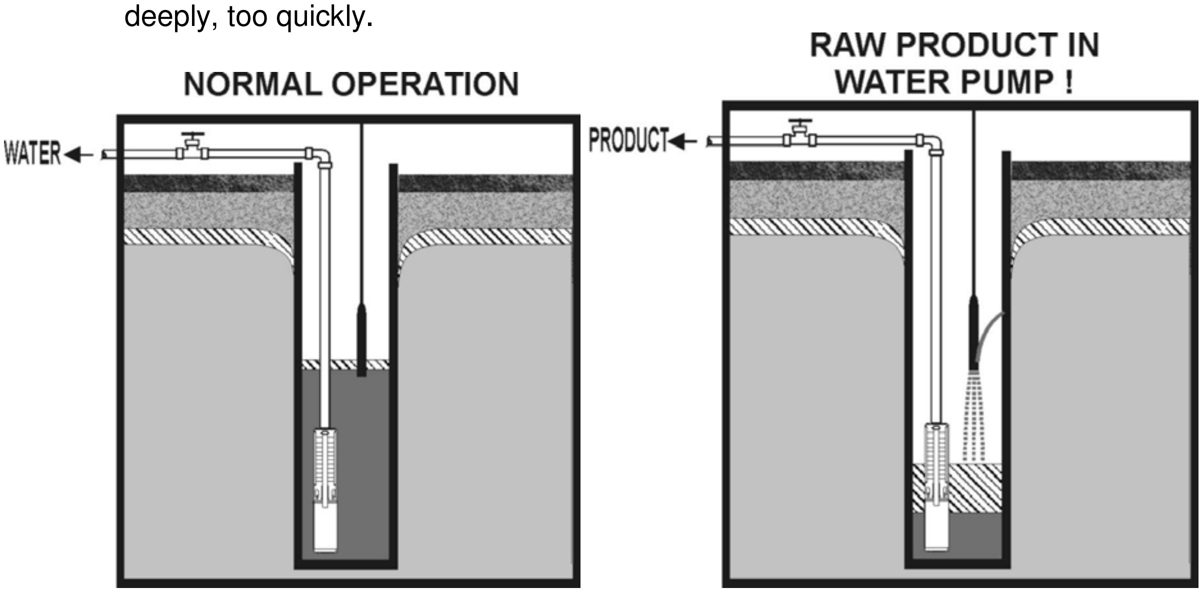
This could be similar to putting a piece of well screen in a pool and trying to pump water out of the screened area - it would just pour in again from all levels. In the ground the effect on the flow of water into the well would be minimized by the resistance of the surrounding soil, but significant cascading water can occur none the less.

Figure F


Sometimes the cascading water can come in the form of a stream from a single spot where a fissure occurs in the soil, as shown in Figure F. This can actually look similar to a water fountain. A stream of water like this may result in serious mixing of water and product creating emulsions, especially with heating and diesel oils. Since any product recovery system relies on some form of liquid level detection sensor to position a pump inlet in the accumulated product area of the recovery well, this emulsification can significantly impair product recovery.

The Magnum Spill Buster's sensors will ignore cascading water as long as the water stream is broken up (like individual rain drops) and won't allow a conductive path back to the point of stream entry. However, if the stream becomes solid, then the sensor will falsely detect the water/product interface where the cascading water enters the well, rather than at the real interface. The resulting erratic activity of the system may lead the user to think that the system is defective when in reality **the depression level should be reduced.**

When cascading water causes the system to falsely detect that its sensors are flooded, it may signal the water depression pump to stay on longer than it should. This could result in lowering the water/product interface to the water pump intake, and pumping raw product into the water treatment system. This is usually a very bad situation since most water treatment systems are not intended to, or capable of, handling pure product and are overwhelmed. Subsequently, raw product can end up being discharged back into the environment. The moral of this story: don't depress too deeply, too quickly.



Conclusions and Warnings

A) Cascading water may cause very erratic Magnum Spill Buster system behavior. Symptoms may include the panel lights for the product and depression pumps to act out of sequence and erratically.

B) Cascading water may cause the sensor to detect a continuous false product/water interface many feet above the real interface. **<u>This may cause large quantities of pure product to be pumped into the water treatment system and be discharged into the environment.</u>**

C) Cascading water may cause product and water to mix creating "mayonnaise like" emulsions which will immensely complicate product recovery.

5.0 Maintenance Operations

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.
- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

Probe/Product Pump

This is the down-well component of the system. The Probe/Product Pump contains circuits for sensing the product/water interface, as well as housing the product pump. Sensors assure that water will never be pumped into the product tank. The Probe/Product Pump assembly is constructed of state of the art polymer materials for very high corrosion and deterioration resistance.

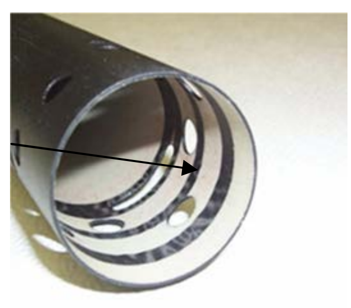
Probe Product Cable

The Probe product cable is the "umbilical cord" of the down-well probe, connecting it to the above ground components. The cable carries signal and electrical power to and from the probe along with the product discharge tube. Examine the entire length of the probe product cable on a routine basis, looking for signs of unusual wear or strain. If present, these damaged areas may compromise the electrical wiring, leading an Intrinsic Safety barrier to trip which would then need replacement at the factory. Damage to the Probe product cable could also cause a leak in the product discharge tubing, potentially causing a secondary spill. Contact Clean Earth Technology if you detect damage to the Probe product cable.

Alpha Array Sensor Band Location

There is an array of sensor bands, internal to the probe, including one dispensing a low limit signal, and one dispensing a high limit signal. The sensors use a low frequency, omni-directional signal to sense the product/water interface. The sensors operate on the principle that signal transmission varies significantly due to the transmission characteristics of the type of fluid surrounding the antenna. The variation in signal transmission is used to accurately determine the interface location relative to the product inlet. The sensors are constructed of "state of the art" polymer materials for corrosion resistance and long life.

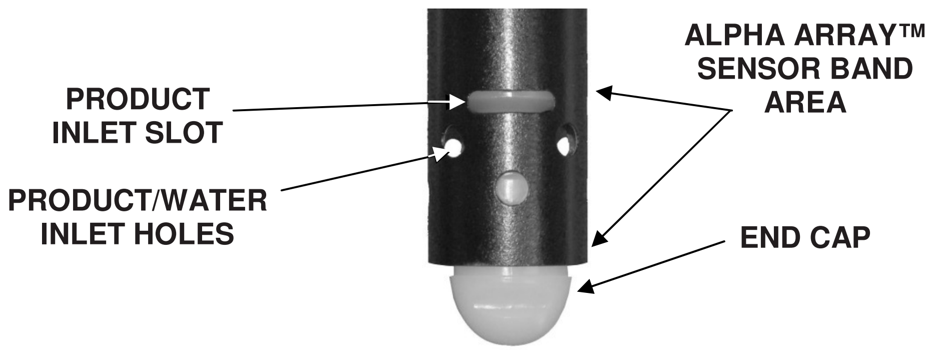
ALPHA ARRAY™
SENSOR BAND AREA



Inlet Slot

Probe Inlet slots and holes in the sensor band area of the probe body allow the product and water to freely enter into the interior of the probe. These slots must be kept clean and free of debris in order for the system to function properly. Care must be taken when cleaning the inlet slots and holes to avoid damaging the probe and sensor band area. Avoid using sharp tools such as screwdrivers, knives, etc. to clean the probe inlet slots and holes.

The product inlet slots lie toward the end of the probe, which allows the product to flow into the pump filter. There are also several round holes, which allow water and product to freely flow into the inside of the probe pump cavity where the sensor bands are located. These holes must all be kept clean.



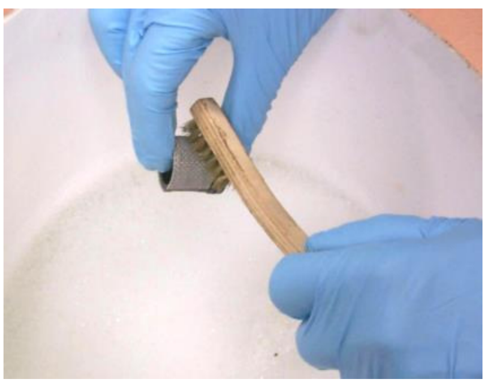
Cleaning the Probe

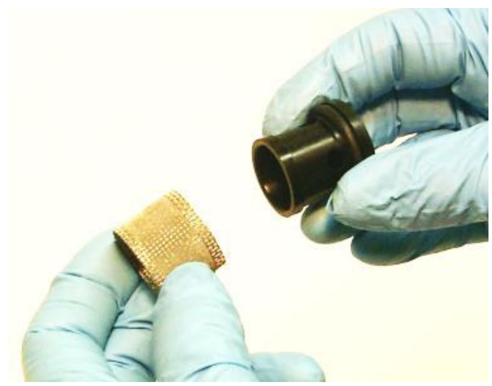
If the Probe sensors become coated with a very heavy layer of biological growth, emulsions, or other materials, the Probe will not function properly. The Probe can be cleaned, as shown below, using spray cleaner or mild dish liquid in warm water and a cloth or soft bristled brush. Care must be taken to avoid damaging the Probe and sensor bands, either by brushing too hard or by using a very hard tool to perform cleaning.

Make sure that the Product Inlet Slots and holes are clear, and the interior Alpha Array™ Sensor Band area is free of coating and debris

If persistent residue sticks inside the sensor area, a soft brush or tooth brush is recommended to fully clean sensors.

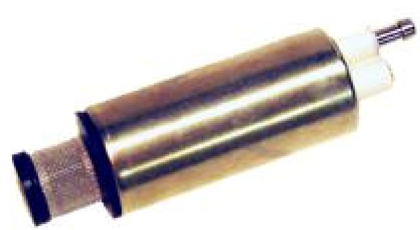
The pump inlet screen and inlet holes should be checked and cleaned also during inspection.



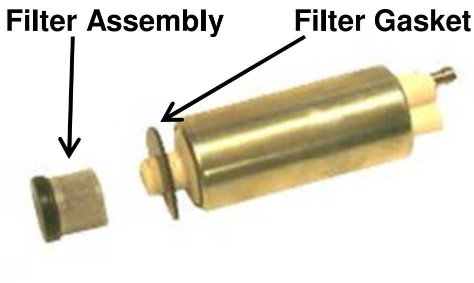


The Product Pump

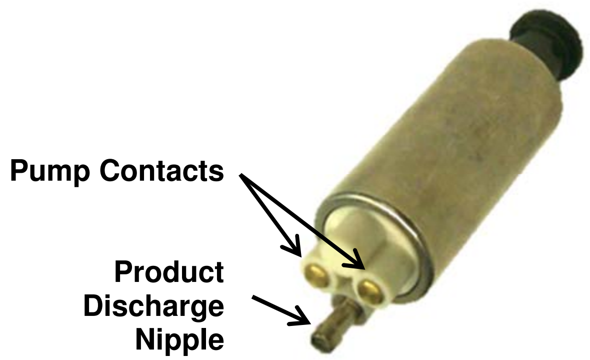
The product pump is a rugged and chemically resistant roller vane unit capable of pumping up to 46 gallons (174 liters) per hour of low viscosity liquids (up to 12 Cp) per day in shallow wells and to reliably recover product out of wells 150 feet in depth. In addition, it can withstand a certain amount of small solids such as dirt or sand passing through it. See Pump Performance Curve, page 87.



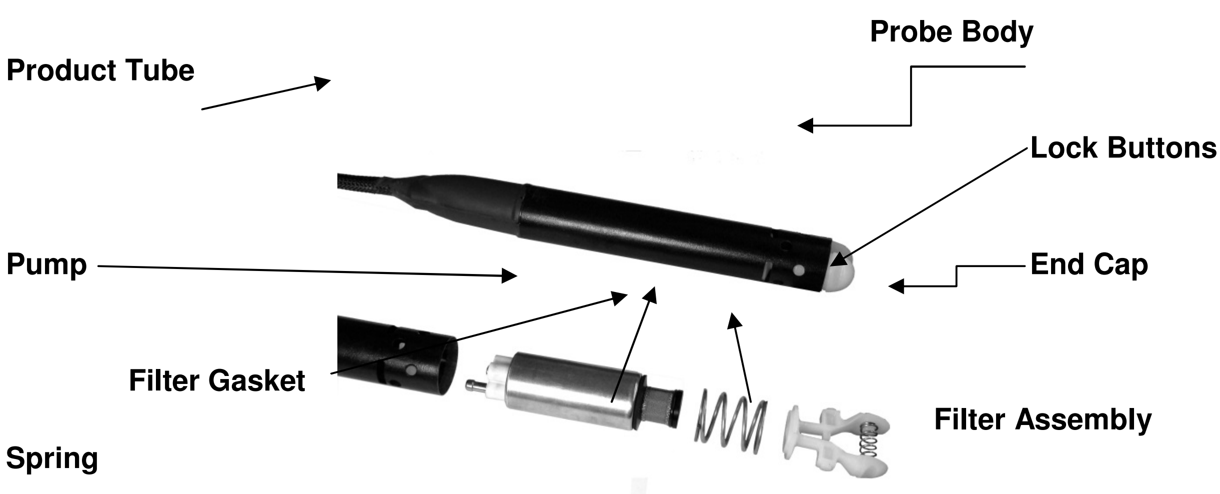
The Product Pump is located near the bottom of the probe and is easily accessible. The pump is inserted into the bottom of the probe body and is held in place by the spring and end cap.



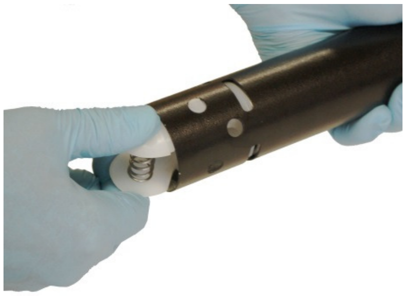
The pump product nipple and the pump electrical contacts should also be kept clean.



Removing the Product Pump



The Product Pump is located near the bottom of the probe and is easily accessible. The pump is inserted into the bottom of the probe body and is held in place by the end cap.
To remove pump, push end cap firmly into probe to loosen the locking buttons. While pushing end cap in, press locking buttons into probe.



Releasing First Lock Button **Releasing Second Lock Button** **Removing End Cap**

The Pump is removed from the Probe using a Pump Removal Tool supplied with the system. One end has two pins which are used to spin the filter & filter top off. The second end has a threaded hole, which is screwed onto the inlet end of the Pump. The Pump then is pushed out of the Probe.

Pump Removal/Insertion Tool

Threaded Hole

Filter Adapter Pins

Remove the Pump

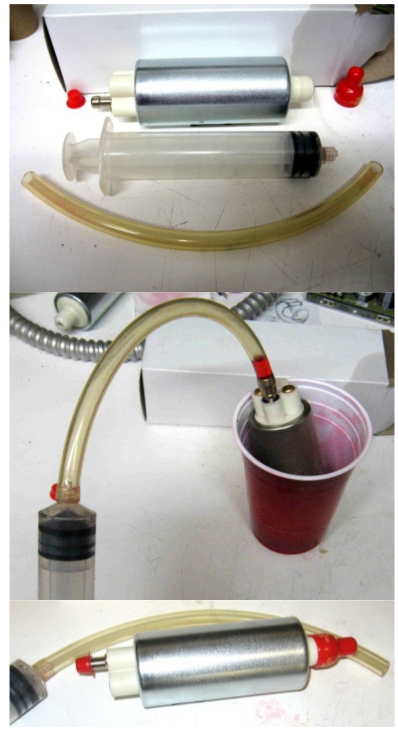
Pump Maintenance

After the filter is cleaned, clean Pump contacts with brush. Make sure that the contacts are free of any corrosion. If the pump will be immediately reinstalled in the probe and the system will be turned on again, then proceed to the pump flooding procedure on page 72.

If the pump or the system as a whole is to be decommissioned and stored for a period of time, then the pump should be lubricated to prevent the pump rotor from corroding (which may lead to pump failure). In this case lubricate the pump internals with a Non-Flammable oil such as 3 In 1 Oil®. To lubricate, hold Pump upside down (intake hole up) and squirt lubricant into intake hole. This will allow lubricant to flow into working parts of Pump. Also, squirt lubricant into product discharge nipple in Pump.

Pump Flooding Procedure

Before a probe can be installed down the well (or re-installed after servicing), the pump must be flooded. The purpose of this procedure is to displace oxygen and vapors from within the pump body. Once the system is installed, the added fluid will be pumped out to the recovery container during the first recovery cycle. **Note:** CET does not ship new or serviced systems with the pump pre-flooded.



Required Equipment:

- A suction device
- Suitable container for the fluid
- Approximately 8 fl oz of flooding fluid, such as Ultra-Pure Paraffin Lamp Oil, mineral oil, material from the subject well, or similar non combustive fluid. DO NOT USE WATER, the pump internals are NOT corrosion resistant.
- Approximately 12”of 3/8 fuel line
- A product pump, CET P/N 90-1318-019

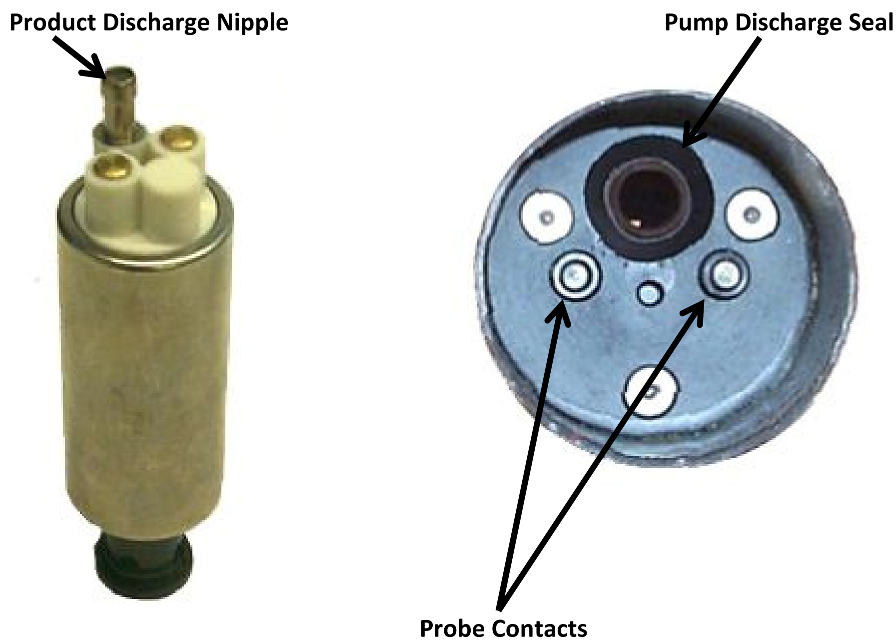
Flood the pump

- Attach the fuel line to the discharge side of the pump.
- Attach the other end of the fuel line to the suction device.
- Place the pump inlet in the container of fluid.
- Pull the fluid into the pump until it is observed in the fuel line.
- Remove the fuel line from the pump.
- Install (or re-install) the flooded pump into the probe (reference the “Pump Installation” section of the Maintenance Operations chapter of the Operator’s Manual).
- If the pump is not immediately installed in the probe, replace the red intake and discharge caps. The pump can then be bagged for later use or storage.

Note: Always save the red caps from installed pumps for future use.

Pump Installation

Reinstall pump filter assembly. Don't forget to install filter gasket between filter and Pump. Make sure that the filter assembly is tight. When installing the Pump make sure the product discharge nipple is aligned with the Pump discharge seal.



Drop Pump into Probe and push Pump until the Pump contacts are seated firmly against Probe contacts. The Pump Tool can be used to align the Product Discharge Nipple with the seal. If firm contact is not made, the Pump may not function. Finally, insert the end cap such that both lock buttons snap in place.

Logic Board and Power Supply

- .**Warning-** All AC Power wiring must be done by a qualified electrician who is familiar with all appropriate NEC and/or local codes. Electrical shock may result in serious injury or death.

- **Warning-** Explosive Vapors. Always disconnect AC power at its source prior to connecting/disconnecting any wires and/or cable connections located within any hazardous locations.

On occasion, when troubleshooting with Clean Earth Service about an issue with your system, our technician may be able to pinpoint the problem to the Control Box's logic board. Use this section to properly remove and replace the board as required for service. The Logic Board is located on the back panel inside the Control Box. The Control Panel is held in place by four spring loaded catches (see below). The Control Panel can be removed to expose the Logic Board and Power Supply by carefully prying the Control Panel with a screwdriver near one of the four corners. The control panel will then "pop" out.

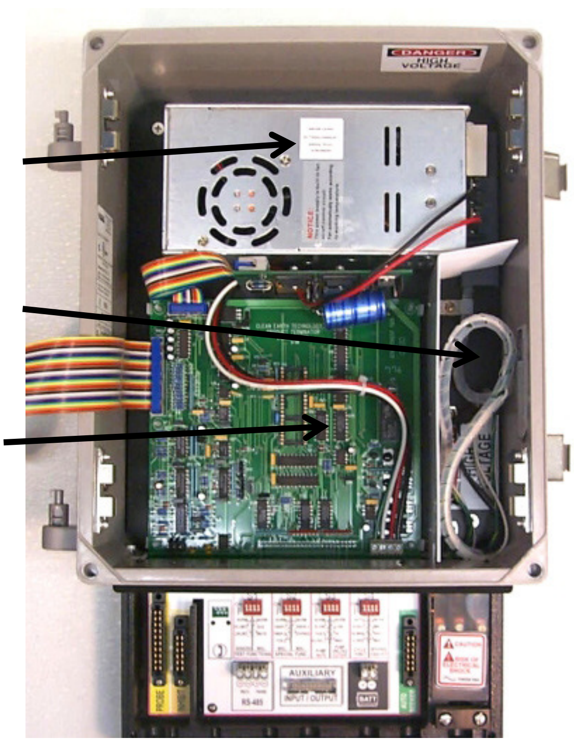
"Popping" Off the Front Panel with a Screwdriver

Lift off Front Panel

POWER SUPPLY

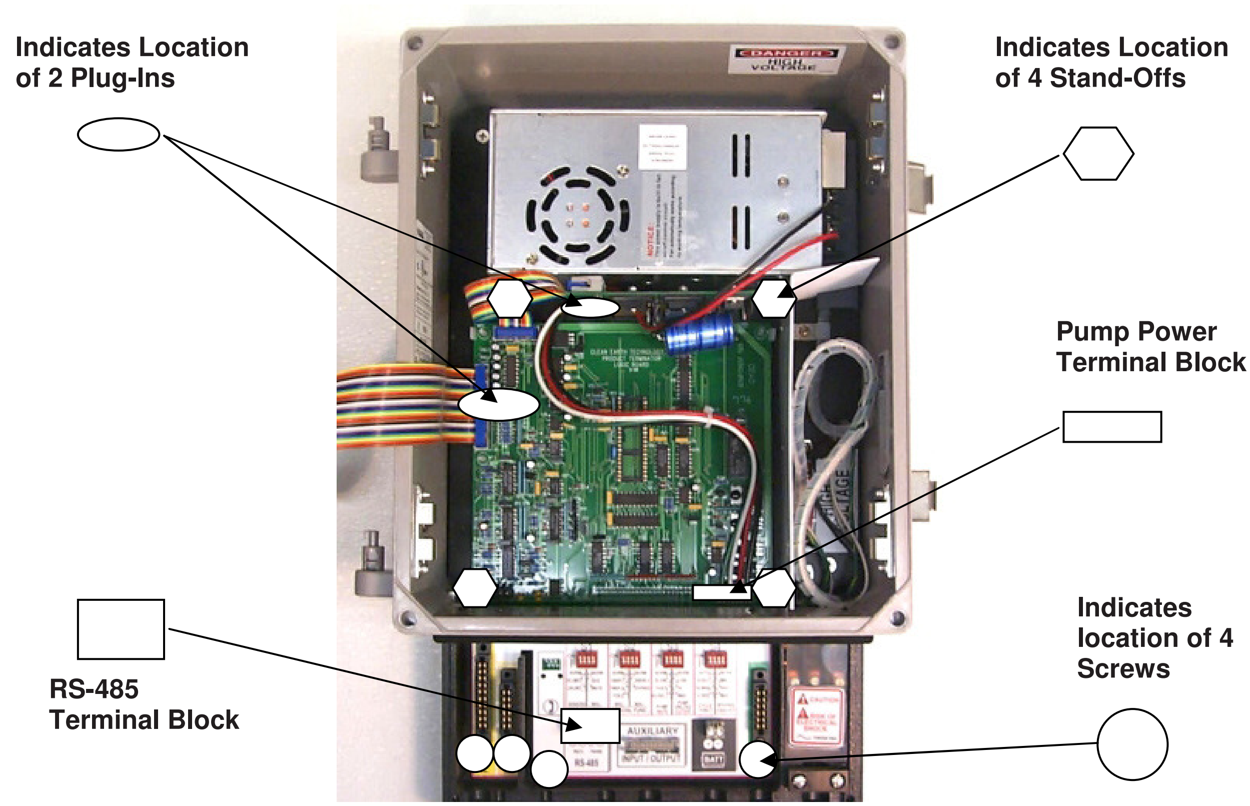
HIGH VOLTAGE SAFETY BARRIER

LOGIC BOARD



[NOT SHOWN] UL APPROVED ISOLATION BARRIER (OPTIONAL)

Removing the Logic Board



1. Disconnect Power

2. Unplug two (2) plug-ins.

3. Remove pump power wires from terminal block.
   NOTE: When replacing wires - Green, White, Red & Black

4. Remove RS-485 wires from terminal block.
   [IMPORTANT -- Note/record position of color coded wires]

5. Unscrew four (4) screws.

6. Disengage four (4) stand-offs.

7. Slide board out toward the top of the box.

Removing Probe from Auto Seeker Reel

Warning!

To prevent damage to the logic board, DISCONNECT the Auto Seeker Extension cable from the control box before rotation of the Auto Seeker by hand.

There are two cases in which it is necessary to remove the Probe Product Tubing from the reel:

1) If the Probe stops before reaching the interface; or, if the reel stops before the Probe is fully rewound when raising the Probe, then the Auto Seeker rotation is not fully synchronized with the Probe Product Tubing. The tubing must be fully unwound and removed from the reel; then reinstalled and rewound in order to correct the problem.

2) When decontaminating the Auto Seeker unit to return to the factory for service.

Resynchronizing Product Cable With The Standard Auto Seeker Rotation

Rotate the Auto Seeker in the DOWN direction until the entire length of the Probe Product Tube is off the reel. This can best be accomplished by initiating a cycle with the PRC switch (see Diagram Pg. 29), while keeping the probe away from contact with a grounded surface. The system will continue to lower the Probe in search of the interface. Press STOP on the PRC switch when all the Product tubing is off the reel.

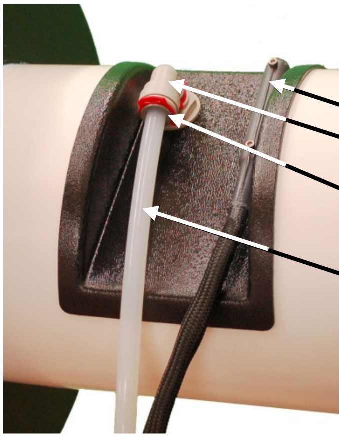
If the Auto Seeker stops before the tube is fully unwound, then the unsynchronized Auto Seeker has reached its extreme DOWN position. Press STOP and remove the remaining tubing by hand without moving the reel.

If the unsynchronized Auto Seeker continues to rotate past the point at which the Product Tube is fully unwound, then press STOP and detach the Product Tubing from the Auto Seeker at the reel. [See instruction, following page.] After the Product Tubing is detached, set PRC switch back to AUTO and allow the Auto Seeker to go in the DOWN direction until it stops on its own. The Auto Seeker reel is now in the extreme DOWN position. Set PRC switch to STOP.

Now, reattach the Product Tube to the reel. Don't forget the retainer clip! Rewind the tubing onto the reel by 1) moving the HI LIMIT dip switch (S1-1) to ON [see page 37] and then 2) by placing the PRC switch in the AUTO position. This will cause the Auto Seeker to rotate in the UP direction. [If the Auto Seeker does not start going up, carefully turn the reel by hand until it starts moving. It should only take about a quarter turn before beginning to wind automatically.] Feed the cable carefully back and forth in layers. Switch the PRC to STOP once the probe is in the full UP position.

Take care that the probe head is not dragged along the ground as the Auto Seeker rewinds. [Remember to turn OFF the HI LIMIT dip switch.]

To Remove the Probe from a Standard Auto Seeker Reel

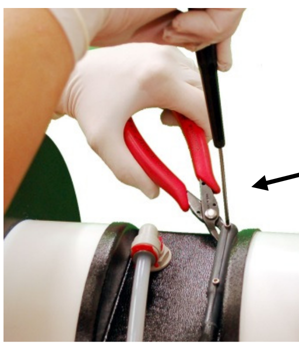


The Probe is connected to the hub of the reel by instant tube fittings and a Slim-line™ connector.

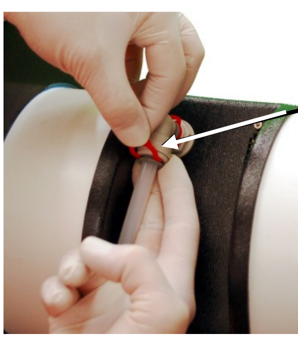
SLIM LINE CONNECTOR™
DISCHARGE TUBE FITTING

RETAINER CLIP

DISCHARGE TUBE

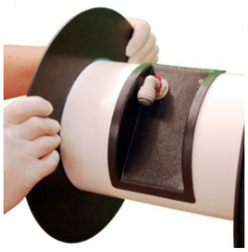


Unplug the Slim-line™ Connector using an Allen wrench and a pair of needle nose pliers to hold the stand-off nut in place, and remove the screws.

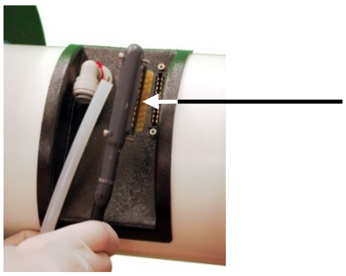


Remove the red locking clip on the discharge tube fitting by pushing the bottom of the clip up with two fingers and pulling up at the top with your other hand. Then push down on the locking sleeve of the discharge tube fitting with a screwdriver while pulling on the discharge tubing. Make sure to push the locking sleeve squarely into and against the fitting; otherwise, the tube will not be released.

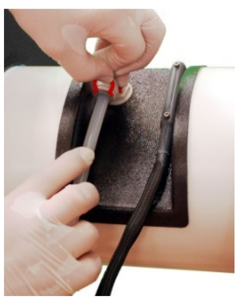
To Install the Probe on a Standard Auto Seeker Reel



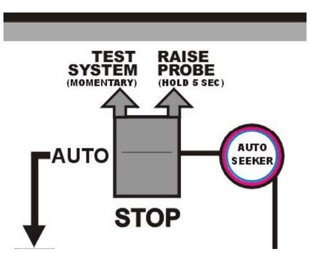
WARNING: To prevent damage to the logic board, DISCONNECT the Auto Seeker extension cable from the Control Box before rotating the Auto Seeker by hand. To wind the probe onto the reel, turn the reel a couple of turns by hand in order to reset the safety switch. This is an important step to ensure that the probe is synchronized with the Auto Seeker safety limit switches.



Check to be sure the Slim-line™ gasket is in place. Install the Slim-line™ connector using an Allen wrench to tightly install the screws.



Insert the product discharge tube into the discharge tube fitting. Install the red locking clip.

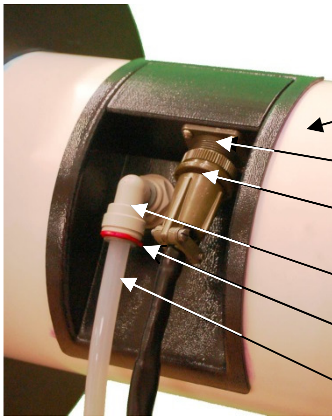


Reconnect the Auto Seeker to the Control Box I/O pouch

Power up system and press the PRC Switch to the RAISE PROBE position for 5 seconds until the Auto Seeker starts to rotate upward. [If the Auto Seeker does not start going up, carefully turn the reel by hand until it starts moving. It should only take about a quarter turn before beginning to wind automatically.] Feed the cable carefully back and forth in layers. Switch the PRC to STOP once the probe is in the full UP position.

Take care that the probe head is not dragged along the ground as the Auto Seeker rewinds.

To Remove the Probe from an Explosion Proof Auto Seeker Reel



The Probe Cable is connected to the hub of the reel by instant tube fitting and the electrical connections are via a MIL-Spec circular connector.

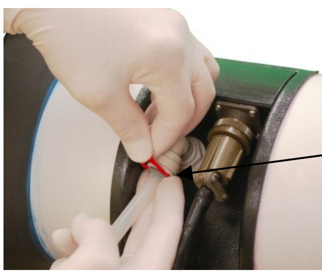
CONNECTOR RECEPTACLE

CONNECTOR PLUG

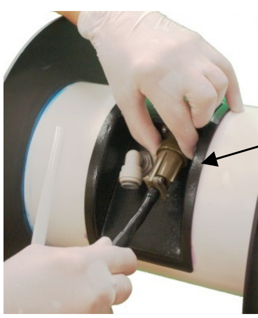
DISCHARGE TUBE FITTING

RETAINER CLIP

DISCHARGE TUBE



Remove the red locking clip on the discharge tube fitting by pushing the bottom of the clip up with two fingers and pulling up at the top with your other hand. Then push down on the locking sleeve of the discharge tube fitting with a screwdriver while pulling on the discharge tubing. Make sure to push the locking sleeve squarely into and against the fitting; otherwise, the tube will not be released.

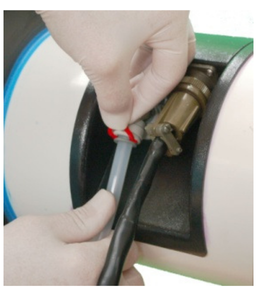


.
After removing the product discharge tubing remove the probe cable by threading the MIL-Spec plug collar off the receptacle and gently pull the connector plug out.

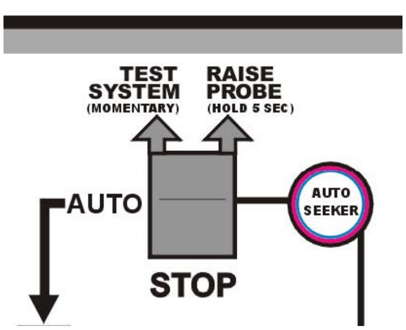
To Install the Probe on an Explosion Proof Auto Seeker Reel

WARNING: To prevent damage to the logic board, DISCONNECT the Auto Seeker extension cable from the Control Box I/O pouch before rotating the Auto Seeker by hand. To reinstall the probe, turn the reel by hand to gain easy access as shown.

Insert the probe cable plug firmly into the MIL-Spec connector receptacle and then tread the collar down. Tighten the collar as tightly as possible in order to insure the connector gasket is fully sealed.



Install the product discharge tube: Insert the product discharge tube into the discharge tube fitting. Install the red locking clip



Reconnect the Auto Seeker to the Control Box I/O pouch.

Power up system and press the PRC Switch to the RAISE PROBE position for 10 seconds until the Auto Seeker starts to rotate upward. Feed the cable carefully back and forth in untangled layers . Switch the PRC to STOP once the probe is in the full UP position.

Take care that the probe head is not dragged along the ground as the Auto Seeker rewinds.

6.0 Troubleshooting

Problem	**System doesn't power up when System Power switch is turned ON.**
Possible Causes & Solutions	1. Make sure Control Box is connected to the power source. 2. Check for issues with the power source.
Problem	**System powers up, but pump won't run.**
Possible Causes & Solutions	1. Probe Cable is not plugged in or is broken. - Check that Probe cable connectors are properly and securely connected at both the Control Box I/O panel and at the Auto Seeker.- Inspect entire length of Probe Cable for signs of damage. 2. If the Product Tank lamp is ON: - Make sure the Product Tank is not full - Make sure Product Tank sensor is connected to Control Box - Make sure the Pump contacts are seated firmly against probe contacts. (Remove end cap from probe and push pump up in probe using your thumb; then test system) - Make sure the Pump is operating correctly. (Replace pump and try TEST SYSTEM on PRC switch).
Problem	**Probe stops before reaching interface, or when raising probe, Auto Seeker stops before being fully rewound on reel.**
Possible Causes & Solutions	Auto Seeker rotation and probe product tubing are not synchronized. To correct, See Section 5 on page 76.
Problem	**High Limit sensor is not sensing water, or probe moves to the bottom of the well.**
Possible	1. Make sure there is enough water in the well for the Magnum to operate. There must be at least 3" of water in the well below the

Causes & Solutions	product. 2. Make sure the System is properly grounded. See page 18. 3. Make sure that the probe cable is not damaged or disconnected. 4. Make sure that the sensor bands in the probe head are not fouled. If needed, See page 67.
Problem	**Pump runs but no product is pumped.**
Possible Causes & Solutions	1. Make sure there is enough product in the well for the Magnum to operate. There must be at approximately ½ inch (12mm) of product present. 2. Make sure that neither the pump intake nor filter screen is clogged. See page 67. 3. Make sure that the Interface clearance has not been set too high by checking the settings on dipswitches S4-3 & S4-4. See page 44. 4. Make sure that the product discharge tubing is not clogged or frozen. Make sure the Pump is operating correctly. (Replace pump and try TEST SYSTEM on PRC switch).
Problem	**Pump runs briefly, but then cuts off prematurely.**
Possible Causes & Solutions	1. Make sure Interface Clearance is not set too high. Check dipswitches S4-3 & 4. See page 44. 2. Make sure Pump Unload Cutoff setting is not too high. Check dipswitches S3-3 & 4. See page 44.
Problem	**System was cycling, but now appears to be inactive.**
Possible Causes & Solutions	If the cycle function is set on automatic (dipswitches S4-1 & 2), Magnum Spill Buster will automatically extend the pump delay time to match the recharge rate of the well. This delay can be as long as six hours between cycles. To see if system is still functioning properly, run TEST SYSTEM on PRC switch (See page 41) to see if pump will run. After the pump runs for 10 secs, STOP the system, and then push the PRC switch to the “Auto” setting. If it is operating properly, the System should then go through a cycle.

Problem **PROCESSOR lamp on Control Panel does not light.**

Possible Causes & Solutions

1. If the System is otherwise operating as expected, it is possible that the LED bulb is simply burned out.
2. If the System is not operating properly, the unlit Processor lamp indicates a problem with the logic board. Please call the factory to report the issue.

Problem **AUTO SEEKER does not raise.**

Possible Causes & Solutions

1. Make sure that the Auto Seeker cable is connected to the Control Box and shows no sign of damage.
2. Make sure that the System has not been set in DNAPL mode by checking that dipswitch S2-1 is not set. See page 46.

Problem **Processor Lamp on Control panel blinks on and off and the System is not cycling**

Possible Causes & Solutions

1. The Pump may have experienced an overload. Make sure that neither the pump intake nor filter screen is clogged. See page 67.
2. The pump circuit may be stuck open, possibly due to a failed pump. Replace pump and try TEST SYSTEM on PRC switch.
3. Make sure that the probe cable is connected to the Control Box.

7.0 System Specifications

Complete Magnum Spill Buster™ System includes: Magnum Spill Buster™ Control Box, Magnum Spill Buster™ Probe with 50’ down well cable, Auto Seeker with 30’ cable, and Product Tank Shutoff Probe with 30’ cable, and 50 ft. Nylon Product Discharge Tubing.

Input Power: 115vac or 230vac, 100 watts max. or 24vdc, 75 watts max. with optional battery cable and deep discharge batteries. A 5 amp AC circuit breaker is built into the System Power switch.

Operating Temperature Range: Ambient air temperature of -40F to +140F (-40C to 60C).

Pumping Rate: up to 46 gal/hr (175 liter/hr) @ 0 psi (zero depth & no discharge back pressure), or up to 37 gal/hr (140 liter/hr) @ 25 psi discharge back pressure.

Product Viscosity: Products with viscosity of less than 10 Cp at 70 degrees F. Examples: gasoline, diesel fuel, #2 heating oil, JP-4, JP-5, paint thinners.

Well Diameter: 2 inch minimum for product recovery only.

Standard Well Depth: 50 ft.(15.2m.) max

Maximum Well Depth: 150 ft (45.7 m) on special order with 150 ft (45.7m) down-well cable.

Probe

The Probe is certified compliant with NEC2011 specifications for use in Class 1, Div 1 locations. DC power for the pump is supplied using a conductor pair that has an over woven metal shield along with a Tefzel overcoat. The signal wires also have a separate over woven metal shield. The two cable bundles, along with the discharge tubing, are contained in a tough woven plastic protective scuff jacket.

Probe Dimensions: 1.93” (4.9cm) dia. x 15.25” (38.7cm) long [cable size including the discharge tube is 5/8” thickness x 1 1/2’ width]. Standard Probe cable length is 50 ft. (15.2m)

Control Box

Certified IS barriers are wired into the Probe and Override circuits in the Control Box in order to make them compliant with NEC2011 specifications.

Dimensions & Weight: 14” (36cm) wide x 23” (59cm) high x 6” (15.4cm) deep. An additional 10” is required below for cable exit and an additional 14” is required in front and to the left for door swing. Weight: 25 lbs. (11.34 kg)

Standard Auto Seeker

The Standard Auto Seeker is not rated for use in hazardous locations.
Dimensions & Weight (with 50' probe attached)**:** 14" (36cm) wide and deep; 20" tall (15.8cm). Weight: 32 lbs. (14.51 kg)

Optional Explosion Proof Auto Seeker

The Explosion Proof Auto Seeker is certified compliant with NEC2011 specifications for use in Class 1 Div 1 locations. Connections to all cabling now have positive threaded Mil-Spec circular connectors.
Dimensions & Weight (with 50'probe attached)**:** 52 lbs. (23.59 kg)
Minimum Well Head Clearance for EXPLOSION PROOF AUTO SEEKER: 28"x24"x24" Deep (71 cm x 61 cm x 61 cm deep). **(Does not apply to Standard Auto Seeker, which must be mounted outside of any classified hazardous areas)**

Optional Explosion Proof Enclosure for the Control Box

The Explosion Proof enclosure is certified compliant with NEC2011 specifications for use in Class 1 Div 1 locations. Comes with the control box mounted in a certified XP enclosure and includes three XP cable feed through fittings with Chico® seals.
Dimensions & Weight: 29" (73.66cm) tall; 11' (27.9cm) deep; 18' (45.7cm) wide, with an additional 18" required in front and to the left for door swing and an additional 10" (25.4cm) required below for cable exit. Weight (with Control Box mounted inside): 210 lbs. (95.25 kg)

Optional Explosion Proof Enclosure AC Power Switch

This feature provides a convenient AC power switch mounted directly to the XP control box enclosure to enable the Spill Buster to be turned on and off at the box instead of back at the AC main power panel.

Standard Extension Cable length: 30 ft (9.1m) from Control Box to well head.

Override Product Tank Probe: Threads into a standard 2" barrel bung. Standard cable length is 30 ft (9.1m)

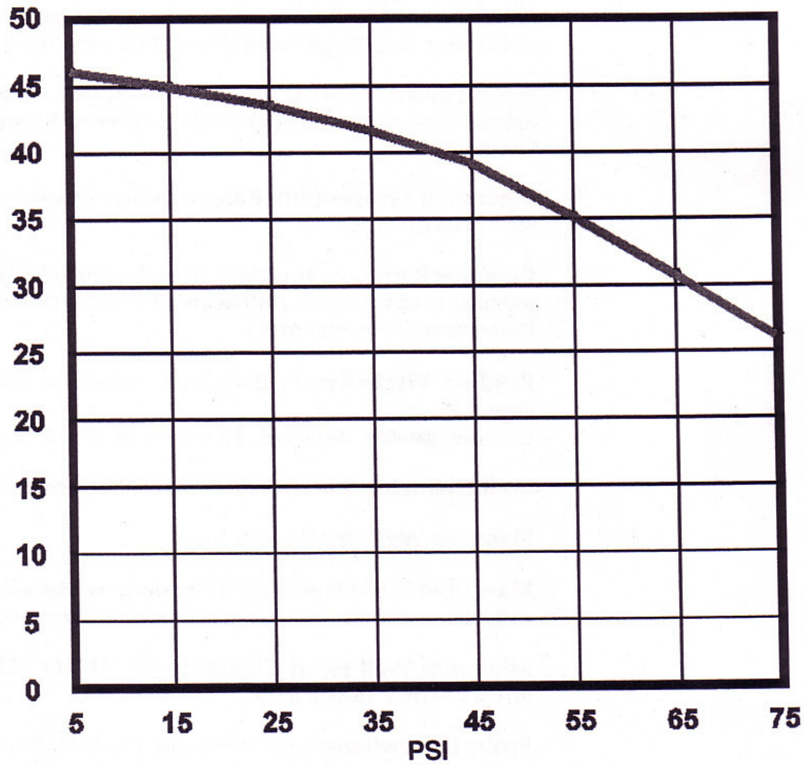
Total System Shipping Weight:

Complete Standard Magnum System – aprox. 68 lbs. (30.84 kg)

Complete Magnum System with Explosion Proof Auto Seeker- aprox. 92 lbs. (41.73 kg)

Complete Explosion Proof Magnum System- aprox. 277 lbs. (125.65 kg) (includes Exp. Enclosure for Control Box)

Magnum Spill Buster Pump Performance



8.0 Equipment Decontamination Procedures

Prior to return to Clean Earth Technology, Inc., all equipment must be thoroughly cleaned and decontaminated. Please follow your organization's prescribed decontamination procedures, and also carefully observe each step of the following procedure. During decontamination, make sure personnel are wearing the appropriate protective clothing and observing all safety precautions.

1. REMOVE PUMP- (See page 69). Remove pump, wipe off with absorbent cloth or paper towel, clean the filter, and seal parts in a plastic bag to send with your system.
2. REMOVE PROBE FROM AUTO SEEKER- (See page 76). Unwind the probe tubing from the Auto Seeker reel and disconnect the discharge hose and Slim-line connectors.
3. Depending on the individual requirements for your site, you may need a container to catch the waste for this step. Hold the probe upright and pour several gallons of hot soapy water through it. (Alconox, Simple Green, or other similar detergents work well).
4. Place the entire probe and tubing in a large tub with enough hot soapy water to cover the entire probe assembly. Soak for several hours or overnight.
5. Remove the probe from the tub and rinse with clean fresh water . Using a garden hose with an attachment, flush several gallons of water through the probe tube and the tubing (as in step 3).
6. Remove all remaining fluid left in the tubing by gravity: starting at the probe tube end, hold the tubing over your head and pass the entire tubing through your hands, holding it high all the while.
7. Wipe off the outside of the tubing with a dry absorbent cloth or towels. Push a clean rag into the end of the probe tube and secure a plastic bag around the end of the probe to contain any possible remaining leakage.
8. Wipe down the Auto Seeker reel with a cloth and hot soapy water.
9. If you have not already done so, call CET at (802) 425-3710 to request an RMA number AND an RMA form, if needed.
10. ***Completely*** fill out the RMA form. If at all possible, fax the form to us or scan it to attach to an email so that our service department has it ahead of your equipment's arrival. Make sure to include a copy with your return- preferably in a packing slip pouch on the outside of the box, or else placed inside the box.
11. Pack the equipment with care to ship to CET. If possible, use the custom foam box set that came with the system; otherwise use sturdy boxes and a generous amount of packing material. MAKE SURE that the RMA number is clearly written on the outside of all boxes. **CET reserves the right to refuse delivery of any equipment without a CET RMA number clearly displayed on the exterior of the package(s).**

9.0 Equipment Return Policy

Any equipment return must be authorized by Clean EarthTechnology (CET) prior to shipment. Call or FAX CET. A Return Material Autorization (RMA) number will be issued upon receipt of your request to return parts or equipment. An “RMA Number/ REPAIR ORDER” form must be completed by the user and the RMA number should appear on the form along with reasons for the return. Your shipment to CET must have the RMA number clearly marked on the outside of each packaged item.

This policy applies to both equipment sales and repair orders. For a Return Material Authorization, please call our Service Department at (802) 425-3710.

Clean Earth Technology, Inc.
Environmental Equipment Return Policy

This Policy refers to any equipment or parts being returned to Clean Earth Technology (CET), whether:

- Customer owned, leased or rented.
- In warranty or out of warranty.

NO equipment or parts should be shipped to CET without first contacting our service department for a **Return Materials Authorization number (RMA).** Contact our service department at (802) 425-3710 to be assigned an RMA number.

- CET reserves the right to refuse delivery of any equipment without an RMA number clearly displayed on the the package(s).
- CET reserves the right to refuse delivery of any equipment improperly decontaminated.
- CET reserves the right to add a fee of $500.00 to the repair invoice of any equipment or parts not decontaminated to the satisfaction of CET.

Environmental Equipment Return Guidelines:

- All equipment must be thoroughly cleaned, purged of product and decontaminated prior to shipment to CE, as detailed in Section 8 of this manaul- Equipment Decontamination Procedures. NOTE: CET recommends the use of Personal Protective Equipment, level C or D, as defined in OSHA 29 CFR 1910.120.

Any equipment or parts shipped to CET must include the following documentation:

- CET RMA/Repair Order form fully completed by customer, including description/name of product pumped, and the reason for the return.
- The CET RMA number clearly marked on the outside of ALL packages and paperwork.

Return Materials Authorization Form

RMA Number: ___________

Customer Name and Address:

____

____

____

____

Phone Number:_________________________

Fax Number:___________________________

Clean Earth Technology, Inc.
445 Long Point Road
N. Ferrisburgh, VT 05473
T: (802) 425-3710 F: (802) 425-2896

Date: __________________________

Contact Name:__________________________

Contact Email:__________________________

Qty.	**Items Being Returned** **(eg. Auto Seeker, Cables, etc.)**	**Serial Number(s)**

Reason for Return:

____

____

____

____

Type of product(s) this equipment has been used to pump: ____

System Decontamination Date:_______________________________

The undersigned confirms that the equipment or parts being returned to Clean Earth Technology have been properly and thoroughly decontaminated **using the approved procedure described on page 2 of this document.**

Name _______________________________ (printed) *Signed:__________________________________

***No evaluation or repair work will be performed unless this form is signed.**

Clean Earth Technology (CET) reserves the right to add a fee of $500.00 to the repair of any equipment or parts not decontaminated to the satisfaction of CET.

Clean Earth Technology, Inc.
Environmental Equipment Return Policy

This policy refers to any equipment or parts being returned to Clean Earth Technology (CET), whether customer owned, leased, or rented; in warranty or out of warranty. NO equipment or parts should be shipped to CET without first contacting our service department for a **Return Materials Authorization Number (RMA)**. Contact our service department at **(802) 425-3710** to be assigned an RMA number.

- **CET reserves the right to refuse delivery of any equipment without a CET RMA number clearly displayed on the exterior of the package(s).**
- **CET reserves the right to refuse delivery of any equipment improperly decontaminated.**
- **CET reserves the right to add a fee of $500.00 to the repair invoice of any equipment or parts not decontaminated to the satisfaction of CET.**

Environmental Equipment Return Guidelines

- All equipment must be thoroughly cleaned, purged of product and decontaminated prior to shipment to CET. **NOTE: CET recommends the use of Personal Protective Equipment, Level C or D, as defined in OSHA 29 CFR 1910.120.**
- Any equipment or parts shipped to CET must include this RMA form, **completely** filled out by the customer; and the CET RMA number clearly marked on the outside of all packages and paperwork.

Equipment Decontamination Procedure For the Magnum Spill Buster

(Also found in Section 8 of the manual)

The following procedures are aimed at protecting people and the environment from potential contact with hazardous materials. **Please be aware that CET reserves the right to refuse delivery of any equipment improperly decontaminated. CET also reserves the right to add a fee of $500.00 to the repair invoice of any equipment or parts not decontaminated to the satisfaction of CET.**

Please follow your organization's prescribed decontamination procedures, and then carefully observe each step of the following procedure prior to shipping anything back to CET (check each step off as you go). During decontamination, make sure personnel are wearing the appropriate protective clothing and observing all safety precautions.

CALL CET AT (802) 425-3710 FOR ASSISTANCE IF YOU HAVE ANY QUESTIONS ABOUT ANY PART OF THIS PROCEDURE.

12. ______ REMOVE PUMP- (See "Removing the Product Pump"- page 69- in Chapter 5- "Maintenance Operations" in the manual). Remove pump, wipe off with absorbent cloth or paper towel, clean the filter, and seal parts in a plastic bag to send with your system.
13. ______ REMOVE PROBE FROM AUTO SEEKER- (See "Removing the Probe from the Reel" – page 76 in Chapter 5- "Maintenance Operations" in the manual). Unwind the probe tubing from the Auto Seeker reel and disconnect the discharge hose and slimline connectors.
14. ______ Depending on the individual requirements for your site, you may need a container to catch the waste for this step. Hold the probe upright and pour several gallons of hot soapy water through it. (Alconox, Simple Green, or other similar detergents work well).
15. ______ Place the entire probe and tubing in a large tub with enough hot soapy water to cover the entire probe assembly. Soak for several hours or overnight.
16. ______ Remove the probe from the tub and rinse with clean fresh water . Using a garden hose with an attachment, flush several gallons of water through the probe tube and the tubing (as in step 3).
17. ______ Remove all remaining fluid left in the tubing by gravity: starting at the probe tube end, hold the tubing over your head and pass the entire tubing through your hands, holding it high all the while.
18. ______ Wipe off the outside of the tubing with a dry absorbent cloth or towels. Push a clean rag into the end of the probe tube and secure a plastic bag around the end of the probe to contain any possible remaining leakage.

19. ______ Wipe down the Auto Seeker reel with a cloth and hot soapy water.
20. ______ If you have not already done so, call CET at (802) 425-3710 to request an RMA number AND an RMA form, if needed.
21. ______ ***Completely*** fill out the RMA form. If at all possible, fax the form to us or scan it to attach to an email so that our service department has it ahead of your equipment's arrival. Make sure to include a copy with your return- preferably in a packing slip pouch on the outside of the box, or else placed inside the box.
22. ______ Pack the equipment with care to ship to CET. If possible, use the custom foam box set that came with the system; otherwise use sturdy boxes and a generous amount of packing material. MAKE SURE that the RMA number is clearly written on the outside of all boxes. **CET reserves the right to refuse delivery of any equipment without a CET RMA number clearly displayed on the exterior of the package(s).**

ULTRA QUIET & OIL FREE

AIR COMPRESSOR

OwnER'S MAnUAL

CALIFORnIA AIR TOOLS

8010

1.0 HP

3.00 CFM @ 40 PSI

2.20 CFM @ 90 PSI

8.0 gALLOn STEEL TAnk

TAbLe OF CONTeNTS

INTROduCTION

⚠WARNING

This manual contains important instructions for operating this product. For your safety, and the safety of others, be sure to read this manual thoroughly before operating the product.

Failure to properly follow all the instructions and precautions can cause you and others to be seriously hurt or killed.

thank you for purchasing a california air tools, Inc. air compressor.

please contact us if you have any questions.

record the model and serial numbers indicated on your air compressor's nameplate:

model no. ____________________

Serial no. ____________________

date of purchase: ____________________

Store/dealer: ____________________

how to find a local service center:

even quality built equipment might need service or repair parts. Contact the California Air Tools Customer Service department:

Phone: 1-866-409-4581

Online: WWW.CALIFORNIAAIRTOOLS.COM

please provide the information below:

Model number and Serial number and specifications shown on the Model number/Serial number plate.

Part number or numbers shown in the parts list section of the owner's manual for your air compressor model.

A brief description of the trouble with the air compressor.

do not return your air compressor for service or parts to the store/dealer where purchased.

IMPORTANT SAFeTy INSTRuCTIONS

Safety messages & Signal Words:

⚠ DANGER

Indicates an immediate hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or to bystanders.

NOTICE

Indicates a situation which, if not avoided, may result in damage to product components or other property.

⚠ DANGER

RISK OF CUTTING

Moving parts can cause severe trauma.

Keep hands and feet away from rotating parts, tie up long hair, remove jewelry, and DO NOT wear loose clothing.

⚠ DANGER

SHOCK

There is a danger of electric shock.

Use only undamaged electrical cords.

DO NOT touch bare wires or receptacles.

DO NOT operate air compressor in wet weather or in wet conditions.

DO NOT touch air compressor or cords if hands or feet are wet.

Ensure that all cords are free of damage before connecting to the power supply.

Ensure that you have a sufficient electrical supply for supporting the requirements of the motor.

Improper installation of the grounding plug is able to result in a risk of electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

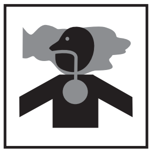
This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electrical shock by providing an escape wire for the electric current.

This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with the local codes and ordinances.

This product is for use on a nominal 120-V circuit and has a grounding plug similar to the plug illustrated in sketch A. Only connect the product to an outlet having the same configuration as the plug.

Do not use an adapter with this product.

⚠WARNING



RISK TO BREATHING

Dust or dust-like particulates caused by power-sanding, sawing, grinding, drilling or any other construction-like activities can contain contaminants that are harmful to breathe.

Always use your air compressor in a well-ventilated and clean area.

Never breathe the air that comes directly out of the air compressor or air hose. This air is not suitable for breathing.

Always wear approved safety equipment. When performing dust-creating activities, securely wear properly-fit face masks or respirators.

If you feel ill from breathing while operating your air compressor, stop and seek medical attention immediately.

⚠WARNING

HOT SURFACE

FIRE

Air compressor surfaces become hot during operation.

DO NOT touch hot surfaces, because they can cause severe burns.

Do not touch the air compressor's cylinder head. During operation, the cooling fins of the cylinder head and delivery pipe become hot.

Allow the air compressor to cool before touching it.

DO NOT place a storage cover on the unit during operation. Only place a cover on the air compressor after it has thoroughly cooled down.

⚠WARNING

FLYING OBJECTS

Flying objects can cause injury to the eyes, head and other parts of the body.

Air-powered equipment and power tools are capable of propelling items (metal chips, fasteners and particulates) at high speed into the air and could result in injury.

Always wear approved head and eye protection.

Never point the air stream at any part of your body, or at another person or animal.

When operating the air compressor, make sure all other people and animals maintain a safe distance.

Do not move the air compressor when the air tank is under pressure.

Never use the air hoses to pull or move the air compressor.

Keep the air compressor on a flat surface.

⚠WARNING

EXPLOSION

Exercise caution when using pressurized air.

To prevent injury and for your general safety, only use high-pressure hoses, fittings and couplings designed for use with air compressors.

Inspect all hoses, fittings and couplings for leaks and wear. When leaks and wear are detected, stop use and replace those items immediately. Do not repair.

Never leave pressurized air in the air tank when performing maintenance.

Never leave the air compressor unattended with the power supply in use and the air hose connected.

⚠WARNING

EXPLOSION

Improper care could lead to the air tank bursting or exploding.

Drain air tank daily or after each use to prevent moisture buildup in the air tank.

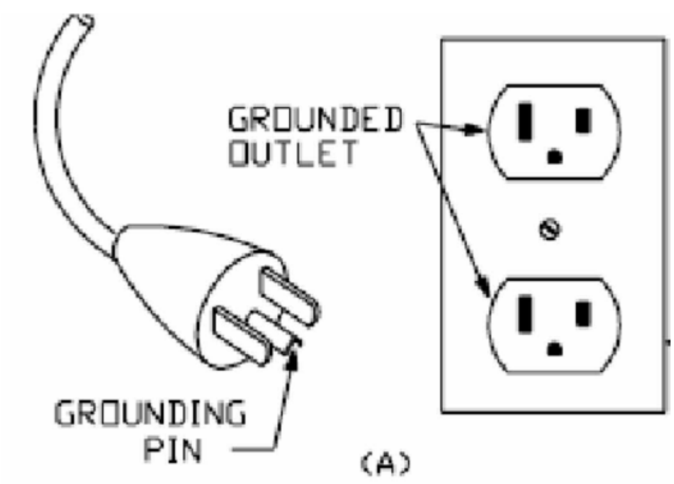
Rust can weaken the air tank and cause leaks or bursting. If rust is detected, replace tank immediately. Do not try to repair the air tank by welding, drilling or modifying it in any other way. These modifications can weaken the air tank and cause a hazardous condition.

If air tank develops a leak, replace the air tank immediately. Never repair, weld or make modifications to the air tank or its attachments.

Never make adjustments to the factory-set pressures.

Never exceed manufacturer's maximum-allowable pressure rating attachments.

Because of extreme heat, do not use plastic pipe or lead tin solder joints for a discharge line.



⚠WARNING

EXPLOSION

FIRE

Use caution to minimize risk of fire or explosion.

It is normal for the air compressor motor and pressure switch to produce sparks while operating. If sparks come in contact with vapors from gasoline or solvents, they may ignite and cause a fire or explosion.

Abrasive tools such as grinders, drills and other tools are capable of making sparks that can ignite flammable materials.

Always operate the air compressor a safe distance away from flammable items. Use in well-ventilated areas.

Never exceed the maximum rated pressure.

⚠CAUTION

Use caution when using extension cords.

Use an extension cord which is no more than 25' (7.6 m) long and at least 14 gauge.

Using an excessively long or thin-wired extension cord will cause severe damage to the motor.

Use only a 3-wire extension cord that has a 3-blade grounding plug.

As undersized cord results in a drop in the line voltage and loss of power and overheating.

When in doubt, use a heavier gauge. The smaller the gauge the more current the cord can carry.

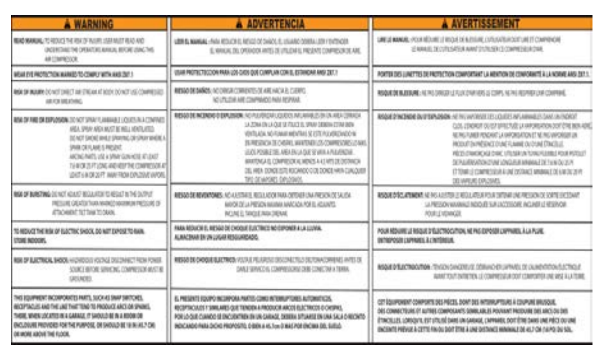
⚠CAUTION

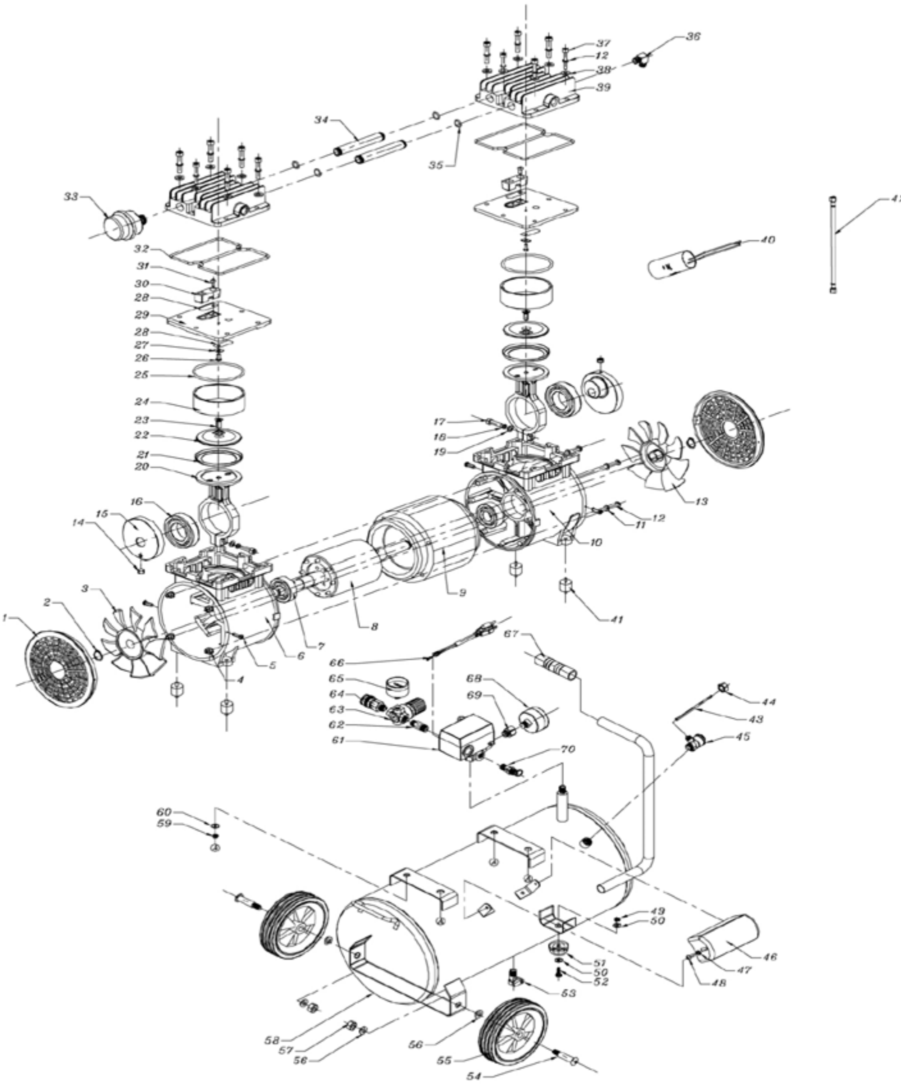
THIS EQUIPMENT INCORPORATES PARTS, SUCH AS SNAP SWITCHES, RECEPTACLES AND THE LIKE THAT TEND TO PRODUCE ARCS OR SPARKS, THERE, WHEN LOCATED IN A GARAGE, IT SHOULD BE IN A ROOM OR ENCLOSURE PROVIDED FOR THE PURPOSE, OR SHOULD BE 18 IN (45.7 CM) OR MORE ABOVE THE FLOOR.

LOCATIONS OF IMPORTANT LABELS

Read these important labels before operating.

These labels provide important safety and maintenance information. These labels should be considered as permanent parts of the air compressor. Should any of these labels become illegible, damaged or removed, please contact California Air Tools Customer Service department at 1-866-409-4581 for replacements.

PRODUCT LABEL	
a	
b	
c	
d	
e	
f	
g	
h	



NO.	Description	NO.	Description	NO.	Description	NO.	Description
1	Fan Cover	21	Piston Ring	41	Shock Strut	61	Pressure Switch
2	O-Ring	22	Pressure Plate	42	Exhaust Pipe	62	Connector
3	Left Fan	23	Pressure Plate Screw	43	Unloading Pipe	63	Regulator
4	Nut	24	Cylinder Ring	44	Unloading Pipe Not	64	1/4"Hose Quick Connect
5	Screw	25	Cylinder Obturaring Ring	45	Check Valve	65	Pressure Gauge (small)
6	Crank Case	26	Screw	46	Capacitor Cover	66	Power Cord & Plug
7	Bearing	27	Metal Strengthen Sheet	47	Washer	67	Handle Cover
8	Rotor	28	Air Inflow Valve	48	Screw	68	Pressure Gauge (large)
9	Stator	29	Valve Plate	49	Nut	69	Adaptor
10	Crank Case	30	Limited Block	50	Washer	70	Safety Valve
11	Spring Washer	31	Screw	51	Cushion Foot	71	Cushion Foot
12	Screw	32	Cylinder Head Obturating Ring	52	Bolt	72	Nut
13	Right Fan	33	Air Filter	53	Drain Valve	73	
14	Set Screw	34	Connecting Hose	54	Wheel Bolt	74	
15	Crank	35	Connecting Hose Obturating	55	Wheel	75	
16	Bearing	36	Elbow	56	Washer	76	
17	Screw	37	Screw	57	Nut	77	
18	Spring Washer	38	Washer	58	8.0 Gallon Steel Tank	78	
19	Washer	39	Cylinder Head	59	Nut	79	
20	Connecting Rod	40	Capacitor	60	Washer	80	

PRe-OPeRATION CheCk LIST

package contents & assembly

model: 8010

package contents:

Air Compressor

Owner's Manual

Air Filter

Wheel Assembly kit

2 - #54 Wheel bolts

2 - #55 Wheel

4 - #56 Washers

2 - #57 Nut

1 - #52 bolt

2 - #50 Washers

1 - #51 Cushion Foot

1 - #49 Nut

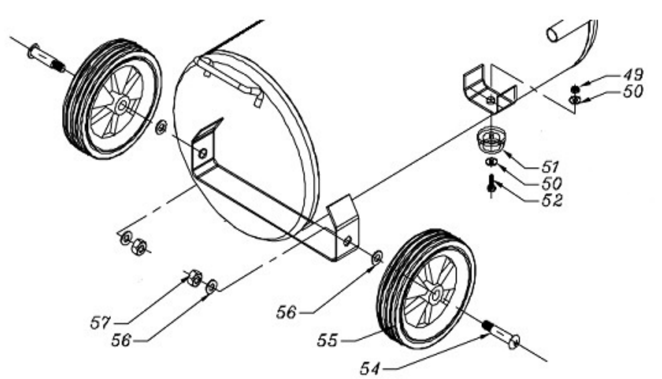
assembly:

Install the Air Filter

1. Attach the air filter to the top rear of motor head.
   (looking from the front to the back of the air compressor)
   Screw the air filter into the motor head port that is located
   under the Plastic head Cover

Install the Wheel kit

1. Slide bolt #54 through Wheel #55 .
2. Slide the bolt #54 through Washer #56 and wheel support hole located on the back bottom of the air compressor tank.
3. Attached the Washer #56 and Nut #57 to the bolt #54 and tighten firmly.
4. Repeat steps 1-3 to assemble the other wheel.
5. Slide bolt #52 through Washer #50 and Cushion Foot #51
6. Slide bolt #52 through cushion foot support hole located on the front bottom of the air compressor..
7. Attach Washer #50 and Nut #49 to bolt #52 firmly.



Inspect for damage

before using the air compressor, make sure the air tank is not damaged, inspect all parts for damage, and check that all pipes are firmly connected.

do not use the air compressor if any damage is found. If damaged, have an authorized service center inspect and test the air compressor to ensure that is working properly.

Save packaging

IMPORTANT: Save all outside packaging in case you ever need to return the product for service or repair.

compressor Location

use on flat Surface

For proper operation, the air compressor must be placed on a flat surface with an incline no greater than 15 degrees.

⚠WARNING

EXPLOSION

FIRE

Use caution to minimize risk of fire or explosion.

It is normal for the air compressor motor and pressure switch to produce sparks while operating. If sparks come in contact with vapors from gasoline or solvents, they may ignite and cause a fire or explosion.

Abrasive tools such as grinders, drills and other tools are capable of making sparks that can ignite flammable materials.

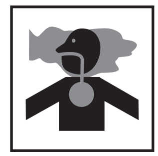
Always operate the air compressor a safe distance away from flammable items. Use in well-ventilated areas.

Never exceed the maximum rated pressure.

maintain a clear area

It is very important that the air compressor is positioned so that there is adequate airflow around the machine. There must be at least 2 feet of obstacle-free space surrounding and above the air compressor.

⚠WARNING



RISK TO BREATHING

Dust or dust-like particulates caused by power-sanding, sawing, grinding, drilling or any other construction-like activities can contain contaminants that are harmful to breathe.

Always use your air compressor in a well-ventilated and clean area.

Never breathe the air that comes directly out of the air compressor or air hose. This air is not suitable for breathing.

Always wear approved safety equipment. When performing dust-creating activities, securely wear properly-fit face masks or respirators.

If you feel ill from breathing while operating your air compressor, stop and seek medical attention immediately.

use in areas with clean air

For proper operation and to maximize the longevity of the air compressor, it is very important that the air drawn into the air compressor is clean. The air compressor should not be used in areas where dust or particulates are in the air. This will damage the motor and impair proper operation.

Important: Always use the air filter, properly installed.

e lectrical power

e lectrical power r equirements

⚠DANGER

SHOCK

There is a danger of electric shock.

Use only undamaged electrical cords.

DO NOT touch bare wires or receptacles.

DO NOT operate air compressor in wet weather or in wet conditions.

DO NOT touch air compressor or cords if hands or feet are wet.

Ensure that all cords are free of damage before connecting to the power supply.

Ensure that you have a sufficient electrical supply for supporting the requirements of the motor.

Improper installation of the grounding plug is able to result in a risk of electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electrical shock by providing an escape wire for the electric current.

This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with the local codes and ordinances.

This product is for use on a nominal 120-V circuit and has a grounding plug similar to the plug illustrated in sketch A. Only connect the product to an outlet having the same configuration as the plug.

Do not use an adapter with this product.

b efore using the air compressor, refer to the serial label for voltage and amperage requirements. Make sure you have a sufficient electrical supply for supporting the motor's requirements.

u se a dedicated circuit for the best results.

Low voltage and/or an overload circuit can cause the motor's overload protection system circuit breaker to trip.

e lectrical e xtension c ords

⚠CAUTION

Use caution when using extension cords.

Use an extension cord which is no more than 25' (7.6 m) long and at least 14 gauge.

Using an excessively long or thin-wired extension cord will cause severe damage to the motor.

Use only a 3-wire extension cord that has a 3-blade grounding plug.

As undersized cord results in a drop in the line voltage and loss of power and overheating.

When in doubt, use a heavier gauge. The smaller the gauge the more current the cord can carry.

Inspect all electrical extension cords to ensure that they are free of damage.

When using an extension cord, use a heavy-duty cord that is no more than 25 feet long and at least 14 gauge.u se only a 3-wire extension cord that has a 3-blade grounding plug.

OPe RATINg Th e AIR COMPRe SSOR

⚠WARNING

This manual contains important instructions for operating this product. For your safety, and the safety of others, be sure to read this manual thoroughly before operating the product.

Failure to properly follow all the instructions and precautions can cause you and others to be seriously hurt or killed.

Save this manual for future reference.

Introduction

This air compressor features a compact structure, stable performance, a high airflow rate, easy operation and maintenance. b ecause the air compressor produces no oil in the airflow, it can be used as an independent air supply machine for situations in which oil in the airflow is an issue. The motor directly drives the pistons and is able to function without lubrication for a long period of time.

a ssembly

.**1.** Connect your air supply hose to a 1/4" male universal or industrial quick connect coupler. Connect the male quick connect coupler to the female quick connect coupler located on the air compressor

2. Make sure the drainage valve is off and that the pressure switch is in the OFF position.

3. e nsure that the power supply you are going to use is operating normally.

4. Insert the power supply cord into the power supply socket.

test run

before using the air compressor for the first time, complete a test run as follows:

1. Turn the power switch to the OFF position. Plug the power supply cord into a power supply socket. Start the air compressor by turning the power switch to the ON position. The pressure gauge reading will slowly rise as pressure increases inside the air tank. When the gauge reading reaches 115 PSI - 120 PSI, the pressure switch will automatically turn the power off. This indicates the compressor is working normally.
2. Turn the power switch to the Off position, unplug the power supply cord and release the air in the tank by pulling on the safety valve. At this point proceed to the next step (daily operations).

   note: If the Air Compressor is not working properly, the pressure gauge will indicate that there is a decrease in pressure in the air tank. If there is an air leak from the compressor the pressure in the air tank decreases, the pressure switch resets and the motor automatically turns back on.

   If you detect an air leakage, turn the power switch to the Off position, release the air from the tank by pulling on the safety valve. unplug the power supply cord and contact Customer Support for Assistance.

⚠WARNING


HOT SURFACE **FIRE**

Air compressor surfaces become hot during operation.

DO NOT touch hot surfaces, because they can cause severe burns.

Do not touch the air compressor's cylinder head. During operation, the cooling fins of the cylinder head and delivery pipe become hot.

Allow the air compressor to cool before touching it.

DO NOT place a storage cover on the unit during operation. Only place a cover on the air compressor after it has thoroughly cooled down.

⚠WARNING

FLYING OBJECTS

Flying objects can cause injury to the eyes, head and other parts of the body.

Air-powered equipment and power tools are capable of propelling items (metal chips, fasteners and particulates) at high speed into the air and could result in injury.

Always wear approved head and eye protection.

Never point the air stream at any part of your body, or at another person or animal.

When operating the air compressor, make sure all other people and animals maintain a safe distance.

Do not move the air compressor when the air tank is under pressure.

Never use the air hoses to pull or move the air compressor.

Keep the air compressor on a flat surface.

daily operation

Starting the compressor:

1. Turn the power switch to the OFF position.
2. Attach the air hose to the 1/4" quick connect coupler
3. Close the drain valve.
4. have air filter attached
5. Plug the power supply cord into a power supply socket.
6. Turn the power switch to the ON position.
7. Let the motor run and tank fill until motor turns off.
8. To regulate the air flow.

   While the air compressor is running, turn "On" your tool and turn the regulator knob to the right increasing the pressure. Turn the pressure up until the desired pressure is reached.
9. Operate air tool normally.

Shutting down the compressor:

1. Turn the power switch to the OFF position.
2. unplug the power supply cord.
3. Reduce the pressure in the air tank through the air supply hose.

MAINTeNANCe

draining the air tank

The frequency at which you should drain the air tank depends on the environmental conditions and the amount of operating time logged. The average draining frequency is every 2 to 3 days.

1. Place the air compressor above a container capable of holding water.

2. With compressed air in the air tank, slowly turn the drain valve knob to the forward (open) or straight position.
The water in the air tank will drain out.

3. After all of the accumulated water has drained out, turn the drain valve knob to the closed or left position in order to avoid leakage.

4. draining the air tank protects parts from rust and corrosion.

cleaning or changing the air filter

The air filter is designed to reduce noise and help prevent particulates in the air from entering and damaging the air compressor.

After being used for a period of time, the air filter will become clogged. This will reduce the air intake capabilities of the air compressor, reducing performance. Therefore, the air filter must be cleaned or replaced regularly.

1. Open the lid on the air filter, then remove the air filter element.

2. To clean the element blow off or brush off the dirt and dust.

3. If clogged, replace with a new air filter.

testing for Leaks

Make sure all connections are tight. do not overtighten.

A small leak in any hose or pipe connection will reduce the air compressor's performance.

To test for small leaks, spray a small amount of soapy water on the area suspected of leaking. If the soap bubbles, replace the broken part.

cleaning

Clean items with a soft brush, or wipe with a moistened cloth using a biodegradable solvent.

do not use flammable liquids such as gasoline or alcohol. Always keep parts clean from dirt and dust for better performance.

pressure Switch

The pressure switch is factory pre-set to shut off at between 115 - 120 PSI and to re-start at between 85 -90 PSI

STORAge

before storing for a prolonged period of time:

1. Turn off the power supply.

2. disconnect the power cord from the power supply and wrap the power cord around the air compressor handle to reduce the risk of damage.

3. Pull the relief valve and release all the pressure from the air tank.

4. Clean the air compressor to remove all dirt and dust.

5. Cover the air compressor with a cover to protect the unit from dust and moisture.

6. do not stack or store any items on top of or around the air compressor. damage could occur.

⚠CAUTION

TO REDUCE THE RISK OF ELECTRIC SHOCK , DO NOT EXPOSE TO RAIN.

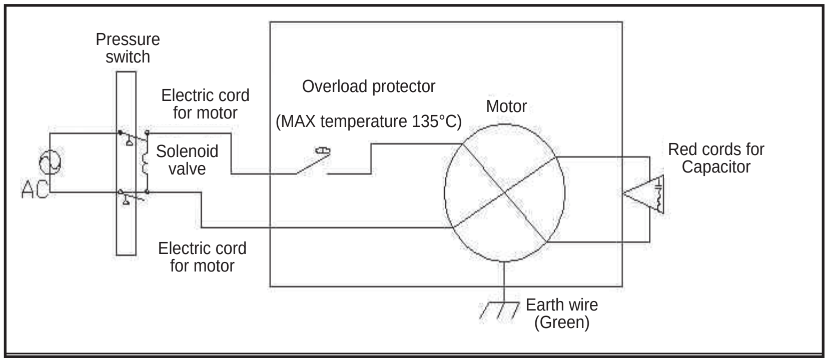
STORE INDOORS.

TROubLeShOOTINg

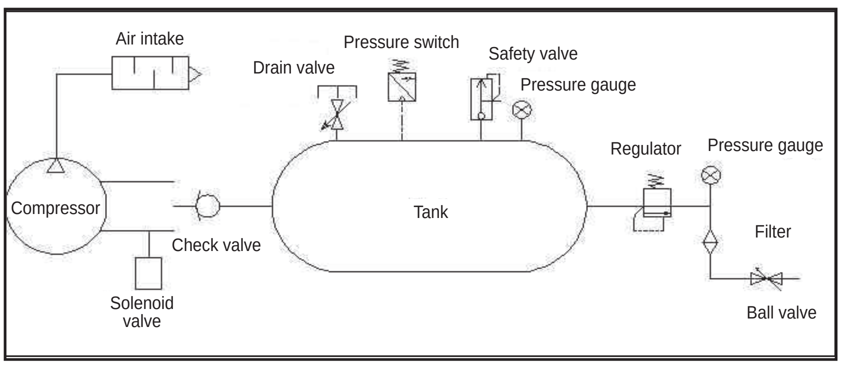
problem	poSSIbLe cauSe	poSSIbLe SoLutIonS
Pressure drop in the tank.	Air leaks at connections.	Let the compressor build pressure in the tank, to the maximum pressure if possible. brush soapy water on air connections and look carefully for air bubbles. Tighten leaky connections. If the problem persists, contact the seller for further advice.
The unloader valve leaks when the compressor is idle.	unloader valve seal is defective.	Let the air in the air tank flow out until all the pressure is released. Then remove the unloader valve plug and clean the valve seal. If necessary, replace the seal and then reinstall all components.
The compressor stopped and does not start.	The thermal protector turned on because the motor is overheating.	Check that the main voltage corresponds to the air compressor specifications. An extension cord that is too thin or too long can cause a voltage drop and cause the motor to overheat. excessive use (over 1 hour continuous use) can cause the motor to overheat Allow the motor to cool down.
	Motor windings are burned out.	Contact Customer Support.
The motor does not start and makes a humming noise.	Capacitor is burned out.	Contact Customer Support
The motor does not start or starts slowly.	Low voltage supply to the motor.	Check that the main voltage corresponds to the air compressor specifications. An extension cord that is too thin or too long can cause a voltage drop.. use heavy duty extension cords. ensure that the air compressor is plugged into a fully functional power outlet
The compressor is noisy with metallic clangs.	Compressor head gasket or reed valve is damaged	Stop the compressor and contact the dealer.
The compressor does not reach the maximum pressure.	Compressor head gasket or reed valve is faulty.	Stop the compressor and contact the dealer.
The compressor doesn't seem to provide as much air as it did when new and/or the compressor cuts off within a much shorter time period.	The pressure switch needs adjusting.	Stop the compressor and contact the dealer.
	The tank is full of water due to condensation.	Open the drain valve and release the water from the tank.
The motor pump unit does not stop when the tank pressure reaches its maximum working pressure (75 PSI).	Pressure switch defective or needs adjusting.	Stop the compressor immediately and contact Customer Support.

SPeCIFICATIONS

electrical circuit



air passage drawing



CALIFORNIA AIR TOOLS INC. LIMITed WARRANTy

This warranty is limited to Air Compressors distributed by:

California Air Tools, Inc.
8560 Siempre Viva Road, unit 3
San diego, CA 92154

Limited Warranty

California Air Tools Inc. will repair or replace, free of charge, to the original retail customer who purchased a California Air Tools, Inc. Air Compressor from an authorized dealer, distributor or distributor's dealer in North America.

This warranty does not transfer to subsequent owners.

California Air Tools Inc. will repair or replace, at its option, any parts of the portable air compressor that are proven by an authorized service center to be defective in material or workmanship under normal use during the applicable warranty time period as stated below. This limited warranty covers the cost of the replacement parts and labor for all defects when installed by an authorized service center. Transportation charges are the responsibility of the customer. Any part replaced under warranty becomes the property of California Air Tools Inc.

All parts replaced under warranty will be considered as part of original product, and any warranty on those parts will expire coincident with the original product warranty.

Limited Warranty periods

Non-commercial / Non-rental (personal use by a retail customer):	1 year parts and labor
Commercial / Rental (usage for income, business use):	1 year parts and labor

The limited warranty period begins on the date of retail purchase by the original purchaser.

disclaimers, Limitations of remedies & exclusions

This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

disclaimer of other Warranties

To the fullest extent permitted by applicable law, this limited warranty is exclusive and expressly in lieu of any and all other warranties, including, without limitation, any implied warranties of merchantability or fitness for a particular purpose or any other implied warranties that may arise from the course of dealing or usage of the trade. California Air Tools Inc. hereby declaims and excludes all other warranties. To the extent that California Air Tools Inc. products are consumer products under applicable federal and state law with respect to any customer, the duration of any implied warranties (including but not limited to implied warranties of merchantability or fitness for a particular purpose) are limited to the shortest duration permitted by applicable law or the Limited Warranty period provided herein, whichever is longer.

Limitations of remedies

California Air Tools Inc. shall not be liable to customer, or anyone claiming under customer, for any other obligations or liabilities, including but not limited to, obligations or liabilities airing out of breach of contract or warranty, negligence or other tort or any theory of strict liability, with respect to the air compressor or California Air Tools Inc. acts or omissions or otherwise. To the fullest extent permitted by applicable law, California Air Tools Inc. shall not in any event be liable for incidental, compensatory, punitive, consequential, indirect, special or other damages, including but not limited to loss of use, loss of income, loss of time, loss of sales, injury to personal property, or liability customer incurs with respect to any other person, or any other type or form of consequential damage or economic loss.

e xclusions

In addition to the foregoing disclaimers, limitations and terms, this limited warranty shall not apply to and does not cover accessories, nor does it cover products that are in any way subject to any of the following:

1. Improper setup, installation or storage.
2. Lack of proper maintenance and service.
3. Accident, damage, abuse or misuse.
4. Abnormal operating conditions or applications.
5. Repair or modification by customer or any third party without written consent of California Air Tools Inc.
6. u se under operating conditions or in applications not recommended by California Air Tools Inc.
7. Normal wear.
8. The use of accessories or attachments not recommended by California Air Tools Inc.
9. Acts of g od.

The application of these exclusions will be determined at the sole discretion of California Air Tools Inc.

r egistration

Warranty registration with California Air Tools Inc. is required on all products.

you can mail the enclosed registration form or register on-line.

h ow to Videos

California Air Tools provides “h OW TO VId e OS” on our website WWW.CALIFORNIAAIRTOOLS.COM.

The “h ow to Videos” provide valuable information regarding set-up, operation and maintenance.

Please visit our website and view these videos for beneficial information.

Service or parts

Warranty is also available by keeping and showing your original receipt from the date of purchase to an Authorized California Air Tools Service Center.

For all customer service inquiries call 1-866-409-4581 or visit

WWW.c a LIf o r nIa a Ir t o o LS.c o m

g o to the “c ustomer Service” t ab

c lick on “Service & parts” b utton for the f astest Service.

PROd u CT Re g ISTRATION

To register your product, please complete the information below and mail to the mailing address at the end of this page.

1. personal Information:

Full Name (Include Middle Initial): ____________________

Mailing Address: ____________________

City:____________________ State:__________ Zip Code: ____________

Phone Number: ____________________

e -mail Address: ____________________

(Check here to receive product information and offers via e-mail)

(Check here to receive product information from other companies via e-mail)

2. product Information:

d ate of Purchase: ____________________(MM / d d / y y y y)

Model Number:____________________

Serial Number: ____________________ (Found on name plate)

Purchased Location:____________________

Purchase Price: ____________________

Type of Primary u se for this Product: h ome Recreation e mergency Rental Commercial

Other____________________

Features Influencing Product Purchase: b rand Portability Power Rating Price Warranty

Other Features (describe) ____________________

What other Power e quipment are you interested in purchasing in the future? ____________

Thank you for registering your product.

Mail to:
California Air Tools
8560 Siempre Viva Road, u nit 3
San d iego, CA 92154

"THE ENGINEERED ENCLOSURE"

Hot Box® Enclosures have been trusted since 1986, and requested by name. Leading the industry with innovative designs, Hot Box enclosures are built to speed the installation and maintenance of backflow prevention, pump and sprinkler assemblies, pressure vacuum breakers, and air release valves. The enclosures facilitate an installation in the most economical, safe, and accessible location - outside and above ground. More and more designers, utilities, and contractors are putting the backflow preventer at the curb to eliminate costly problems encountered in equipment rooms.

Features such as heater sizing, drain-sizing, service access, and rigid construction make Hot Box enclosures the ultimate solution for protecting outdoor infrastructure and piping systems.

Table of Contents

Hot Box® Enclosures

Hot Box offers the broadest range of enclosures in the industry with multiple material types, styles, and sizes. All are built with the same attention to quality and performance that you know and expect from Hot Box. Our comprehensive product offering is designed to ensure that your application requirements are met, and your expectations are exceeded.

Aluminum Enclosures

Manufactured from corrosion and UV resistant stucco embossed aluminum, these enclosures have a highly durable, industrial style, riveted construction (optional Mill Finish and Marine Grade aluminum available). Commonly used for larger projects due to its ability to be easily customized, aluminum provides both versatility and strength. Bonded foam insulation will not sag or delaminate from the walls, unlike glued or tacked board insulation.

Fiberglass Enclosures

Reinforced fiberglass revolutionized the Hot Box industry by reducing both installation time and cost. With five different fiberglass models to protect your backflow, pump, air release valve, or anything that needs to be protected from the elements, fiberglass is often chosen for smaller devices (up to 4″) due to its lightweight nature. For smaller applications, typically one person can easily install a Hot Box on their project, thus reducing your labor costs.

Poly EZ Box® (Plastic) Enclosures

Polyethylene enclosures can efficiently provide protection for up to a 2″ device. Commonly specified by irrigation suppliers and landscape architects, the PEZ enclosures are available in green or brown. Combining easily recycled materials with a lightweight, cost effective design, our PEZ product line has both attractive designs and the high quality the industry expects.

Fiberglass Hot Rok® & Plastic PolyRok® Enclosures

Hot Rok and PolyRok are camouflaging enclosures. They are commonly used by irrigation contractors and landscape architects to blend in with the natural environment.

ASSE Standard # 1060

In 1996, The American Society of Sanitary Engineering (ASSE) developed the ASSE 1060 industry standard for outdoor enclosures to cover fluid conveying components. Born from the organization's philosophy of "prevention rather than cure," the ASSE 1060 seeks to protect public health and safety by providing performance requirements to safeguard equipment from freezing, tampering, and vandalism. As a result, the ASSE 1060 standard has been adopted by utilities and Water Authority departments across the nation. To this day, the ASSE 1060 remains the water industry's gold standard.

Hot Box®-ASSE 1060 Certified

All Hot Box standard enclosures meet or exceed the test provisions of the ASSE 1060 standard and proudly bear the ASSE 1060 seal. To achieve the certification, Hot Box enclosures must pass numerous independent material and product performance tests.

Laboratory Test Requirements for ASSE 1060 2006:

- Section 3.1 Air Inlet Test (Class I-V, II-V and II-V)
- Section 3.2 Structural Test (All Classes)
- Section 3.3 Access for Testing and Maintenance (All Classes)
- Section 3.4 Hinged Access Panel Restraints Test
- Section 3.5 Drainage Performance Test (All Classes)
- Section 3.6 Freeze Protection Capability Test (Class I and I-V)
- Section 3.7 Security/Locking Mechanism Test

ASSE Standard # 1060 Classes-Which One Do You Need?

Class I - Freeze Protection Enclosures (Heated): Designed and constructed to maintain a minimum internal temperature of 40°F with external temperatures as low as -30°F.

Class II - Freeze Retardant Enclosures (Insulated Non-Heated): Designed and constructed to be installed in locations with minimum external temperatures of 33°F.

Class III - Non-Freeze Protection Enclosures (Uninsulated Non-Heated): Designed and constructed to provide system security for components when freezing temperatures are not a consideration.

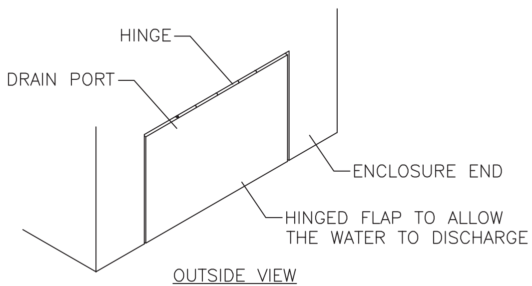
Hot Box®- Reduced Liability...Increased Credibility

Hot Box is the #1 trusted outdoor protection enclosure manufacturer in the industry. Our enclosures undergo rigorous physical, environmental, and internal equipment testing. When an engineer, architect, or contractor specifies or installs an ASSE certified Hot Box enclosure, they know the safety and quality of the enclosure will bring peace of mind and integrity to the entire project.

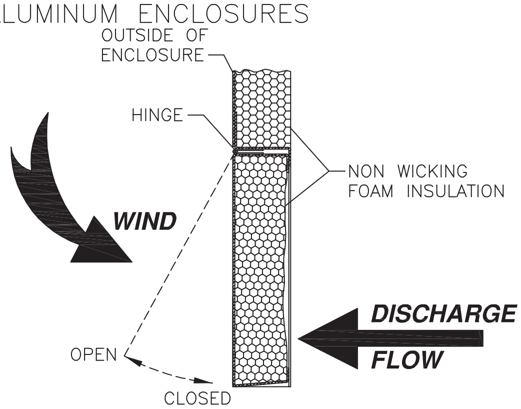
Look for the Seal

to Know it's Real!

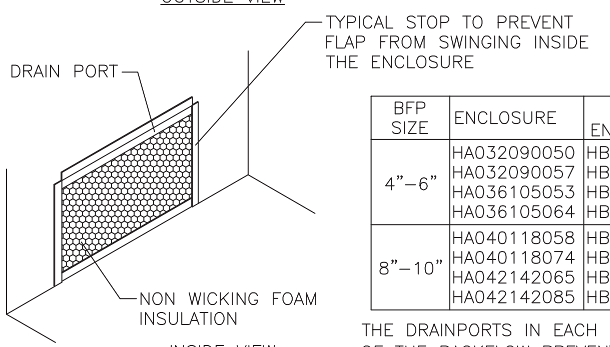
DRAIN PORT DETAILS FOR ALUMINUM ENCLOSURES



OUTSIDE VIEW



SECTION VIEW SHOWING
THE DISCHARGE RELIEF

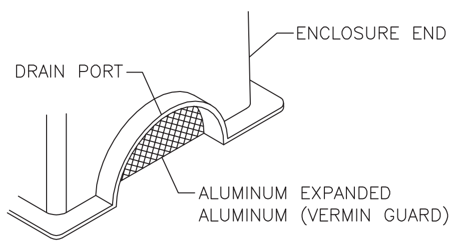


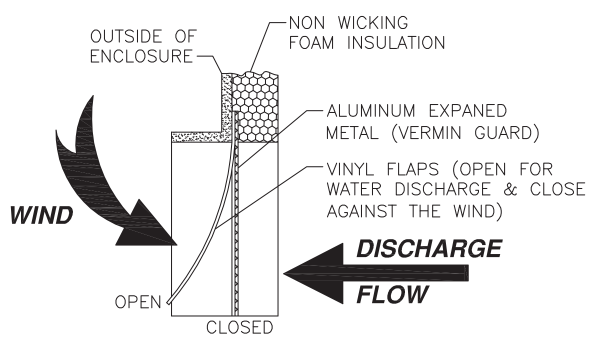
INSIDE VIEW

BFP SIZE	ENCLOSURE	OLD ENCLOSURE #	DRAIN SIZE	DRAINAGE AREA	BFP DISCHARGE	# PER ENCLOSURE
4"–6"	HA032090050 HA032090057 HA036105053 HA036105064	HB4N HB4E HB6N HB6E	8LX7.5H	7LX6H	750 GPM	4
8"–10"	HA040118058 HA040118074 HA042142065 HA042142085	HB8N HB8E HB10N HB10E	10LX6.5H	9LX5H	1,100 GPM	4

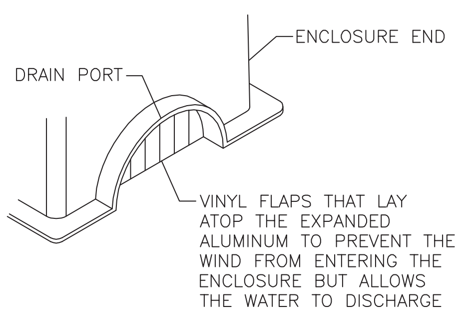
THE DRAINPORTS IN EACH ENCLOSURE ARE SIZED TO ALLEVIATE A FULL DISCHARGE OF THE BACKFLOW PREVENTER. (LAB TESTED PER A.S.S.E. STANDARD #1060.)

DRAIN PORT DETAILS FOR FIBERGLASS ENCLOSURES





SECTION VIEW SHOWING
THE DISCHARGE RELIEF



BFP SIZE	ENCLOSURE	ENCLOSURE OLD #	DRAIN SIZE	BFP DISCHARGE	# PER ENCL.
3/4"–1"	HF011019022 HF013027023 HF013027035 HT013026024	HB.75 HB1 HB1T HR1	R4"	200 GPM	2
1 1/4"–2"	HF021033025 HF013039028 HF013039036 HT019048040	HB1.5 HB2 HB2T HR2	R5"	300 GPM	2
2 1/2"–3"	HF026070045 HF026070055	HB3N HB3E	R6"	450 GPM	2

THE DRAINPORTS IN EACH ENCLOSURE ARE SIZED TO ALLEVIATE A FULL DISCHARGE OF THE BACKFLOW PREVENTER. (LAB TESTED PER A.S.S.E. STANDARD #1060.)

Code & Specification Requirements

The following are samples of building codes and manufacturer's specifications that demonstrate the need for an enclosure to protect infrastructure from freezing temperatures:

ASSE STANDARD #1060 Outdoor Enclosures for Fluid Conveying Components

Section 3.2.1: Enclosure is capable of supporting a minimum vertical load of 100 lb./sf.

Section 3.3.1: Enclosure has been designed to be accessed and provide sufficient room for monitoring, testing, maintenance, repair or replacement of the component located inside the enclosure.

Section 3.5.1: Depth of water within the enclosure does not exceed 8 inches during full flow of the backflow prevention assembly relief discharge, and that the depth of the water does not exceed 1/4" after full flow has ceased.

Section 3.6.1: Enclosures shall contain a heat source capable of maintaining the temperature of the component and associated piping at 40°F (4.4°C) inside the enclosure when subjected to -30°F (-34.4°C) outside air temperature.

AMERICAN SOCIETY OF PLUMBING ENGINEERS-ASPE

Data Book:

Reduced pressure principle devices, double check valves and vacuum breakers installed in regions subject to freezing must be protected by the insulation of the units in above-ground, heated structures.

INTERNATIONAL PLUMBING CODE® 2015

Section 608.14.1: Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

AWWA M-14

A reduced pressure backflow assembly must be protected from freezing temperatures, and a double check (backflow) valve assembly must be protected from freezing temperatures.

FEBCO

The backflow prevention assembly must be protected from freezing.

WATTS

In an area where freezing conditions can occur, the backflow prevention assembly should be installed in a properly insulated utility building or shelter.

NFPA 13

8.16.4.1.3: Where aboveground water-filled supply pipes, risers, system risers, or feed mains pass through open areas, cold rooms, passageways, or other areas exposed to temperatures below 40°F (4°C), the pipe shall be permitted to be protected against freezing by insulated coverings, frost proof casings, or other means capable of maintaining a minimum temperature between 40-120°F (4-49°C).

PLUMBING-HEATING-COOLING CONTRACTORS ASSOCIATION (PHCC) National Standard Plumbing Code

Freezing: The plumbing system shall be protected from freezing or overheating. The following conditions shall be met:

In areas with seasonal freezing temperatures, all waste, vent and water supply piping in exterior walls and other areas shall be protected from freezing.

THE COUNCIL OF AMERICAN BUILDING OFFICIALS (C.A.B.O.) One and Two Family Dwelling Code

Freezing: Water, soil, or waste pipe shall not be installed or permitted outside of a building or in an exterior wall unless adequate provision is made to protect such pipe from freezing where necessary.

THE SOUTHERN BUILDING CODE CONGRESS International (S.B.C.C.I) Standard Plumbing Code

Freezing: A water, soil, or waste pipe shall not be installed or permitted outside of a building or concealed in outside walls or on any place where they may be subject to freezing temperature, unless adequate provision is made to protect them from freezing.

THE BUILDING OFFICIALS & CODE ADMINISTRATORS International, In. (B.O.A.C.) National Plumbing Code

In climates with freezing temperatures, plumbing piping in exterior walls or areas subject to freezing temperatures shall be protected against freezing by insulation or heat or both.

NATIONAL BUILDING CODE OF CANADA

Where piping may be exposed to freezing conditions it shall be protected from frost.

Enclosure Selection

With hundreds of Hot Box® Enclosures available, you may be asking yourself, which enclosure should I choose? Below is a guide to help you choose from our many different options:

HOT BOX® SELECT SIX (See pages 12-13)

Hot Box® would like to introduce our new "Select Six" aluminum enclosures. It's just another way we're creating innovative products that make it easy for you to protect your equipment:

- Six nominal sizes accommodate standard and N-pattern pipe sizes from 2 ½" to 10" dia.
- Reduced lead times.
- Protects against freezing conditions with optional, wall-mounted heaters that offer better performance and safety with the heater raised above the discharge point.
- Available in Mill Finish aluminum or Federal Brown.

STANDARD SIZE ENCLOSURES (See pages 14-21 & 24-43)

Hot Box® has a wide variety of standard enclosure sizes available in different styles and material types to meet your needs:

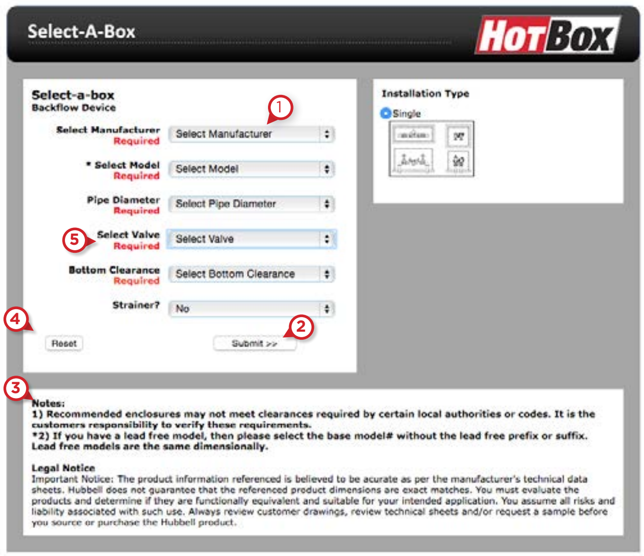
- Better fit with standard sizes ranging from 6"W x 20"L x 22"H to 87"W x 172"L x 85"H.
- Dura Fold® and Designer Series™ Enclosures are the industry benchmarks. These models provide both ease of installation and accessibility.
- Other traditional enclosure styles include: flip-top fiberglass, sectional aluminum, and drop over.
- Material types: aluminum, fiberglass, and polyethylene.
- Various options, such as vents, fans, lights, and alarms are available to modify any standard enclosure. See pages 45-49 for details.

CUSTOM SIZE ENCLOSURES (See pages 22-23)

Hot Box® offers custom sized sectional and Dura Fold® aluminum enclosures which can be manufactured to an engineer's exact specifications depending on the application:

- Best fit with dimensions manufactured to engineer's specifications .
- Peace of mind with ASSE 1060 certified enclosures up to 172"L x 87"W x 85"H (larger enclosures built with same design and quality).
- Special configurations, like wall-mounted enclosures, available upon request.
- Various material thicknesses available depending on specification requirements.
- Various options, such as vents, fans, lights, and alarms are available to modify any custom sized enclosure. See pages 45-49 for details.

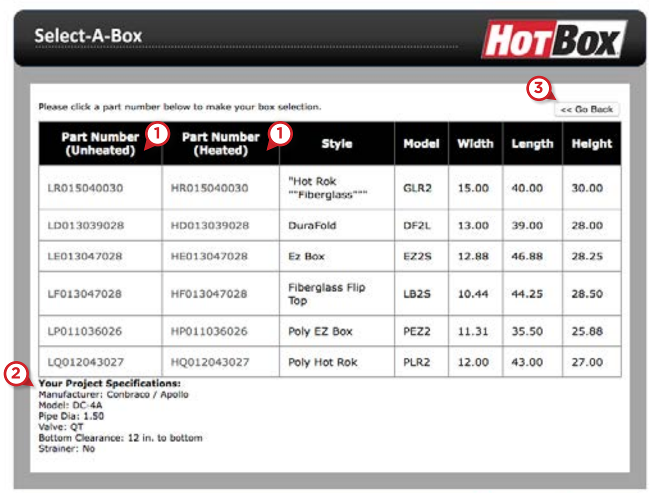
Selecting a standard Hot Box® enclosure for your application is easy. Our Select-A-Box tool quickly shows all available styles of Hot Box® enclosures to fit your specific backflow device. Once you select the style of enclosure desired, the tool will provide a drawing, piping layout diagram, specification, and installation instructions.



Step # 1

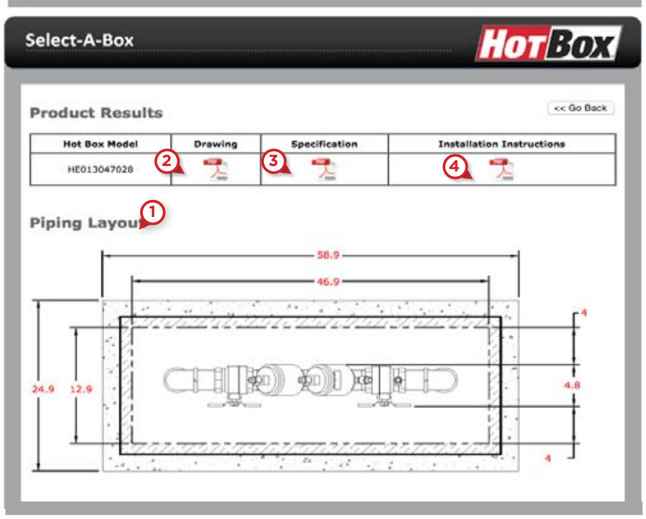
Select your manufacturer, model, valve type and clearance requirement from the drop-down menus provided[1], then hit submit[2].

Notes: 1) Helpful notes[3] 2) You can hit reset[4] at any time to start over. 3) If you hit "Submit"early, then it will indicate which "Required"[5] piece of information is missing.



Step # 2

The Select-A-Box tool will display all available styles of Hot Box®. Please click on the heated or unheated part# of your preferred style to proceed[1]. Your project specifications are viewable below the table for verification[2]. If you need to make changes, then simply select the "Go-Back" button[3].



Step # 3

The Product Results page with Piping Layout[1] will be displayed. Click on the available PDF's for drawings[2], specifications[3], or installation instructions[4].

Visit www.hpsapps.com/hotbox/ or scan the QR code to select a Hot Box® Enclosure today.

Enclosure Selection-By Pipe Size

If you only know your pipe size because the valve manufacturer and type has yet to be determined, the chart below can help you select a Hot Box® Enclosure. Please note that the Hot Box Select-A-Box tool can potentially provide a better fit, and one of the Hot Box Select Six can cover a wider range of pipe sizes and valves types.

Backflow Preventer (Straight) Sizing Guide by pipe size

		Standard HotBox Enclosure 12" bottom clearance		Standard HotBox Enclosure 18" bottom clearance		Standard HotBox Enclosure 30" centerline		
Pipe Size		**Quarter Turn**		**Quarter Turn**		**Quarter Turn**		**Excluded bfp's**
0.75	Part No. Model No.	HD/HF013027023 DF1/HB1		HD/HF013027035 DF1T/HB1T		HD/HF013027035 DF1T/HB1T		
1	Part No. Model No.	HD/HF013027023 DF1/HB1		HD/HF013027035 DF1T/HB1T		HD/HF013039036 DF2T/HB1T		
1.25-1.50	Part No. Model No.	HD/HF013039028 DF2/HB2		HD/HF013039036 DF2T/HB2T		HD/HF013039036 DF2T/HB2T		
2	Part No. Model No.	HD/HF013039028 DF2/HB2		HD/HF013039036 DF2T/HB2T		HD/HF013039036 DF2T/HB2T		
Pipe Size		**NRS**	**OS&Y**	**NRS**	**OS&Y**	**NRS**	**OS&Y**	**Excluded bfp's**
2.5	Part No. Model No.	HD/HE/HF026070045 DF3N/EZ3/HB3N	HD/HE/HF026070045 DF3N/EZ3/HB3N	HD/HE/HF026070045 DF3N/EZ3/HB3N	HA/HD/HF026070055 HB3E-AL/DF3E/HB3E	HD/HE/HF026070045 DF3N/EZ3/HB3N	HA/HD/HF026070055 HB3E-AL/DF3E/HB3E	909RPDA (LA045072052)
3	Part No. Model No.	HD/HE/HF026070045 DF3N/EZ3/HB3N	HD/HE/HF026070045 DF3N/EZ3/HB3N	HD/HE/HF026070045 DF3N/EZ3/HB3N	HA/HD/HF026070055 HB3E-AL/DF3E/HB3E	HD/HE/HF026070045 DF3N/EZ3/HB3N	HA/HD/HF026070055 HB3E-AL/DF3E/HB3E	909RPDA (LA045072052)
4	Part No. Model No.	HA/HD032090050 HB4N/DF4N	HA/HD032090057 HB4E/DF4E	HA/HD032090050 HB4N/DF4N	HA/HD032090057 HB4E/DF4E	HA/HD032090057 HB4E/DF4E	HA/HD032090057 HB4E/DF4E	909RPDA (HA051096067) 350AST OSY (HA045072060)
6	Part No. Model No.	HA036105053 HB6N	HA036105053 HB6N	HA036105053 HB6N	HA036105064 HB6E	HA036105053 HB6N	HA036105064 HB6E	
8	Part No. Model No.	HA040118058 HB8N	HA040118074 HB8E	HA040118058 HB8N	HA040118074 HB8E	HA040118058 HB8N	HA040118074 HB8E	909RPDA (HA054153075)
10	Part No. Model No.	HA042142065 HB10N	HA042142085 HB10E	HA042142085 HB10E	HA042142085 HB10E	HA042142085 HB10E	HA042142085 HB10E	

Backflow Preventer (N pattern) Sizing Guide by pipe size

		Standard HotBox Enclosure 12" bottom clearance		Standard HotBox Enclosure 18" bottom clearance		Standard HotBox Enclosure 30" centerline		
Pipe Size		**NRS**	**OS&Y**	**NRS**	**OS&Y**	**NRS**	**OS&Y**	**Excluded bfp's**
2.5	Part No. Model No.	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	n/a	n/a	
3	Part No. Model No.	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	n/a	n/a	
4	Part No. Model No.	HD/HM041041045 DF4FE/HB4FEM	HD/HM041041045 DF4FE/HB4FEM	HA/HD/HM047047049 DF6FE/HB6FEM	HA/HD/HM047047049 DF6FE/HB6FEM	n/a	n/a	
6	Part No. Model No.	HD/HM053053056 DF8FE/HB8FEM	HD/HM053053056 DF8FE/HB8FEM	HD/HM053053056 DF8FE/HB8FEM	HD/HM053053056 DF8FE/HB8FEM	n/a	n/a	
8	Part No. Model No.	HA045072060 HB8000ANT	HA065072060 HB8000AET	HA051096067 HB8FN-DT	HA051096067 HB8FN-DT	n/a	n/a	
10	Part No. Model No.	HA045082062 HB6FN-DT	HA071105064 HB6E-D	HA071105064 HB6E-D	HA071105064 HB6E-D	n/a	n/a	450OSY (HA083123074) 475OSY (HA083123074)

The above enclosures are based from the largest backflow device for each pipe size unless listed in the "Excluded bfp's" column. Sizing verification is ultimately the responsibility of the customer
For the unheated version replace the Hotbox part number prefix "H" with an "L".

Part numbering system: Prefix x Width x Length x Height

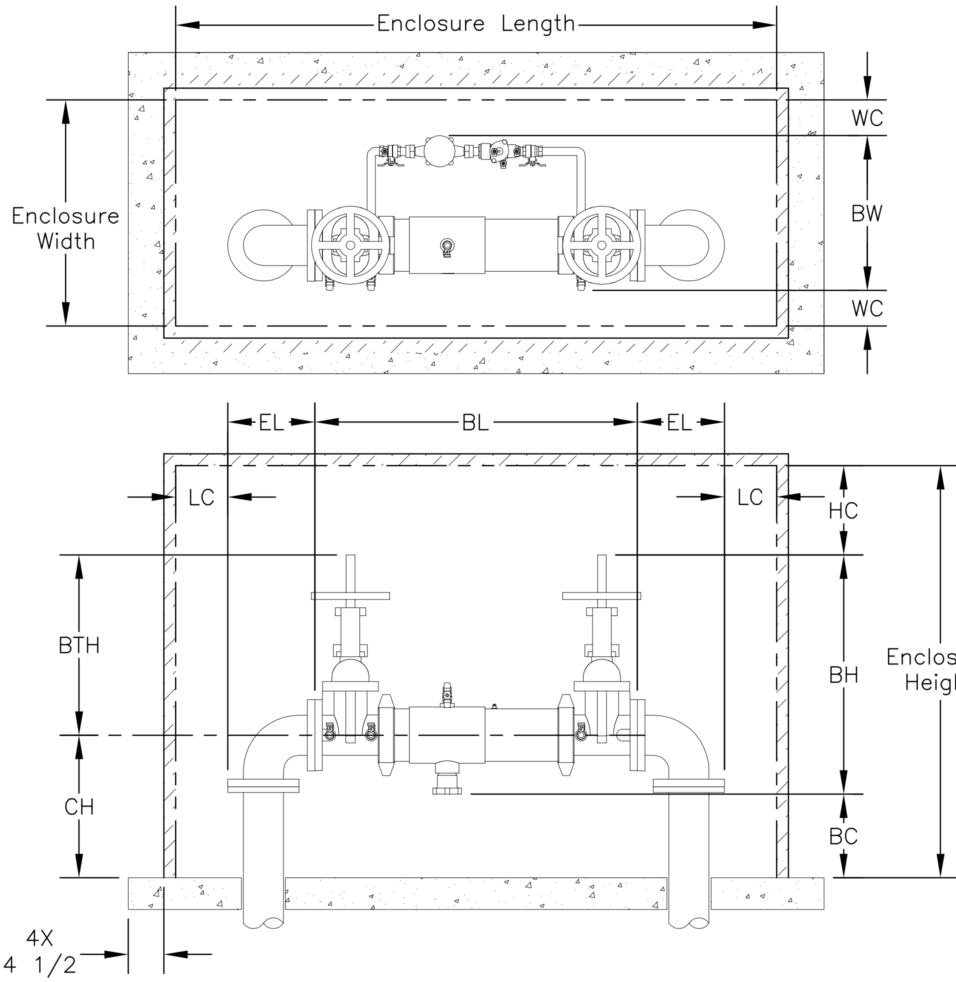
Prefix Definition: (digits 1 & 2)

HA Heated Sectional Aluminum
HD Heated Durafold Aluminum
HE Heated Drop Over Fiberglass
HF Heated Fliptop Fiberglass
HM Heated Designer Series
HP Heated Polyethylene drop over

LA Unheated Sectional Aluminum
LD Unheated Durafold Aluminum
LE Unheated Drop Over Fiberglass
LF Unheated Fliptop Fiberglass
LM Unheated Designer Series
LP Unheated Polyethylene drop over

Note: The enclosure recommendations are based on the largest backflow device for each pipe size unless listed in the "Excluded bfp's" column. Sizing verification is ultimately the responsibility of the customer. Customers are also responsible for verifying the clearances meet all local code requirements.

HOW TO SIZE A HOT BOX ENCLOSURE



Formulas:

BW Backflow Width
WC Width Clearance
+ WC Width Clearance
=Enclosure Width

BL Backflow Length
EL Elbow Length
EL Elbow Length
LC Length Clearance
+ LC Length Clearance
=Enclosure Length

BH Backflow Height
BC Backflow Clearance
+ HC Height Clearance
=Enclosure Height
w/ bottom clearance

OR

BTH Backflow Top Height
CH Centerline Height
+ HC Height Clearance
=Enclosure Height
w/ centerline

Size	Elbow Length	Elbow Style
0.50	3.25	Threaded
0.75	3.75	Threaded
1.00	4.06	Threaded
1.50	5.13	Threaded
2.00	5.75	Threaded
2.50	8.50	Flanged
3.00	9.25	Flanged
4.00	11.00	Flanged
6.00	13.50	Flanged
8.00	15.75	Flanged
10.00	19.00	Flanged
12.00	21.50	Flanged

The elbow length on threaded elbows include a 2" pipe nipple for ease of attachment.

See the backflow manufacturers website for the backflow dimensions.

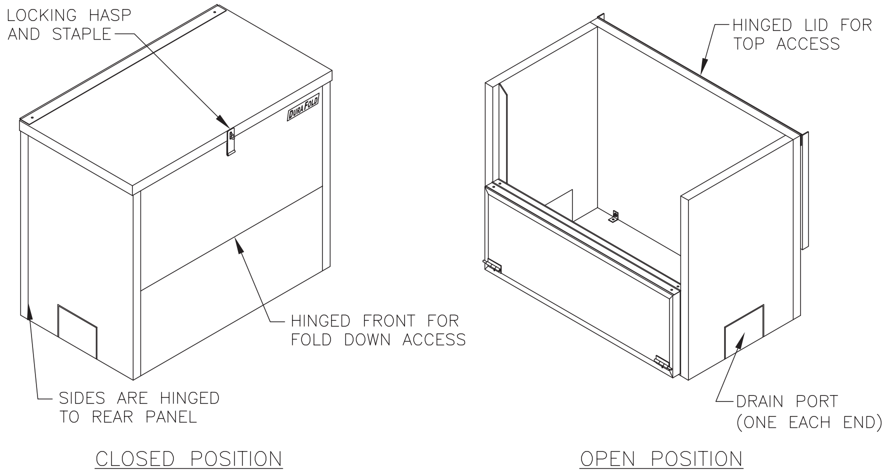
Hot Box suggests a minimum 3" clearance (each side) for 2" pipe and smaller and 6" clearance (each side) for 2 1/2" pipe and larger. These clearances can be adjusted to better fit a particular Hot Box enclosure.

Hot Box® Select Six

SPECS MADE SIMPLE

Hot Box® Select Six Enclosures are six enclosure sizes designed to accommodate standard and N-pattern pipe sizes from 2 ½″ to 10″ diameter.

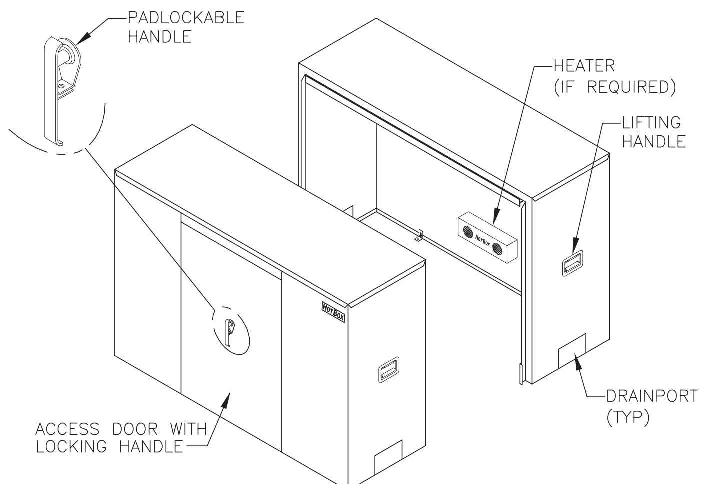
- **Reduced Lead Times** - A few enclosure sizes fit a variety of backflows.
- **Durable and strong -** The aluminum enclosure is corrosion and UV resistant.
- **Fast Access -** Dura Fold® design allows fast access via hinged and removable sections.
- **Reliable Insulation -** will not sag or delaminate from the walls dues to its strong chemical bond to the aluminum.
- **Safe Freeze Protection -** Wall-mounted heaters above the discharge point provide better performance and safety.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Finish Options -** Available in a smooth mill finish aluminum or federal brown.



Hot Box® - Dura Fold®

		Inside Clearance (inches)						
Backflow Type	Pipe Dia.	Width	Length	Height	Weight (lbs)	Pad Size (in)	Heater(s)	Part Number
Standard	2 ½" - 3"	26	70	45	144	38 X 82	(1) 1000W	HD026070045L
Standard	4" - 6"	32	90	57	201	44 X 102	(1) 2000W	HD032090057L
N-Pattern	2 ½" - 4"	38	38	45	109	50 X 50	(1) 1000W	HD038038045L
N-Pattern	6" - 8"	53	53	53	185	65 X 65	(1) 1500W	HD053053053L
N-Pattern	10"	62	68	58	248	74 X 80	(1) 1000W (1) 1500W	HD062068058L

For unheated units, replace the "H" in the part# with an "L". For federal brown color, change the L in part number to M.



Hot Box® Sectional

		Inside Clearance (inches)						
Backflow Type	Pipe Dia.	Width	Length	Height	Weight (lbs)	Pad Size (in)	Heater (s)	Part Number
Standard	8" - 10"	36	118	80	333	48 X 130	(2) 1500W	HA036118080L

For unheated units, replace the "H" in the part# with an "L". For federal brown color, change the L in part number to M.

Hot Box® Aluminum Enclosures

Aluminum Hot Box® Enclosures are crafted from industrial stucco embossed aluminum (smooth mill finish optional). Aluminum is highly durable, and has a riveted construction for added strength. Commonly used for larger projects due to easy customization, aluminum provides both versatility and strength. You can be confident that your insulation will not sag or delaminate from the walls because of the bonded foam insulation. Optional wall-mounted heaters provide the safest and most effective prevention against freezing conditions. All standard models are ASSE 1060 certified, so you can specify and install a product that has been tested by 3rd party engineers. Benefits include:

- **Superior Strength -** Riveted construction provides superior strength and durability.
- **Reliable Insulation -** Spray up foam insulation provides 100% contact with box walls.
- **Wall-Mounted Heaters -** Ensures economical performance and safety by keeping the heater off the ground and above discharge point.
- **Customizable Options -** Built to fit your needs. Custom sizes and components such as vents, fans, and alarms are available.

Hot Box® Aluminum Enclosures

Hot Box® offers the broadest range of aluminum enclosures in the industry with many different styles and standard sizes. All are built with the same attention to quality and performance that you know and expect from a Hot Box Enclosure. Our comprehensive product offering is designed to ensure that your application requirements are met, and your expectations are exceeded.

Dura Fold® Enclosures

Save time and money with quick installation and easy access via hinged access panels and a hinged lid for future testing and maintenance. Dura Fold Enclosures also include all the inherent benefits of our aluminum enclosures, like corrosion and UV resistance, bonded foam insulation, and wall mounted heaters.

Single Aluminum Enclosures

Save time and money during installation as you effortlessly connect two or four sections to assemble your Hot Box Enclosure on-site.

Dual Aluminum Enclosures

Wider design to accommodate dual and tandem installations, with all the same benefits of our sectional aluminum enclosures.

Custom Aluminum Enclosures

Innovative custom enclosures by Hot Box are built to fit your specific project. If your project requires pumps, meter bypasses, FDC hookup, custom sizing or custom colors, Hot Box has a full staff of design engineers ready to assist.

Dura Fold® Aluminum Enclosures

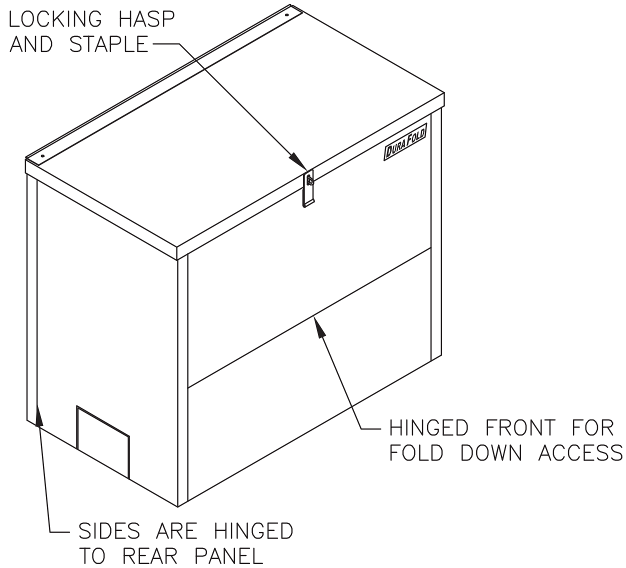
Dura Fold® Enclosures feature an innovative design that helps you save time and money. Unique design features facilitate quick installation and easy access for future testing and maintenance. Key benefits include:

- **Quick Installation & Easy Access -** Dura Fold® Enclosures ship assembled to allow quick installation. The design includes hinged walls, as well as front and top lids, to provide easy access. Also the front wall is easily removed to provide unobstructed access for equipment testing and maintenance after installation.

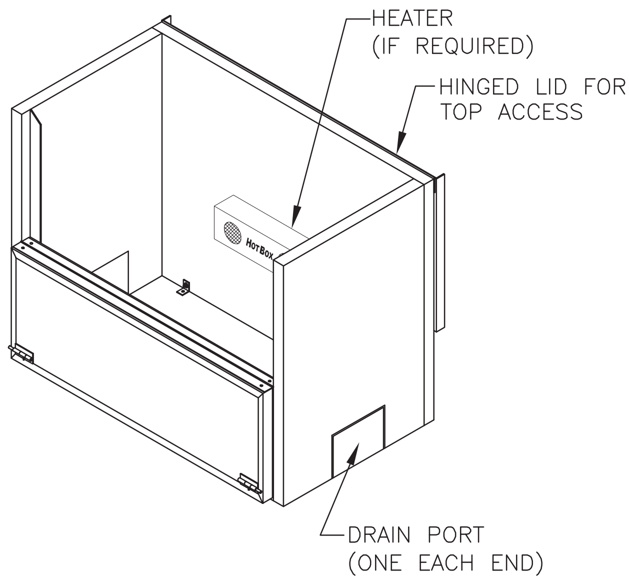
- **Corrosion & Scratch Resistant -** Stucco embossed aluminum sheeting provides a corrosion proof and scratch resistant finish that looks good and stands up to the elements.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Superior Protection -** Insulation will not sag or delaminate from the walls due to the strong chemical bond between the aluminum and the insulation. Heaters and/or heat trace tape can provide proven freeze protection.
- **Bottom-line, when time and money matter, install a Dura Fold® Enclosure every time!**

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

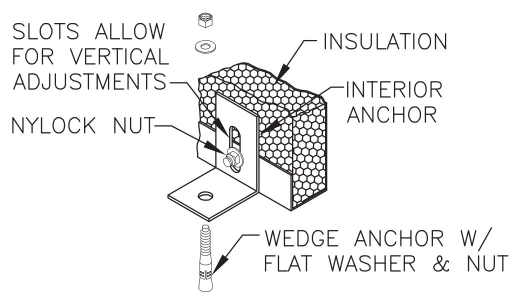
Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater(s)	Weight #
HD011019022	DF.75H	11	19	22	30W	27
HD013027023	DF1H	13	27	23	60W	35
HD013027035	DF1TH	13	27	35	60W	44
HD013039028	DF2H	13	39	28	90W	48
HD013039036	DF2TH	13	39	36	90W	56
HD013047028	DF2SH	13	47	28	90W	54
HD013047036	DF2STH	13	47	36	90W	64
HD021033024	DF1.5H	21	33	24	60W	46
HD022060030	DF2.5H	22	60	30	(2)-90W	78
HD022060042	DF2.75H	22	60	42	(2)-90W	96
HD024039032	DF2000H	24	39	32	90W	65
HD025053032	DF2100H	25	53	32	1000W	77
HD026070045	DF3NH	26	70	45	1000W	118
HD026070055	DF3EH	26	70	55	1500W	135
HD026083045	DF3NSH	26	83	45	1500W	133
HD026083055	DF3ESH	26	83	55	1500W	154
HD029060037	DF3000H	29	60	37	1000W	85
HD032037035	DFS4FOH	32	37	35	1000W	93
HD032090050	DF4NH	32	90	50	1900W	163
HD032090057	DF4EH	32	90	57	1900W	201
HD033053044	DF4000H	33	53	44	1000W	107
HD037043040	DFS6FOH	37	43	40	1000W	108
HD041041045	DF4FEH	41	41	45	1000W	104
HD042052044	DFS8FOH	42	52	44	1500W	138
HD043053036	DF2200H	43	53	36	1000W	127
HD047047049	DF6FEH	47	47	49	1500W	128
HD048063050	DFS10FOH	48	63	50	1900W	175
HD053053056	DF8FEH	53	53	56	1500W	179
HD053062042	DF3100H	53	62	42	1500W	164
HD054062056	DF10FEH	54	62	56	1900W	194



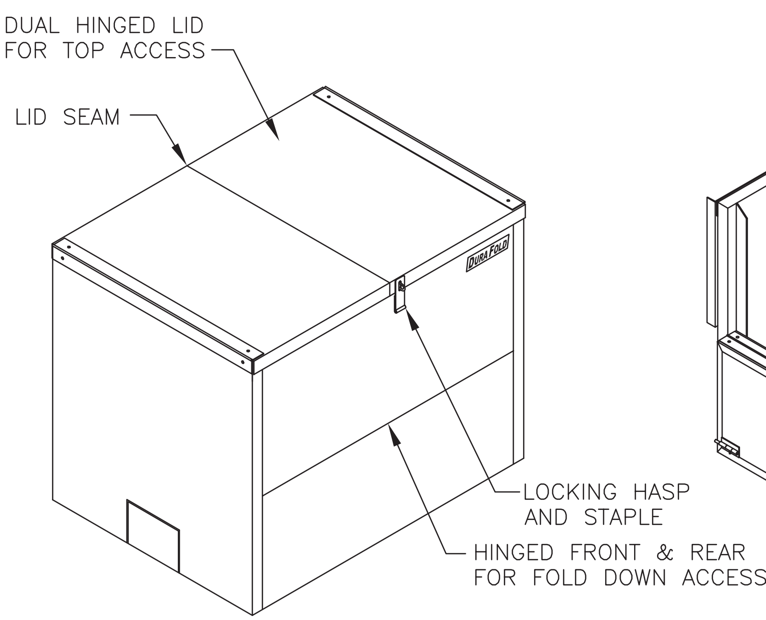
CLOSED POSITION



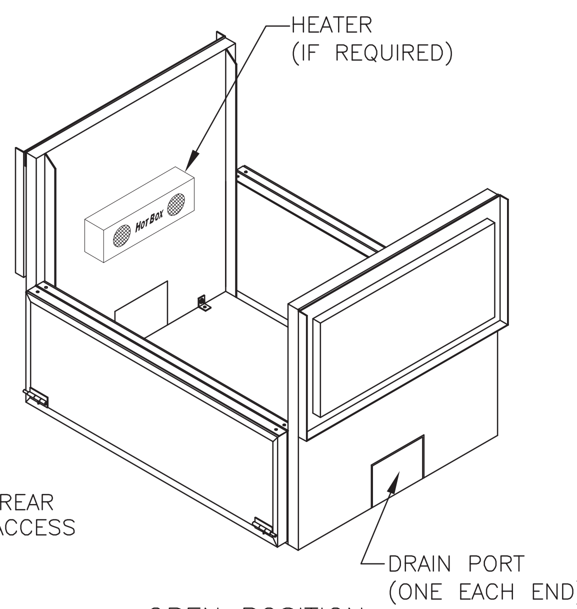
OPEN POSITION



SINGLE ANCHOR DETAIL



CLOSED POSITION



OPEN POSITION

Single Aluminum

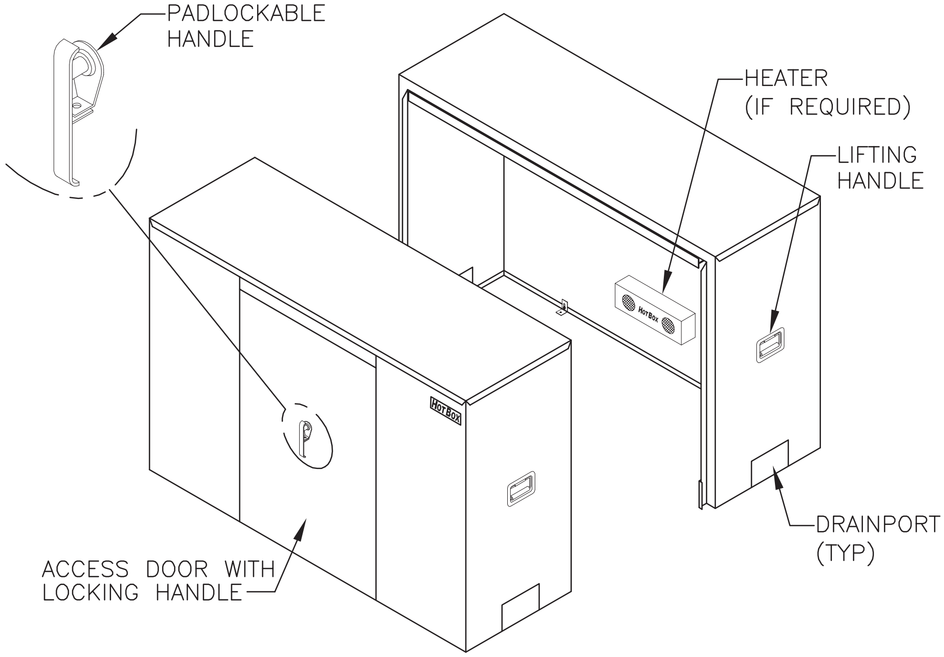
- **Quick & Easy Installation -** Modular design with a maximum of 4 tongue and groove sections.
- **Easy Access -** Lightweight removable doors can easily be removed by one person.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Superior Freeze Protection -** Insulation will not sag or delaminate from the walls due to the strong chemical bond between the aluminum and insulation. Wall-mounted heaters are installed above the discharge point to provide better long-term performance and safety.
- **Finish Options -** Stucco embossed aluminum is standard. Also available in a smooth mill finish aluminum or optional colors (see page 49 for details).

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

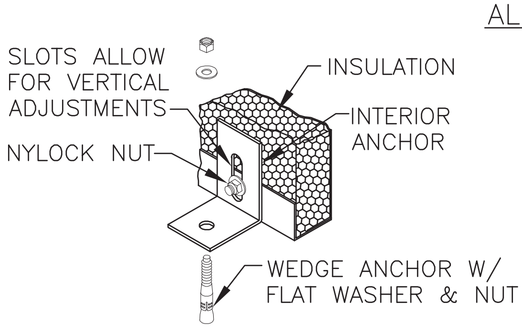
Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater(s)	Sections	Weight #
HA026070055	HB3E-AL	26	70	55	(1) 1500W	2	152
HA026083055	HB3ES-AL	26	83	55	(1) 1500W	2	168
HA032090050	HB4N	32	90	50	(1) 1900W	2	178
HA032090057	HB4E	32	90	57	(1) 1900W	2	192
HA032102050	HB4NS	32	102	50	(1) 1900W	2	192
HA032102057	HB4ES	32	102	57	(1) 1900W	2	209
HA033053044	HB4000AN	33	53	44	(1) 1000W	2	121
HA036105053	HB6N	36	105	53	(1) 1900W	2	209
HA036105064	HB6E	36	105	64	(2) 1500W	2	238
HA036105080	HB6ET	36	105	80	(2) 1500W	2	278
HA036125053	HB6NS	36	125	53	(2) 1500W	4	266
HA036125064	HB6ES	36	125	64	(2) 1500W	4	299
HA039062046	HB6000AN	39	62	46	(1) 1500W	2	155
HA040118058	HB8N	40	118	58	(2) 1500W	2	266
HA040118074	HB8E	40	118	74	(2) 1500W	2	312
HA040142058	HB8NS	40	142	58	(2) 1500W	4	311
HA040142074	HB8ES	40	142	74	(2) 1900W	4	363
HA042142065	HB10N	42	142	65	(2) 1500W	4	342
HA042142085	HB10E	42	142	85	(2) 1900W	4	404
HA042172065	HB10NS	42	172	65	(2) 1900W	4	392
HA042172085	HB10ES	42	172	85	(2) 1900W	4	469
HA044053044	HB4000AE	44	53	44	(1) 1000W	2	147
HA045072052	HB8000AN	45	72	52	(2) 1000W	2	197
HA045072060	HB8000ANT	45	72	60	(2) 1000W	2	235
HA047047049	HB6FE-AL	47	47	49	(1) 1500W	2	149
HA053053056	HB8FE-AL	53	53	56	(1) 1500W	2	183
HA053062046	HB6000AE	53	62	46	(1) 1500W	2	175
HA054062056	HB10FE-AL	54	62	56	(1) 1900W	2	197
HA065072052	HB8000AE	65	72	52	(2) 1000W	2	224
HA065072060	HB8000AET	65	72	60	(2) 1000W	2	244

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

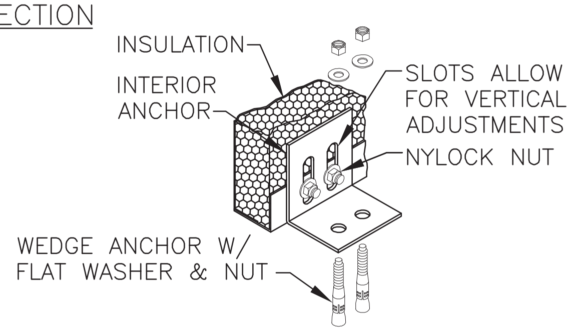
Single Aluminum



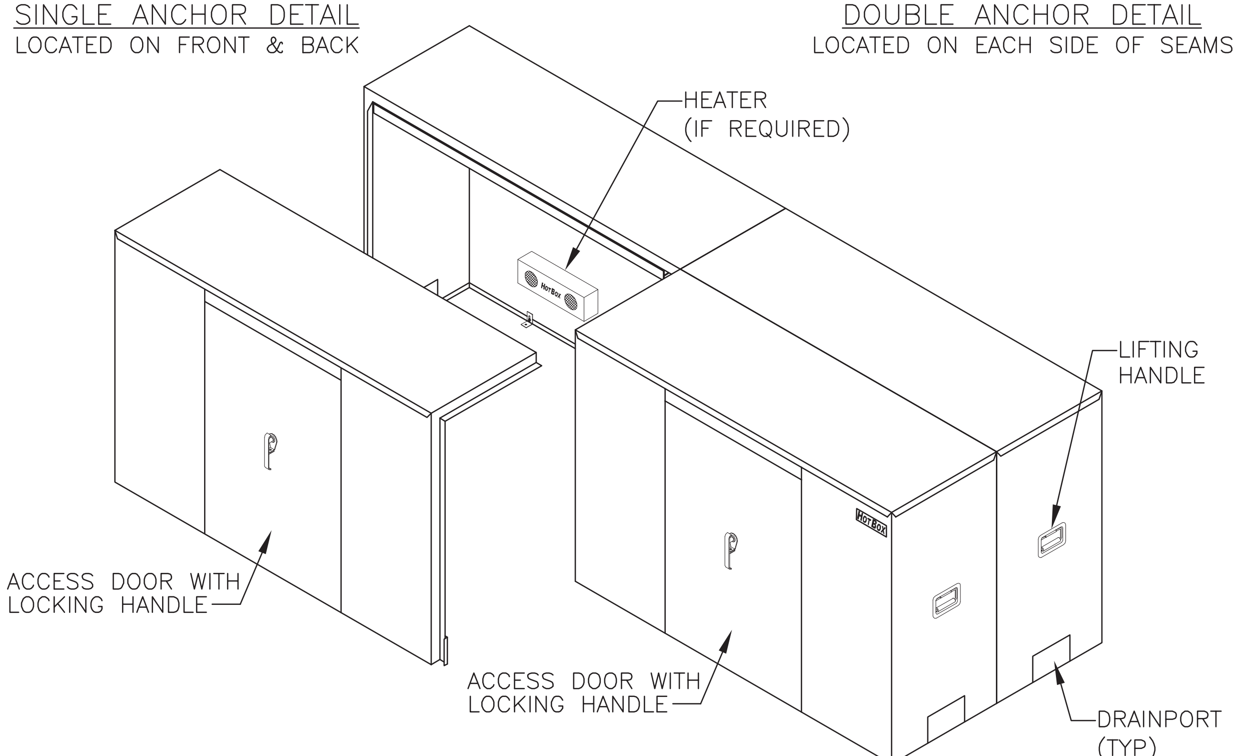
ALUMINUM TWO SECTION



SINGLE ANCHOR DETAIL
LOCATED ON FRONT & BACK



DOUBLE ANCHOR DETAIL
LOCATED ON EACH SIDE OF SEAMS



ALUMINUM FOUR SECTION

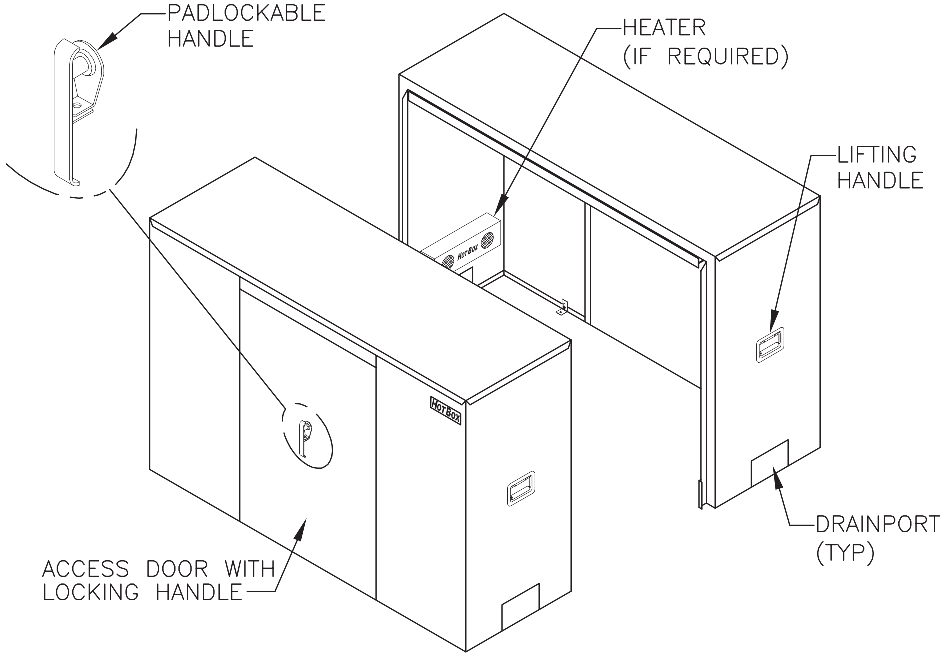
Dual Aluminum

Wider design for dual or tandem installations. Doors on both sides of the enclosure improve access. Key benefits include (see page 49 for finish and color options):

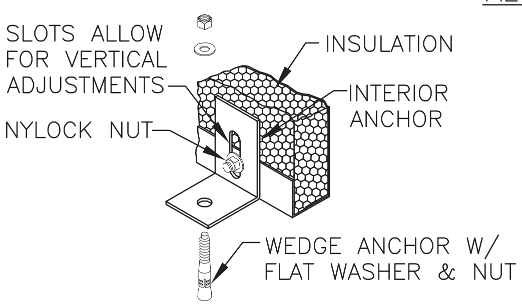
- **Quick & Easy Installation -** Modular design with a maximum of 4 tongue and groove sections.
- **Easy Access -** Lightweight removable doors can easily be removed by one person.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Superior Freeze Protection -** Insulation will not sag or delaminate from the walls due to the strong chemical bond between the aluminum and insulation. Wall-mounted heaters are installed above the discharge point to provide better long-term performance and safety.

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

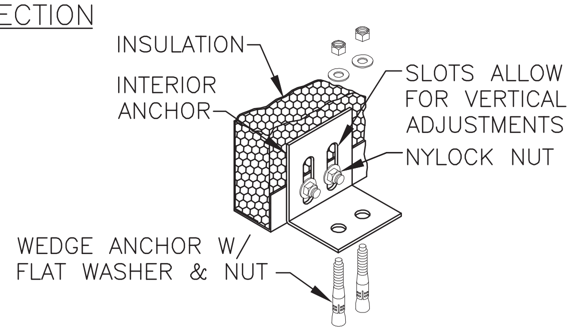
Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater(s)	Sections	Weight #
HA055074057	HB3E-D	55	74	57	(2) 1000W	2	223
HA055085057	HB3E-DS	55	85	57	(2) 1000W	2	239
HA067090050	HB4N-D	67	90	50	(2) 1500W	2	251
HA067090057	HB4E-D	67	90	57	(2) 1500W	2	270
HA067102050	HB4N-DS	67	102	50	(2) 1500W	2	275
HA067102057	HB4E-DS	67	102	57	(2) 1500W	2	291
HA071105053	HB6N-D	71	105	53	(2) 1500W	4	338
HA071105064	HB6E-D	71	105	64	(2) 1500W	4	375
HA071125053	HB6N-DS	71	125	53	(2) 1500W	4	373
HA071125064	HB6E-DS	71	125	64	(2) 1500W	4	415
HA083123058	HB8N-D	83	123	58	(2) 1900W	4	452
HA083123074	HB8E-D	83	123	74	(2) 1900W	4	519
HA083145058	HB8N-DS	83	145	58	(2) 1900W	4	491
HA083145074	HB8E-DS	83	145	74	(2) 1000W (2) 1500W	4	564
HA087144065	HB10N-D	87	144	65	(2) 1500W (2) 1900W	4	571
HA087144085	HB10E-D	87	144	85	(4) 1500W	4	674
HA087172065	HB10N-DS	87	172	65	(2) 1500W (2) 1900W	4	651
HA087172085	HB10E-DS	87	172	85	(4) 1500W	4	766
HA038060043	HB3FN-D	38	60	43	(1) 1500W	2	145
HA038060048	HB3FN-DT	38	60	48	(1) 1500W	2	155
HA038080043	HB3FE-D	38	80	43	(1) 1500W	2	194
HA038080048	HB3FE-DT	38	80	48	(1) 1500W	2	200
HA040066045	HB4FN-D	40	66	45	(1) 1500W	2	159
HA040066051	HB4FN-DT	40	66	51	(1) 1500W	2	171
HA040085045	HB4FE-D	40	85	45	(1) 1900W	2	207
HA040085051	HB4FE-DT	40	85	51	(1) 1900W	2	222
HA045082051	HB6FN-D	45	82	51	(2) 1000W	2	229
HA045082062	HB6FN-DT	45	82	62	(2) 1000W	2	256
HA045106051	HB6FE-D	45	106	51	(2) 1000W	2	260
HA045106062	HB6FE-DT	45	106	62	(1) 1000W (1) 1500W	2	296
HA051096054	HB8FN-D	51	96	54	(1) 1000W (1) 1500W	2	269
HA051096067	HB8FN-DT	51	96	67	(2) 1500W	2	307
HA051124054	HB8FE-D	51	124	54	(2) 1500W	4	325
HA051124067	HB8FE-DT	51	124	67	(1) 1500W (1) 1900W	4	366
HA054112059	HB10FN-D	54	112	59	(2) 1500W	2	317
HA054112075	HB10FN-DT	54	112	75	(1) 1500W (1) 1900W	2	365
HA054153059	HB10FE-D	54	153	59	(2) 1900W	4	394
HA054153075	HB10FE-DT	54	153	75	(2) 1900W	4	453



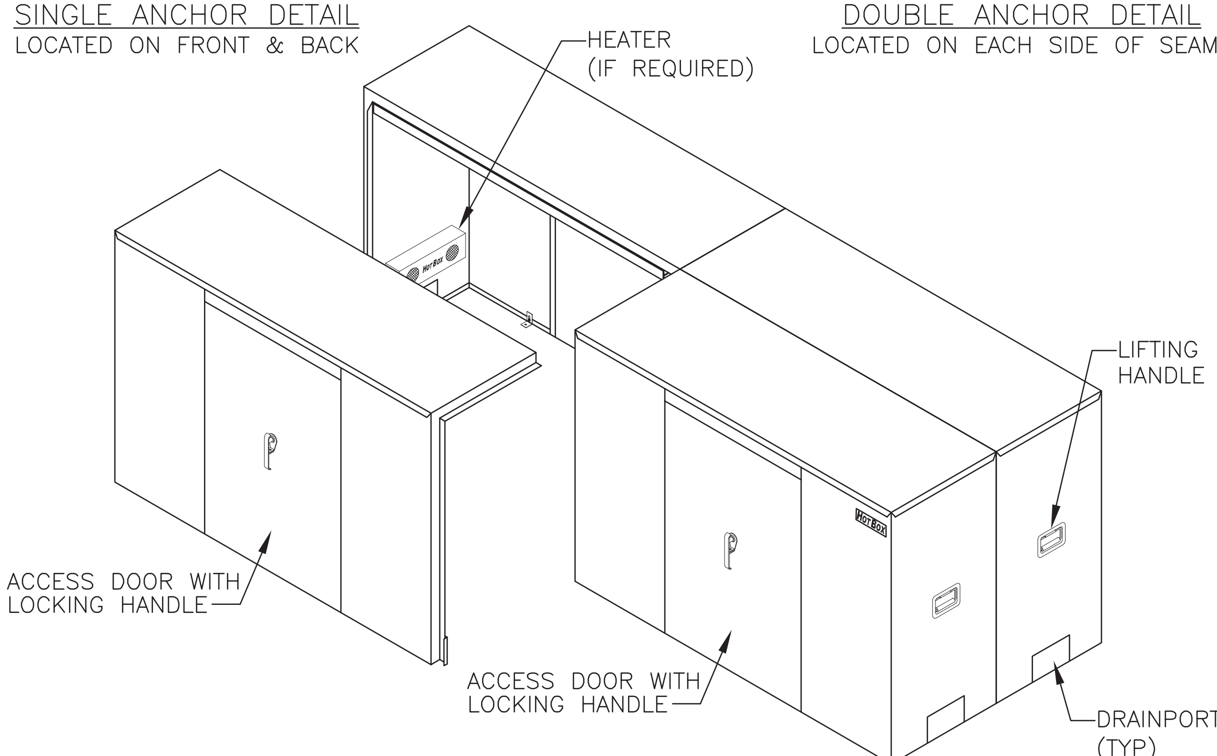
ALUMINUM TWO SECTION



SINGLE ANCHOR DETAIL
LOCATED ON FRONT & BACK



DOUBLE ANCHOR DETAIL
LOCATED ON EACH SIDE OF SEAMS



ALUMINUM FOUR SECTION

Hot Box® Custom Enclosures

Do you have a unique project or application? Hot Box® Enclosures have you covered!

Innovative custom Hot Box® Enclosures can be built to fit your specific project. If your project requires pumps, meter bypasses, FDC hookup, custom sizing, options, or custom colors, a full staff of design engineers are available to assist.

For a quote on a custom enclosure, please fill out the checklist on the opposite page and forward it to your area sales representative. The **minimum** information needed to quote a custom enclosure is: 1) Size of the enclosure 2) Heat required 3) Ventilation required.

- **Standard options include:** vents, exhaust fans, alarm and lighting packages, and special colors (see pages 45-49 for details).
- **Specialized options include:** penetrations, FDC boots, stainless steel anchors, hinged doors, acrylic windows, extra insulation, sound insulation, special voltage heaters, explosion proof heaters/equipment, and different material types like 3003 Mill Finish (.05") or 5052 Marine Grade aluminum (.050" or .125"). Contact your representative for details or any other special requirements.

Please Note:
Orders for custom enclosures cannot be cancelled once production has begun. In addition, custom enclosures are non-returnable.

Custom Enclosure-Boeing

Custom Enclosure-NASA

Custom Enclosure-Gainesville Speedway

Custom Enclosure Backflow Prevention Equipment Checklist

Please fill out completely and send to your local manufacturer representative or customer service representative:

Installation Type:

- ☐ Single Line
- ☐ Dual (Manifold)
- ☐ Tandem (2 Separate)
- ☐ Pump (see below)*

Other: ______

Installation Height:

- ☐ 12" Bottom Clearance
- ☐ 18" Bottom Clearance
- ☐ 30" Center line

Other: ______

Pipe Size:

- ☐ 1/4" ☐ 1/2" ☐ 3/8"
- ☐ 5/8" ☐ 3/4" ☐ 1"
- ☐ 1-1/4" ☐ 1-1/2" ☐ 2"
- ☐ 2-1/2" ☐ 3" ☐ 4"
- ☐ 6" ☐ 8" ☐ 10"
- ☐ 12" ☐ 14" ☐ 16"
- ☐ 18" ☐ 20" ☐ 24"
- ☐ Varies (please explain)

Other: ______

Valve Type:

- ☐ QT
- ☐ OS&Y
- ☐ NRS
- ☐ Butterfly Valves

Other: ______

Backflow Manufacturer:

- ☐ Ames
- ☐ Apollo/Conbraco
- ☐ Febco
- ☐ Watts
- ☐ Wilkins

Model #: ______

Other: ______

Please continue for meters or additional backflow device:

Valve Type:

- ☐ QT
- ☐ OS&Y
- ☐ NRS
- ☐ Butterfly Valves

Other: ______

Backflow Manufacturer:

- ☐ Ames
- ☐ Apollo/Conbraco
- ☐ Febco
- ☐ Watts
- ☐ Wilkins

Model #: ______

Other: ______

Meter Manufacturer:

- ☐ Badger ☐ Metron Farnier
- ☐ Elster ☐ Neptune
- ☐ Hersey ☐ Sensus/Omni
- ☐ Master Meter

Model #: ______

Other: ______

Meter Type:

- ☐ Compound
- ☐ Fire Line
- ☐ Turbine

Strainer Type:

- ☐ Wye
- ☐ Plate
- ☐ Basket
- ☐ None

Additional Equipment:

- ☐ Altitude Valve ☐ Check Valve
- ☐ FDC (Siamese) ☐ Meter Bypass
- ☐ PRV ☐ Solenoid
- ☐ Test Tee ☐ Wafer Check Valve

Other: ______

Model #: ______

Additional Requirements

(Please be specific): ______

Pump Enclosures:

*Note: If quoting to enclose a pump or pumps, please include pump dimensions or attach specifications to this form. Also, please include clearances.

______

Job Name: ______ Job Location: ______

Engineer/Contractor: ______ Phone: ______ Fax: ______ e-mail: ______

Distributor: ______ Phone: ______ Fax: ______ e-mail: ______

Representative: ______ Phone: ______ Fax: ______ e-mail: ______

Hot Box® Fiberglass Enclosures

Hot Box® Fiberglass Enclosures are hand crafted to a yacht quality finish to ensure they remain both aesthetically pleasing and meet the needs of your project. The enclosures are built from only the highest quality fiberglass and gelcoat material. The design incorporates bonded foam insulation, and is built to enclose most backflows available on the market (up to a 4″ device). Offering the most comprehensive line of heated and unheated sizes in the market, all standard fiberglass enclosures meet the latest ASSE 1060 performance standards—ensuring that you are purchasing from a dependable source. Benefits include:

- **Enduring Quality -** Yacht quality finish with a UV stabilized marine grade gelcoat provides years of protection for your equipment.
- **Reliable Insulation -** All Hot Box models come with spray foam insulation. Spray foam promotes 100% bonding with the interior wall of the enclosure, preventing deformation in freeze/thaw conditions. Unlike board foam insulation, spray foam insulation will not delaminate and remains firmly affixed to the enclosure's walls.
- **Better Choices -** Many different styles and sizes of fiberglass models are available to quickly meet your needs.
- **Optional Accessories-** Add a vent, fan, or alarm to your fiberglass enclosure to make it suitable for a pump or other equipment that needs to be kept cool.

Installation photos of model HB1 with Glass Pad™ mounting base

Hot Box® offers the broadest range of fiberglass enclosures in the industry with many different styles and standard sizes. All are built with the same attention to quality and performance that you know and expect from Hot Box. Our comprehensive product offering is designed to ensure that your application requirements are met, and your expectations are exceeded.

Designer Series™ Enclosures

Save time and money with quick installation and easy access via hinged access panels, and an opening lid which makes future testing and maintenance easy. Designer Series Enclosures also come with all the other inherent benefits of our fiberglass enclosures, like corrosion and UV resistance, bonded foam insulation, and wall-mounted heaters.

Flip-Top Fiberglass Enclosures

A convenient flip-top lid provides fast and easy backflow access. Weatherproof and vandal resistance is built in with its overlapping lid design.

EZ Box® Enclosures

This economical one piece drop-over design allows quick and easy installation. Ideal for landscape and irrigation applications where future access needs are limited.

Vent Guard® & Valve Cover™ Enclosures

Vent Guard is a protective enclosure designed specifically for the air release valves found in many public water supply systems. Valve Cover hinged enclosures are a good choice for landscape and irrigation applications where ease of access for future maintenance is desired.

Designer Series™ Enclosures

Designer Series™ Enclosures are innovative fiberglass enclosures that are perfect when ease of installation and full equipment access are top priorities. Unique design features facilitate quick installation and easy access for future testing and maintenance. Key benefits include:

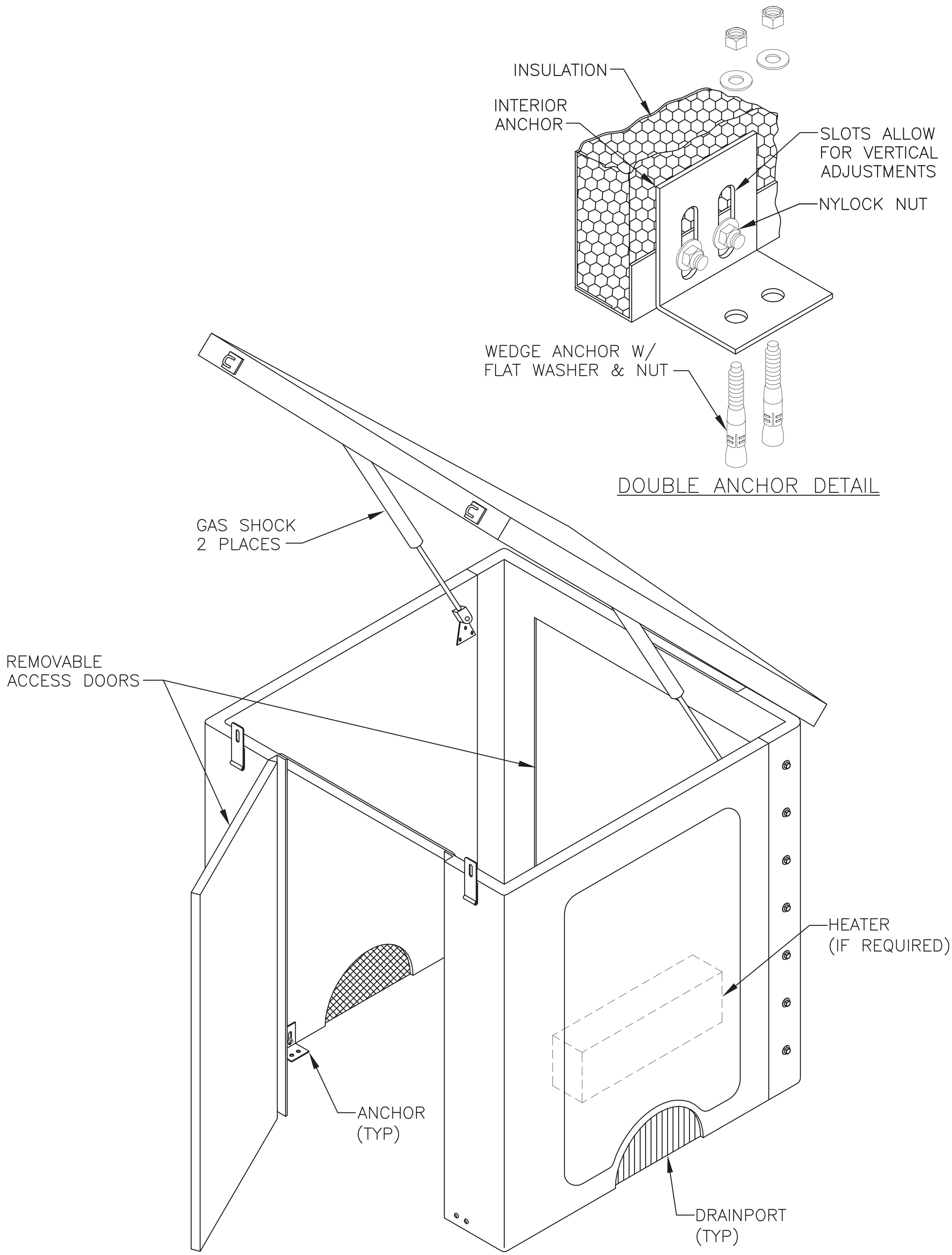
- **Quick Installation & Easy Access -** Designer Series™ Enclosures require minimal installation time. They incorporate easily removable hinged front and rear doors, as well as top lid with gas shock supports. This design provides instant, unobstructed access for equipment testing and maintenance.
- **Corrosion & UV Resistant** - Yacht quality fiberglass with a smooth, UV resistant gelcoat provides a corrosion proof finish that both looks good and stands up to the elements.
- **High Security -** Lockable top lid and internal locks are on both the front and rear doors. Interior steel anchors secure the enclosure to the concrete slab.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Superior Freeze Protection** - Insulation will not sag or delaminate from the walls due to the strong chemical bond between the fiberglass and the insulation. Wall-mounted heaters are installed above the discharge point to provide better long-term performance and safety.

Note: Standard fiberglass color is beige (optional colors are available-see page 49 for details).

Pad size=inside Dimensions + 12".

Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater (if required)	Weight #
LM041041045	LB4FEM	41	41	44	Unheated	241
LM047047049	LB6FEM	47	47	48	Unheated	287
LM053053056	LB8FEM	52	52	55	Unheated	352
LM054062056	LB10FEM	52	63	55	Unheated	389
HM041041045	HB4FEM	41	41	44	1000W	253
HM047047049	HB6FEM	47	47	48	1500W	299
HM053053056	HB8FEM	52	52	55	1500W	364
HM054062056	HB10FEM	52	63	55	1900W	401

Pad size=inside Dimensions + 12".


INSULATION
INTERIOR ANCHOR
SLOTS ALLOW FOR VERTICAL ADJUSTMENTS
NYLOCK NUT
WEDGE ANCHOR W/ FLAT WASHER & NUT
DOUBLE ANCHOR DETAIL
GAS SHOCK 2 PLACES
REMOVABLE ACCESS DOORS
HEATER (IF REQUIRED)
ANCHOR (TYP)
DRAINPORT (TYP)

Flip-Top Fiberglass Enclosures

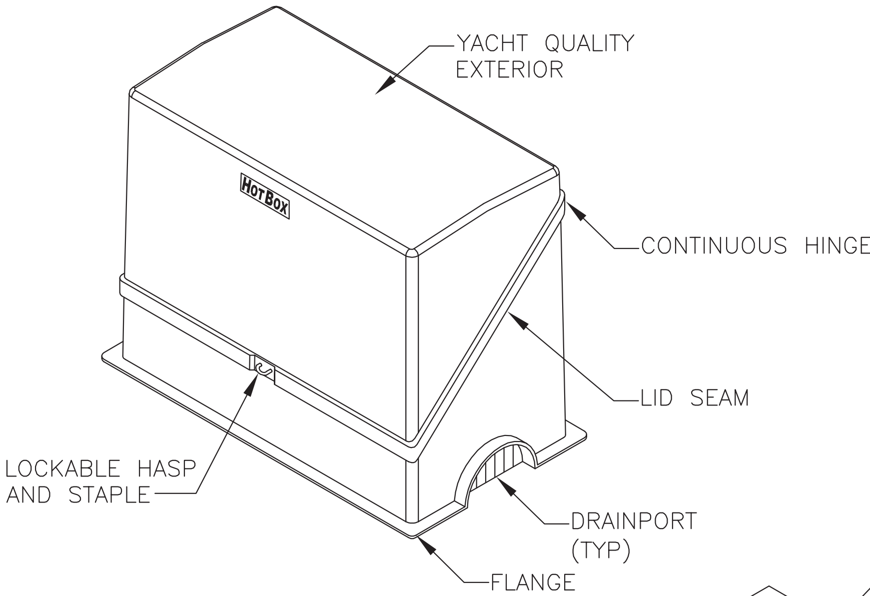
- **Easy Maintenance Access -** Flip top lid design provides quick access.
- **Weatherproof & Vandal Resistance -** Overlapping lid seam design helps keep vandals and mother nature out. Also includes a lockable top and steel anchors (padlocks are not included).
- **Durable & Corrosion Resistant -** Reinforced fiberglass with a smooth, UV resistant gelcoat provides a corrosion proof finish that both looks good and stands up to the elements.
- **Superior Freeze Protection -** Wall-mounted heater or self-regulating heat trace tape provides freeze protection.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

Note: Standard fiberglass color is beige (optional colors are available-see page 49 for details). Also available as uninsulated enclosures (see page 35).

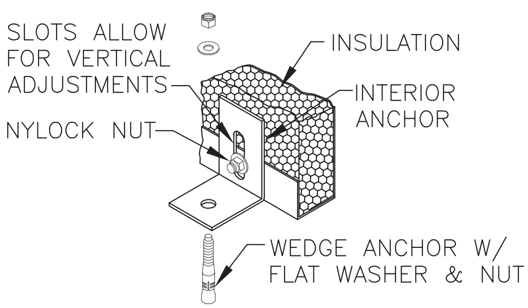
For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater(s)	Glass Pad	Weight #
HF011019022	HB.75	10	18	23	30W	GG019027005	28
HF013027023	HB1	13	26	23	60W	GG021035005	32
HF013027035	HB1T	13	26	36	60W	GG021035005	57
HF013039028	HB2	13	38	29	90W	GG021047005	54
HF013039036	HB2T	12	38	36	90W	GG021047005	65
HF013047028	HB2S	10	44	28	90W	N/A	64
HF013047036	HB2ST	13	47	36	90W	N/A	98
HF021033025	HB1.5	21	33	25	60W	GG029042005	55
HF025039028	HB2-D	25	39	28	(2) 90W	N/A	124
HF025039036	HB2-DT	25	39	36	(2) 90W	N/A	148
HF025047028	HB2-DS	25	47	28	(2) 90W	N/A	139
HF025047036	HB2-DST	25	47	36	(2) 90W	N/A	168
HF026070045	HB3N	27	70	46	1000W	N/A	241
HF026070055	HB3E	26	70	55	1500W	N/A	322
HF026083045	HB3NS	26	83	45	1500W	N/A	308
HF026083055	HB3ES	26	83	55	1500W	N/A	374
HL035045035	HB3000	35	44	35	1000W	N/A	170
HL044053044	HB4000	44	53	45	1000W	N/A	251
HL052061052	HB5000	52	61	51	1500W	N/A	320

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

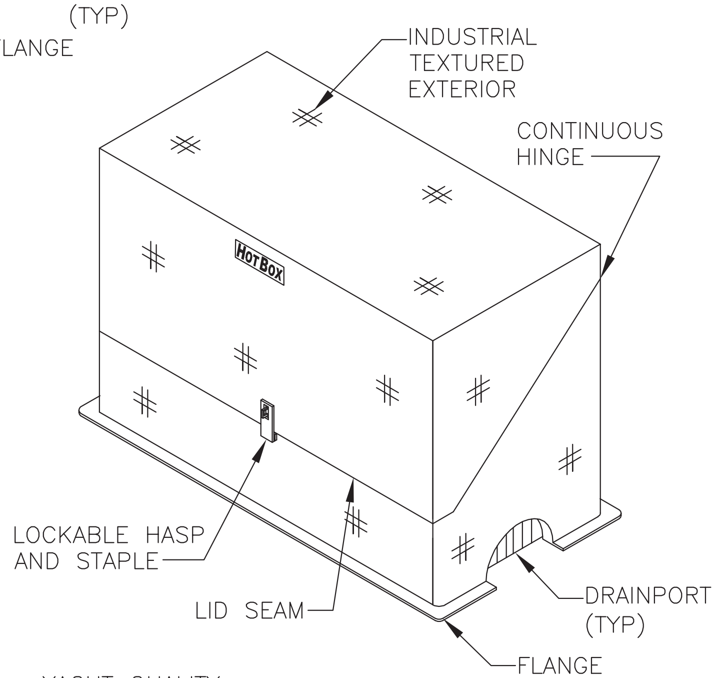


FLIP TOP

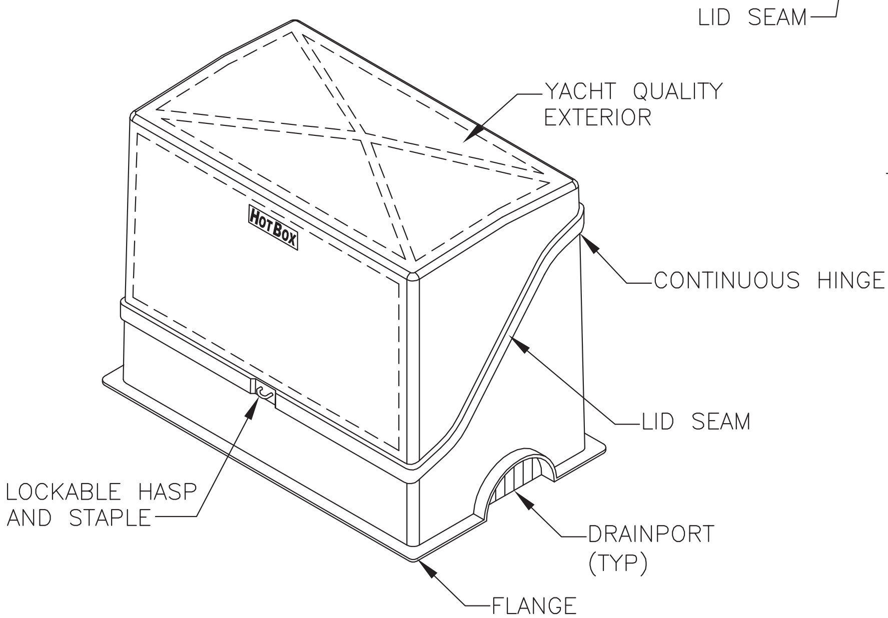


SINGLE ANCHOR DETAIL

LARGE FLIP TOPS WILL GET DOUBLE ANCHOR (NOT SHOWN)



FLIP TOP



LOW PROFILE

EZ Box® Enclosures

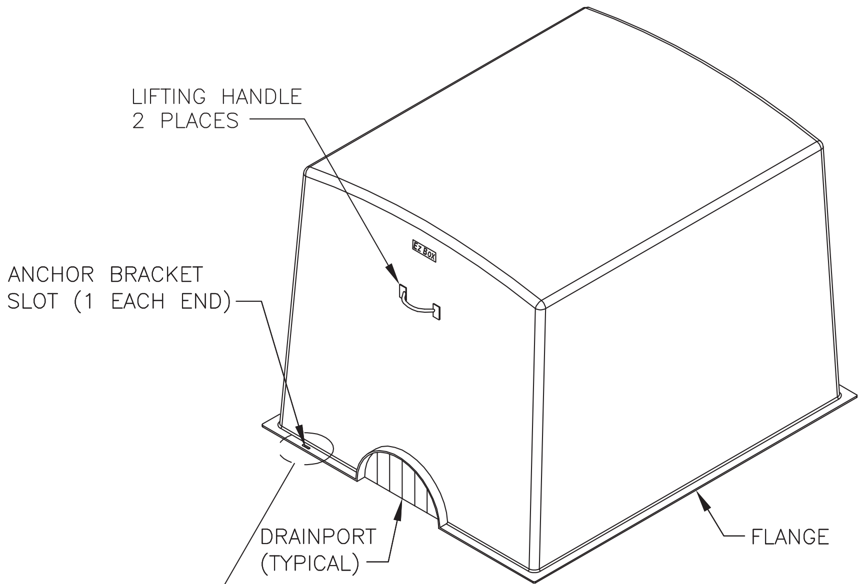
- **Quick & Easy Installation -** Drop-over design is quick and easy to install.
- **Affordable -** Cost effective design is ideal for applications requiring limited access.
- **Durable & Corrosion Resistant -** Reinforced fiberglass with a smooth, UV resistant gelcoat provides a corrosion proof finish that both looks good and stands up to the elements.
- **Superior Freeze Protection -** Wall-mounted heater or self-regulating heat trace tape provides freeze protection.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

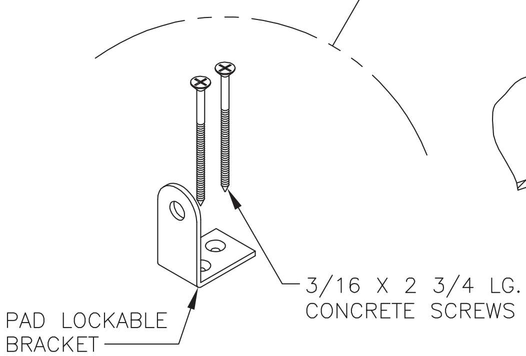
Note: Standard fiberglass color is beige (optional colors are available-see page 49 for details). Also available as uninsulated enclosures (see page 35).

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

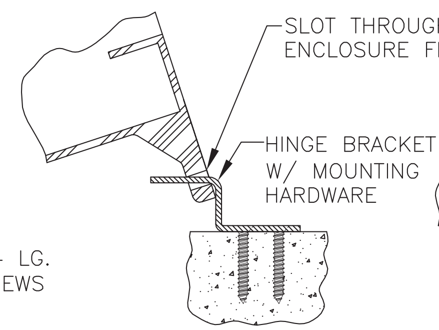
Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater(s)	Glass Pad	Weight #
HE006020022	HEZ.75	7	22	22	30W	N/A	18
HE012017021	HEZLVX.75	13	18	21	30W	N/A	29
HE012017021500	HEZLV.75	13	18	21	30W	N/A	26
HE014027026	HEZ1	14	28	26	60W	GG026040005	67
HE014021027	HEZLVX1	15	22	27	30W	N/A	107
HE014021027500	HEZLV1	15	22	27	30W	N/A	43
HE012038028	HEZ2	16	41	29	90W	GG022056005	33
HE013047028	HEZ2S	13	47	28	90W	N/A	44
**HE026070045	HEZ3	27	70	46	(2) 90W	N/A	183
**HE026083045	HEZ3S	26	83	45	1500W	N/A	310
**HE035045035	HEZ3000	35	44	35	1000W	N/A	122
**HE044053044	HEZ4000	44	53	44	1000W	N/A	173
**HE052061050	HEZ5000	52	61	51	1500W	N/A	238
HN026070045	NCHEZ3	26	70	45	(2) 90W	N/A	183
HN035045035	NCHEZ3000	35	44	35	1000W	N/A	122
HN044053044	NCHEZ4000	44	53	44	1000W	N/A	173
HN052061050	NCHEZ5000	52	61	51	1500W	N/A	238

For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".
****Catalog Part# LE026070045 through LE052061050 without doors are not ASSE Certified.**

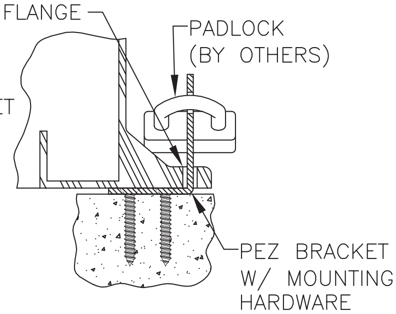




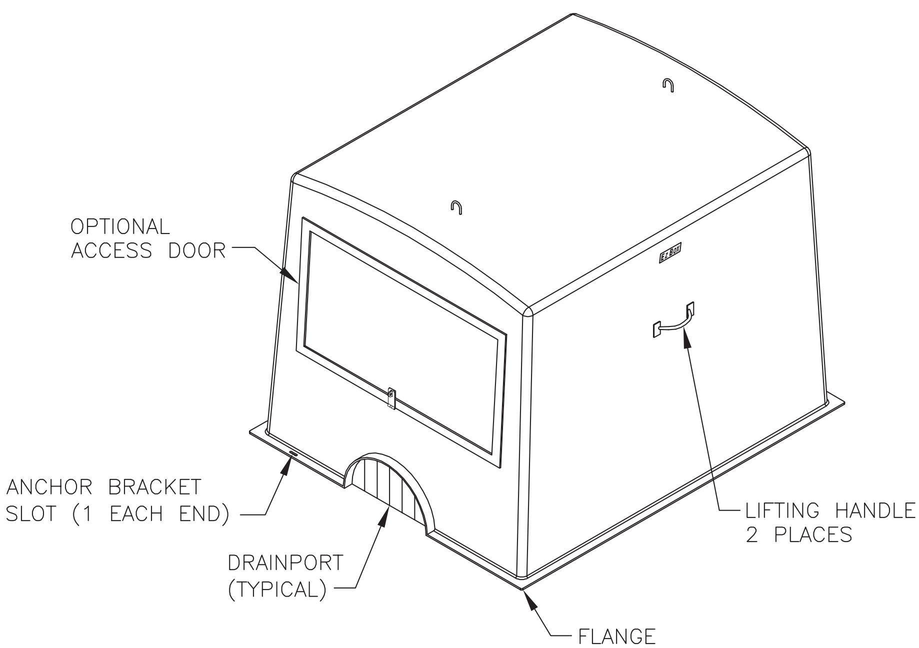
LOCKING DETAIL
2 PLACES



OPEN POSITION



LOCKED POSITION



Vent Guard® Enclosures

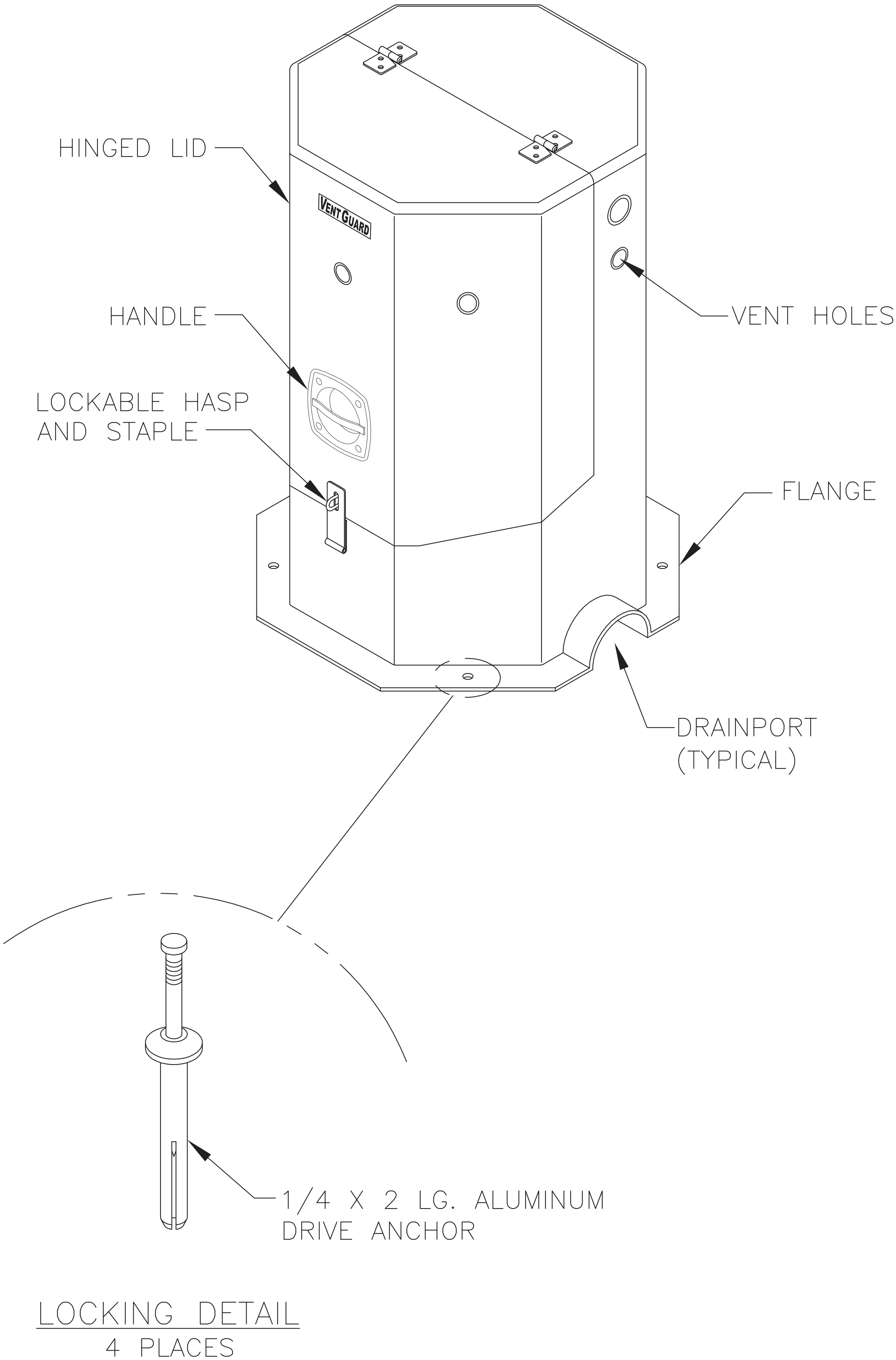
- **Durable & Fast Installation -** Lightweight enclosure and reinforced exterior mounting flange make installation a breeze (optional interior mounting plates available).
- **Easy Maintenance -** Quick access without removal of entire unit via hinged and removable lid.
- **Maximum Air Flow -** 4″ round or 12″ square vents are designed to provide proper air flow for air release valves.
- **Durable & Corrosion Resistant -** Reinforced fiberglass with a smooth, UV resistant gelcoat provides a corrosion proof finish that both looks good and stands up to the elements.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, material construction, equipment access, and functional design are met.

Note: Standard fiberglass color is beige (optional colors are available-see page 49 for details).

Pad size=inside Dimensions + 12″.

Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Glass Pad	Weight #
LV018018024	AVG1824	18	18	24	GG028028005	43
LV020020036	AVG2036	20	20	36	N/A	71
LV020020041	AVG2041	20	20	41	N/A	77
LV022022040	AVG2240	22	22	40	N/A	90
LV024024048	AVG2448	24	24	48	N/A	108
LV036036048	AVG3648	36	36	48	N/A	180
LV048048048	AVG4848	48	48	48	N/A	210

Pad size=inside Dimensions + 12″.


HINGED LID
VENT GUARD
HANDLE
LOCKABLE HASP AND STAPLE
VENT HOLES
FLANGE
DRAINPORT (TYPICAL)
1/4 X 2 LG. ALUMINUM DRIVE ANCHOR
LOCKING DETAIL
4 PLACES

Valve Cover™ Enclosures

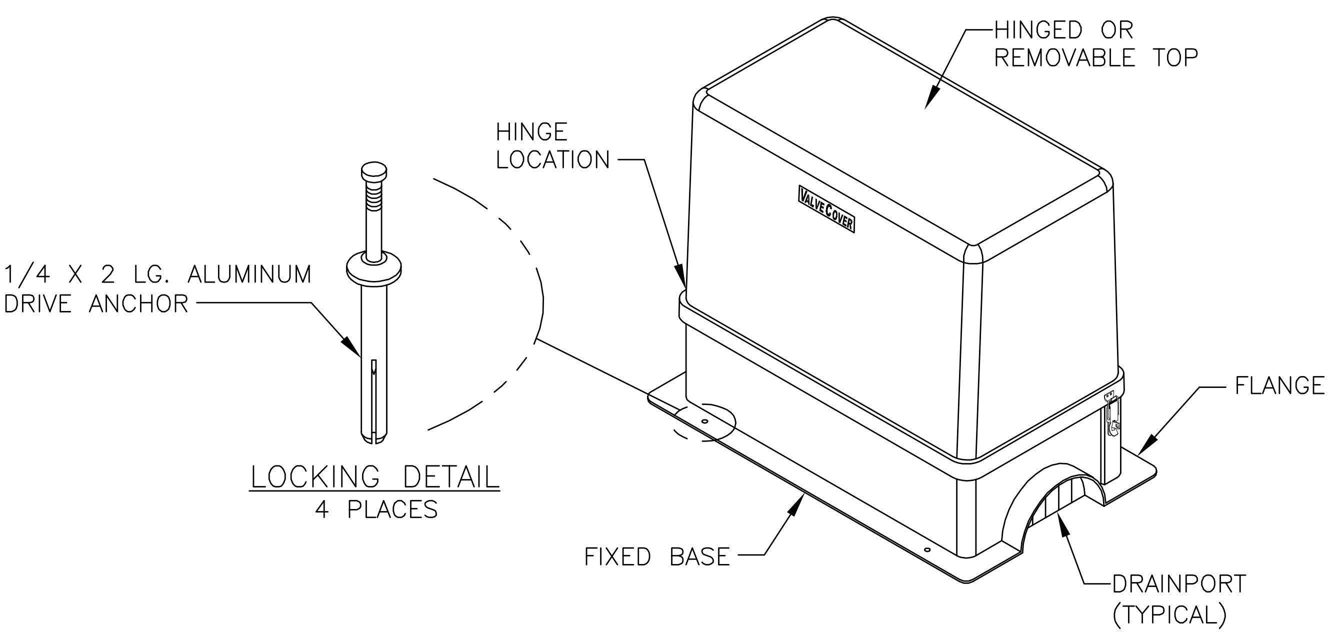
- **Durable & Fast Installation -** Lightweight enclosure and reinforced exterior mounting flange make installation a breeze.
- **Easy Maintenance -** Quick access without removal of entire unit via hinged lid.
- **Durable & Corrosion Resistant -** Reinforced fiberglass with a smooth, UV resistant gelcoat provides a corrosion proof finish that both looks good and stands up to the elements.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

Note: Standard fiberglass color is beige (optional colors are available-see page 49 for details). Also available as uninsulated enclosures (see page 35).

Pad size=inside Dimensions + 12".

Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater	Weight #
LC009018018	VC1	9	18	19	Unheated	32
LC009018024	VC1T	9	18	26	Unheated	41
LC012026020	VC2	12	27	21	Unheated	47
LC012026028	VC2T	12	27	27	Unheated	55
HC009018018	VCH1	9	18	19	30W	33
HC009018024	VCH1T	9	18	26	30W	42
HC012026020	VCH2	12	27	21	60W	48
HC012026028	VCH2T	12	27	27	60W	56

Pad size=inside Dimensions + 12".



Valve Guard® Uninsulated Enclosures

Valve Guard® Enclosures are constructed with the same quality and attention to detail as our standard enclosures, only they are uninsulated and provide no resistance to freezing temperatures. They are intended for improved aesthetics and security purposes only, **not for freeze protection (ASSE Class III). Order insulated and heated enclosures for colder climates (see page 5 for details):**

Class III - Non-Freeze Protection Enclosures (Uninsulated Non-Heated): Designed and constructed to provide system security for components when freezing temperatures are not a consideration.

EZ (Note 1)	Old EZ No.	Enclosure Size (Inside - in)	Mounting Pad	Glass Pad	Shipping Weight
VE012017021500	VGEZLV.75	14W x 19L x 22.5H	29 x 24	N/A	25#
VE014021024500	VGEZLV1	16W x 19L x 25H	33 x 26	N/A	28#
VE006020022	VGEZ.75	8.5W x 22L x 23H	32 x 16	N/A	16#
VE014027026	VGEZ1	16W x 29L x 27H	38 x 25	GG026040005	31#
VE012038028	VGEZ2	14W x 40.5L x 29H	48 x 22	GG022056005	44#
VE013047027	VGEZ2S	15W x 49L x 28H	59 x 22	N/A	49#
VE026070045	VGEZ3	29W x 73L x 46H	82 x 38	N/A	215#
VE035045035	VGEZ3000	38W x 48L x 36H	57 x 47	N/A	175#
VE044053044	VGEZ4000	47W x 56L x 45H	65 x 56	N/A	240#
VE052061050	VGEZ5000	55W x 64L x 51H	74 x 64	N/A	400#
POLY EZ (Note 2)	**Old Poly EZ No**	**Enclosure Size (Inside)**	**Mounting Pad**	**Glass Pad**	**Shipping Weight**
VP009024023G or T	VGPEZ1	11W x 26L x 24H	34 x 17	GG021035005	22#
VP011036026G or T	VGPEZ1	13W x 38L x 27H	45 x 19	GG021047005	35#
Valve Guard (Note 1)	**Old Valve Guard**	**Enclosure Size (Inside)**	**Mounting Pad**	**Glass Pad**	**Shipping Weight**
VF011019022	VG.75	13W x 21L x 23H	28 x 20	GG019027005	21#
VF013027023	VG1	15W x 29L x 24H	36 x 22	GG021035005	31#
VF013027023	VG1T	15W x 29L x 36H	36 x 22	GG021035005	41#
VF021033025	VG1.5	23W x 35L x 26H	44 x 32	GG029042005	46#
VF013039028	VG2	15W x 41L x 29	50 x 24	GG021047005	45#
VF013039036	VG2T	15W x 41L 37H	50 x 24	GG021047005	56#
VF013047028	VG2S	15W x 49L x 29H	58 x 24	N/A	51#
VF013047028	VG3N	29W x 73L x 46H	82 x 38	N/A	270#
VL035045035	VG3000	38W x 48L x 36H	57 x 47	N/A	220#
VL044053044	VG4000	47W x 56L x 45H	65 x 56	N/A	270#
VL052061052	VG5000	55W x 64L x 53H	74 x 64	N/A	410#
Glass Roks (Note 1)	**Old Glass Roks**	**Enclosure Size (Inside)**	**Mounting Pad**	**Glass Pad**	**Shipping Weight**
VR006015019	VGGLR.75	09W x 18L x 20H	27 x 21	N/A	20#
VR010026022	VGGLR1	13W x 29L x 22H	40 x 30	N/A	41#
VR015040030	VGGLR2	18W x 43L x 31H	51 x 26	N/A	75#
VR021067043	VGGLR3	24W x 70L x 44H	90 x 40	N/A	310#
Poly Roks (Note 2)	**Old Poly Roks**	**Enclosure Size (Inside)**	**Mounting Pad**	**Glass Pad**	**Shipping Weight**
VQ010026022	VGPLR1	13W x 29L x 23H	40 x 27	GG027036005	25#
VQ012043027	VGPLR2	15W x 46L x 28H	56 x 22	GG022056005	50#
Valve Cover (Note 1)	**Old Valve Cover**	**Enclosure Size (Inside)**	**Mounting Pad Size**	**Glass Pad**	**Shipping Weight**
VC009018018	VGVC1	11W x 20L x 19H	27 x 19	GG019027005	25#
VC009018024	VGVC1T	11W x 20L x 25H	27 x 19	GG019027005	28#
VC012026020	VGVC2	14W x 28L x 21H	35 x 21	GG021035005	30#
VC012026028	VGVC2T	12W x 26L x 28	35 x 21	GG021035005	35#

- **Note 1: Fiberglass enclosures are constructed of polyester resin with chopped glass.**
- **Note 2: Polyethylene enclosures consist of 1/8" thick UV stabilized LMDPE (Linear Medium Density Polyethylene).**
- **Mounting and access hardware is rust resistant and all enclosures are lockable.**

Poly EZ Box® (Plastic) Enclosures

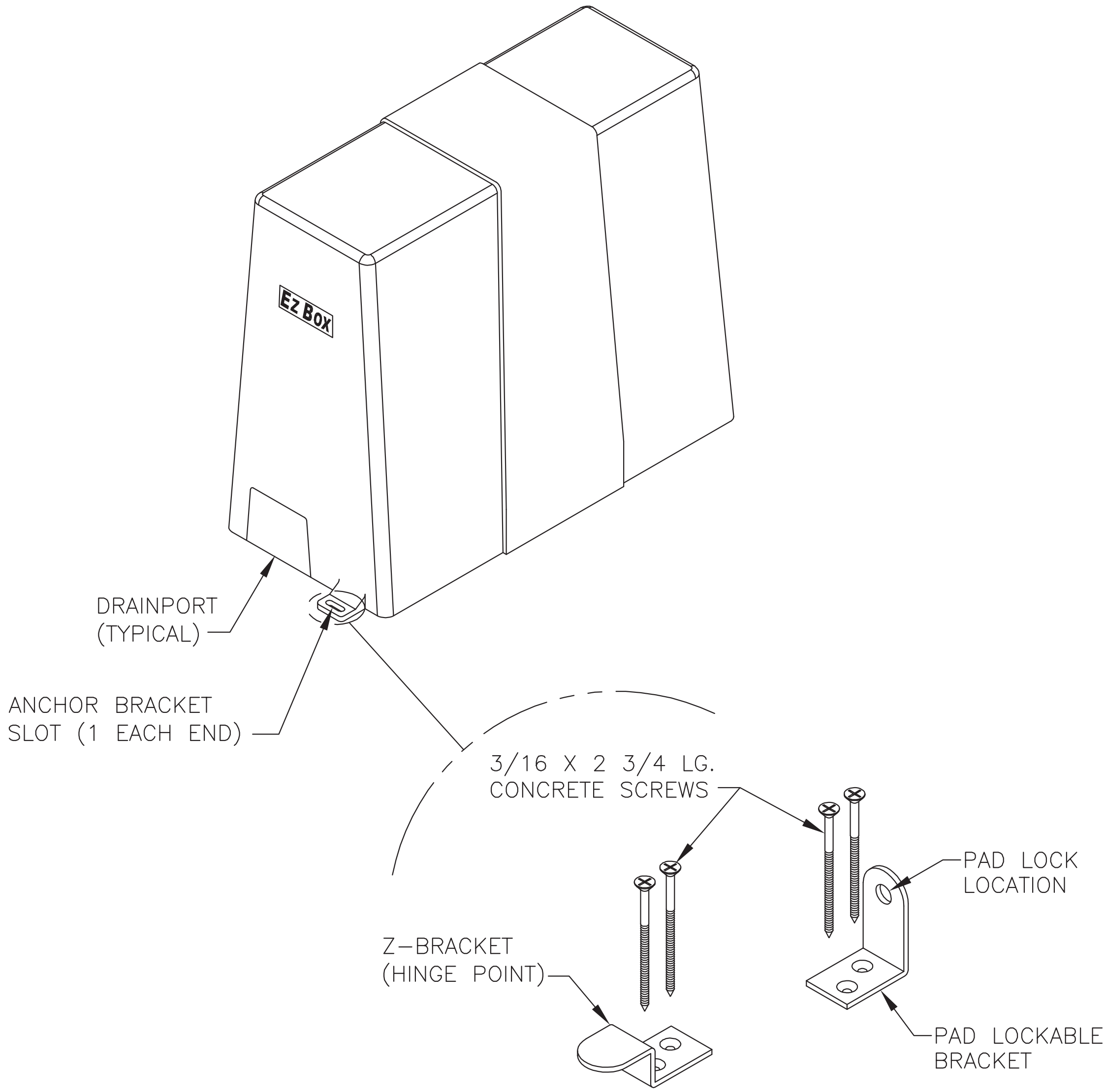
- **Quick & Easy Installation -** Drop-over design is quick and easy to install.
- **Affordable -** Cost effective plastic enclosures ideal for landscape and irrigation applications.
- **Weed Eater Resistant -** Anti-chipping plastic construction.
- **UV & Corrosion Resistant -** UV stabilized plastic provides a corrosion proof enclosure that looks good and stands up to the elements.
- **Freeze Protection -** Self-regulating heat trace tape provides proven freeze protection.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

Note: Two standard colors available: beige or dark green. Also available as uninsulated enclosures (see page 35).

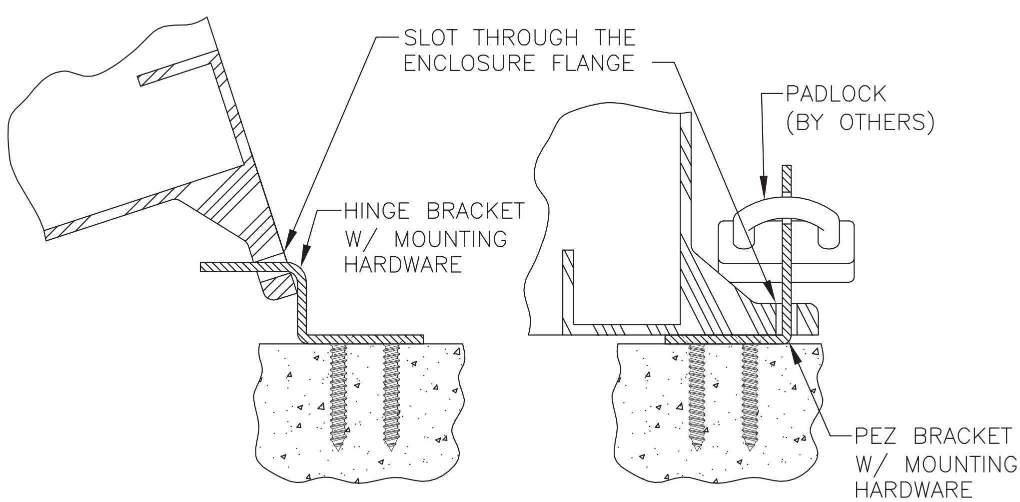
Pad size=inside Dimensions + 12".

Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater	Glass Pad	Weight #
LP009024023G	PEZ1-Green	9	24	23	Unheated	GG021035005	14
LP009024023T	PEZ1-Beige	9	24	23	Unheated	GG021035005	14
LP011036026G	PEZ2-Green	11	36	26	Unheated	GG021047005	20
LP011036026T	PEZ2-Beige	11	36	26	Unheated	GG021047005	20
HP009024023G	HPEZ1-Green	9	24	23	60W	GG021035005	15
HP009024023T	HPEZ1-Beige	9	24	23	60W	GG021035005	15
HP011036026G	HPEZ2-Green	11	36	26	90W	GG021047005	22
HP011036026T	HPEZ2-Beige	11	36	26	90W	GG021047005	22

Pad size=inside Dimensions + 12".



LOCKING DETAIL



OPEN POSITION

LOCKED POSITION

Fiberglass Hot Rok® Enclosures

- **Enhances Landscape -** Natural rocklike texture and colors are visually appealing.
- **Quick & Easy Installation -** Drop-over design with optional hinge for ease of maintenance on larger Roks.
- **Durable & Corrosion Resistant -** Reinforced fiberglass with UV stable gelcoat exterior provides a corrosion proof finish that both looks good and stands up to the elements.
- **Superior Freeze Protection -** Self-regulating heat trace tape provides proven freeze protection.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

Note: Also available as uninsulated enclosures (see page 35).

For unheated units, replace the "H" in the part# with an "L".

Catalog Part Number	Model Number	Style	Color	Inside Width A (in)	Inside Length B (in)	Inside Height C (in)	Heater	Weight #
HR006015019E	GHR.75	Lift Off	Brown	8	16	19	30W	25
HR006015019N	GHR.75	Lift Off	Granite	8	16	19	30W	25
HR006015019S	GHR.75	Lift Off	Desert Rose	8	16	19	30W	25
HR010026022E	GHR1	Lift Off	Brown	10	24	19.5	60W	50
HR010026022N	GHR1	Lift Off	Granite	10	24	19.5	60W	50
HR010026022S	GHR1	Lift Off	Desert Rose	10	24	19.5	60W	50
HR010026022500	GHR1	Lift Off	Brown	10	24	19.5	60W	50
HR010026022501	GHR1	Lift Off	Granite	10	24	19.5	60W	50
HR010026022502	GHR1	Lift Off	Desert Rose	10	24	19.5	60W	50
HR015040030E	GHR2	Lift Off	Brown	15	40	30	90W	80
HR015040030N	GHR2	Lift Off	Granite	15	40	30	90W	80
HR015040030S	GHR2	Lift Off	Desert Rose	15	40	30	90W	80
HR015040030500	GHR2	Lift Off	Brown	15	40	30	90W	80
HR015040030501	GHR2	Lift Off	Granite	15	40	30	90W	80
HR015040030502	GHR2	Lift Off	Desert Rose	15	40	30	90W	80
HR021067043E	GHR3	Hinged	Brown	21	73	43	2-90W	365
HR021067043N	GHR3	Hinged	Granite	21	73	43	2-90W	365
HR021067043S	GHR3	Hinged	Desert Rose	21	73	43	2-90W	365

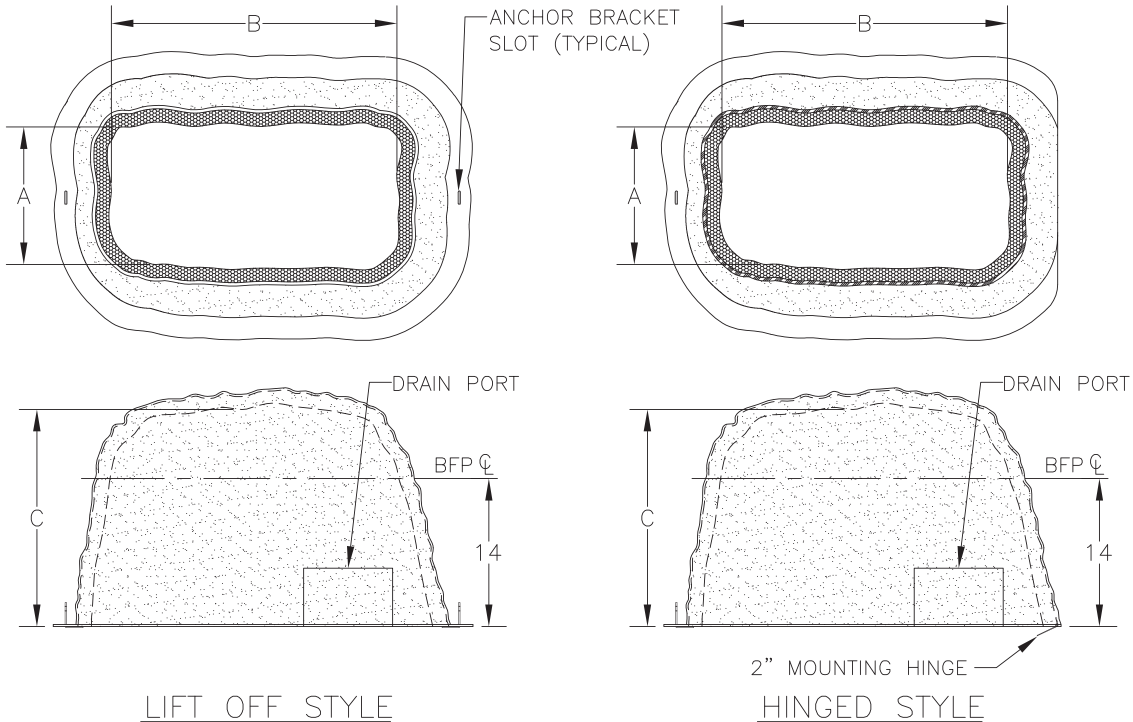
For unheated units, replace the "H" in the part# with an "L".

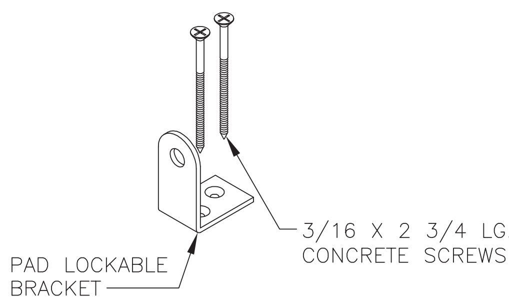
Available Colors:

Brown
Color code = E

Granite
Color code = N

Desert Rose
Color code = S





ANCHOR DETAIL
LIFT OFF STYLE (2 PLACES)
HINGED STYLE (1 PLACE)

Installation:

1. Provide applicable GFI protected power, UL STND. 943-NEMA 3R, inside enclosures requiring heat. Mount at least 8" above any discharge point and near the pipe riser on the enclosure access side or install per local code.
2. Pour a full concrete pad 4" thick around valve, allowing a minimum 1" radial space between riser and pad or install on a "Glass Pad™".
3. Place Hot Rok® Enclosure over the valve onto the pad or footer.
4. Use a masonry bit to drill through anchor hinge. Insert concrete screws and bolt firmly to concrete.
5. Mark and mount locking hasp.
6. Mark and mount support rod anchor.
7. For heated enclosures using a self regulating heat trace tape, secure tape to valve with pipe ties or fiberglass/electrician's tape. No pipe insulation is necessary. The Hot Rok® Enclosure provides the necessary insulation.
8. Plug the heat source into the specified circuit/receptacle, after verifying proper voltage.
9. Lower and secure hasp to staple via pad lock (padlock not included).

PolyRok® (Plastic) Enclosures

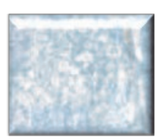
- **Enhances Landscape -** Natural rocklike texture and colors are visually appealing.
- **Quick & Easy Installation -** Drop-over design is quick and easy to install.
- **Affordable -** Cost effective plastic enclosures ideal for landscape and irrigation applications.
- **Weed Eater Resistant -** Anti-chipping plastic construction.
- **UV & Corrosion Resistant -** UV stabilized plastic provides a corrosion proof enclosure that looks good and stands up to the elements.
- **Freeze Protection -** Self-regulating heat trace tape provides proven freeze protection.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.

Note: Also available as uninsulated enclosures (see page 35).

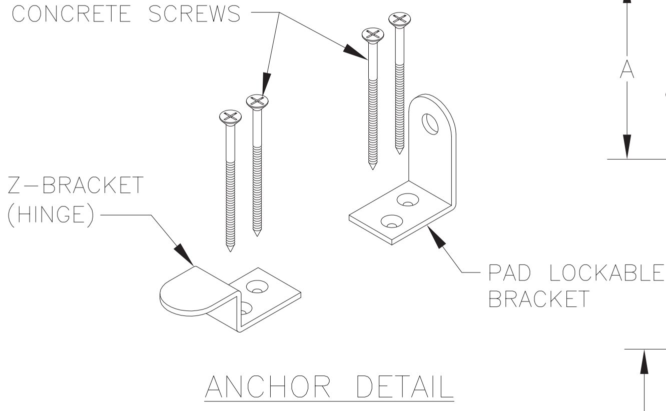
Catalog Part Number	Model Number	Color	Inside Width A (in)	Inside Length B (in)	Inside Height C (in)	Heater	Glass Pad	Weight #
LQ010026022E	PLR1	Brown	10	26	22	Unheated	GG027036005	17
LQ010026022N	PLR1	Granite	10	26	22	Unheated	GG027036005	17
LQ012043027E	PLR2	Brown	12	43	27	Unheated	GG022056005	24
LQ012043027N	PLR2	Granite	12	43	27	Unheated	GG022056005	24
HQ010026022E	PHR1	Brown	10	26	22	60W	GG027036005	18
HQ010026022N	PHR1	Granite	10	26	22	60W	GG027036005	18
HQ012043027E	PHR2	Brown	12	43	27	90W	GG022056005	26
HQ012043027N	PHR2	Granite	12	43	27	90W	GG022056005	26

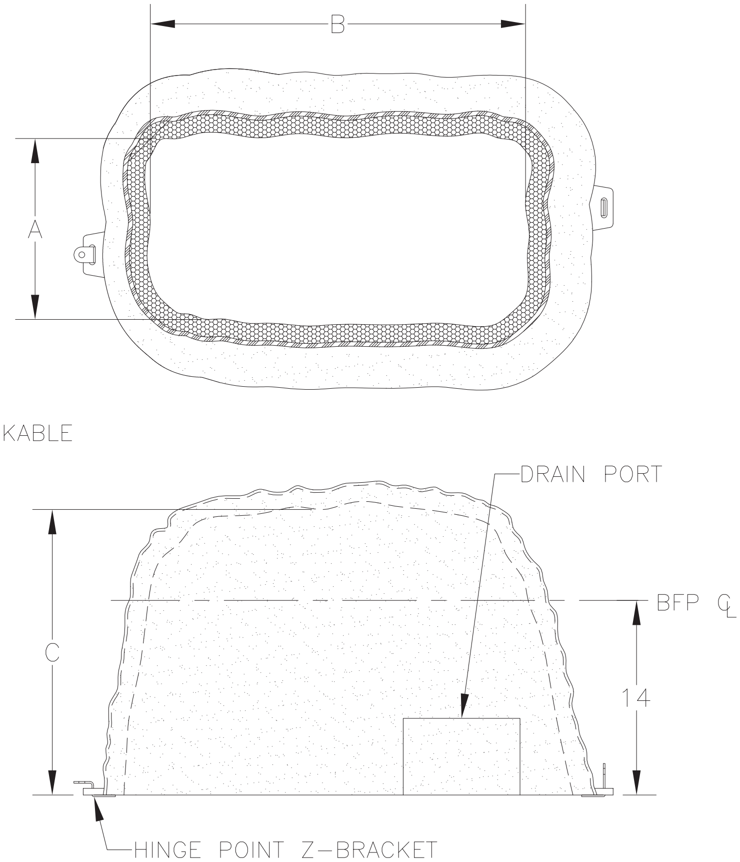
Available Colors:

Brown
Color code = E



Granite
Color code = N





Installation:

1. Provide applicable GFI protected power, UL STND. 943-NEMA 3R, inside enclosures requiring heat. Mount at least 6” above any discharge point and near the pipe riser on the enclosure access side or install per local code.
2. Pour a full concrete pad 4” thick around valve, allowing a minimum 1” radial space between riser and pad or install on a “Glass Pad™”.
3. Place PolyRok® Enclosure over valve and onto the pad or footer.
4. Mark locking staple. Position on concrete.
5. Use a masonry bit to drill through anchor hinge. Insert concrete screws and bolt firmly to concrete.
6. For heated enclosures using a self regulating heat trace tape, secure tape to valve with pipe ties or fiberglass/electrician’s tape. No pipe insulation is necessary. The PolyRok® Enclosure provides the necessary insulation.
7. Plug the heat source into the specified circuit/receptacle, after verifying proper voltage.
8. Lower and secure staple via pad lock (padlock not included).

Pump Guard Enclosures

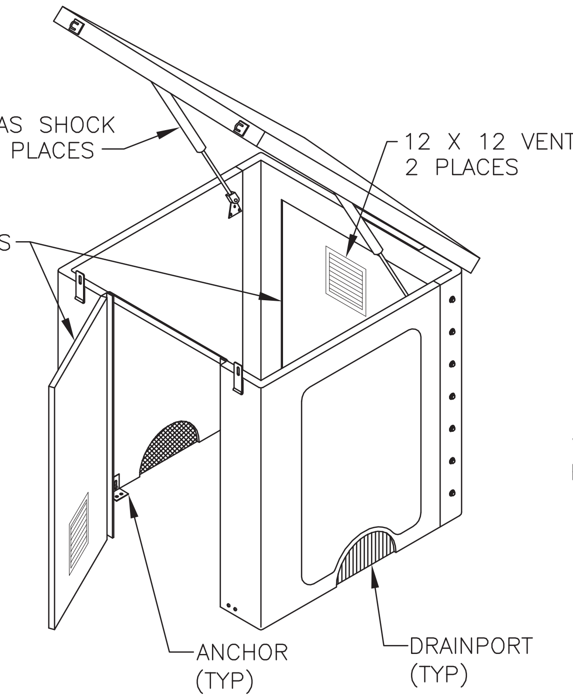
- **Extended Pump Life -** Vented enclosures are designed to keep pumps cool and protected from the elements.
- **Reduce Noise -** Keep neighbors happy by dampening the sound with standard insulated models (optional soundproof insulation available).
- **Vandalism & Theft Deterrent -** Secure lockable enclosures can reduce unwanted access.
- **Peace of Mind -** ASSE 1060 certification ensures that requirements for structural strength, drainage capacity, material construction, equipment access, and functional design are met.
- **Increased Cooling Performance -** Optional fans and thermostatically controlled louvers can improve cooling performance (see page 46 for details).

Note: Available in all Designer Series, Flip-Top, and aluminum enclosures (popular models below). Standard fiberglass color is beige (optional colors are available-see page 49 for details).

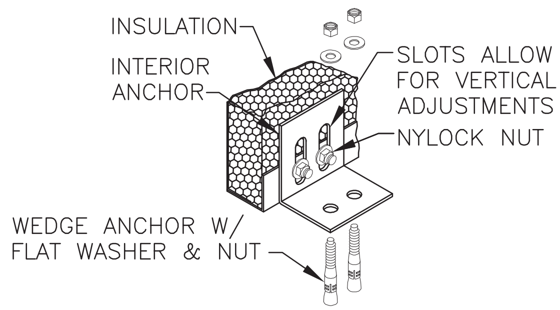
For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".

Catalog Part Number	Model Number	Access Type	Inside Width (in)	Inside Length (in)	Inside Height (in)	Heater	Weight #
HF013027023AAV	PG1000H	Flip-Top	13	27	23	60W	40
HF021033025AAV	PG1500H	Flip-Top	21	33	25	60W	60
HL035045035AAV	PG3000H	Flip-Top	35	45	35	1000W	250
HL044053044AAV	PG4000FH	Flip-Top	44	53	44	1000W	300
HL052061052AAV	PG5000H	Flip-Top	52	61	52	1500W	440
HM041041045AAV	PG4000H	Top, Front & Back	41	41	45	1000W	280
HM047047049AAV	PG6000H	Top, Front & Back	47	47	49	1500W	300
HM053053056AAV	PG8000H	Top, Front & Back	53	53	56	1500W	335
HM054062056AAV	PG10000H	Top, Front & Back	54	62	56	1900W	485

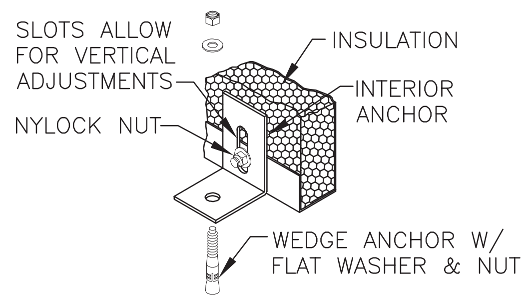
For unheated units, replace the "H" in the part# with an "L". Pad size=inside Dimensions + 12".



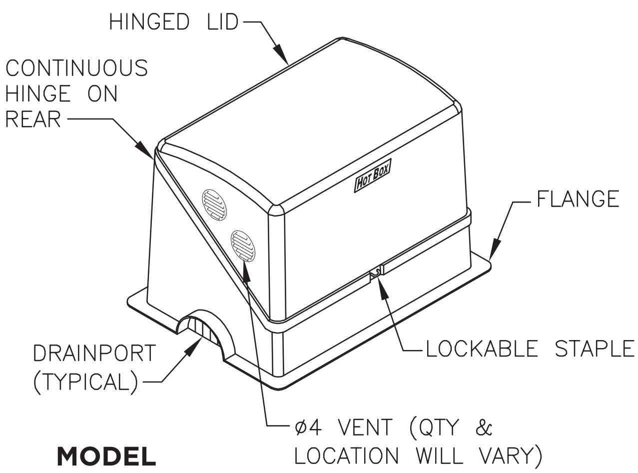
MODEL NUMBERS
PG4000H
PG6000H
PG8000H
PG10000H



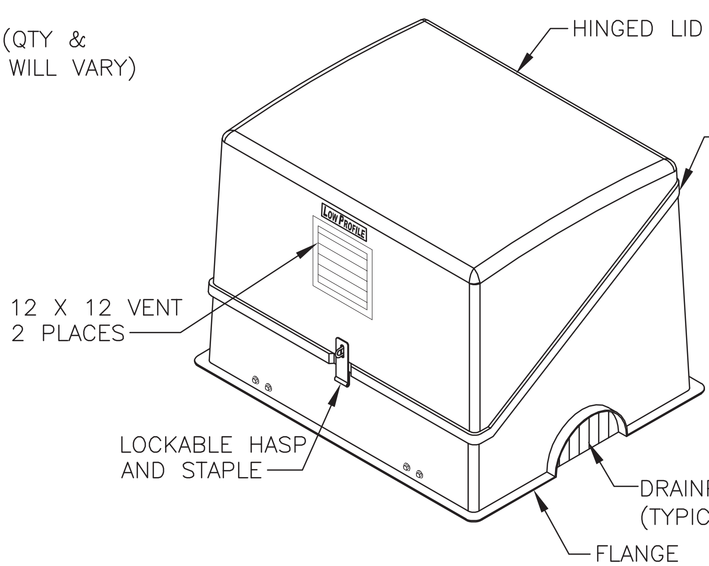
DOUBLE ANCHOR DETAIL



SINGLE ANCHOR DETAIL



MODEL NUMBERS
PG1000H
PG1500H

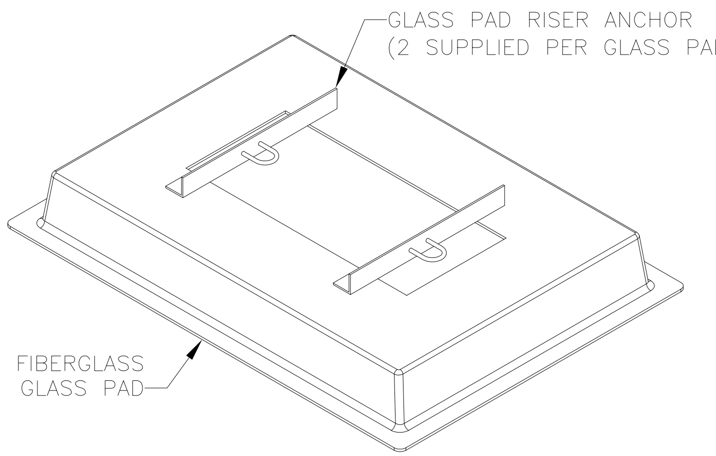


MODEL NUMBERS
PG4000FH
PG5000H

Glass Pad™ Mounting Bases

Fiberglass Mounting Pads for Backflow Enclosures

- **Save Time & Money -** No forms to build or concrete to pour.
- **Quick Installation -** One trip to install Glass Pad and enclosure with no waiting for concrete to cure.
- **Aesthetically Pleasing -** Professional looking installation with matching enclosure and pad.



Catalog Part Number	Model Number	Inside Width (in)	Inside Length (in)	Inside Height (in)	Weight #	For Enclosure Model Number
GG019027005	GP.75	19	27	4	16	(HB, LB, VG) .75 + (VC, VGVC) 1 & 1T
GG021035005	GP1	22	36	4	20	(HB, LB, VG, PEZ) 1 & 1T + (VC, VGVC) 2 & 2T + PG1000
GG021047005	GP2	21	47	4	25	(HB, LB, VG, PEZ) 2 & 2T
GG022056005	GPPR2	23	57	4	27	(PHR, PLR, VGPLR) 2 + (EZ, VGEZ) 2
GG026040005	GPEZ1	26	40	4	26	(EZ, VGEZ) 1
GG027036005	GPPR1	27	36	5	22	(PHR, PLR, VGPLR) 1
GG028028005	GP1824	28	28	5	18	AVG1824
GG028038005	GPFS1	28	38	5	20	(FS, FSL, VGFS) 1
GG029042005	GP1.5	30	42	4	30	(HB, LB, VG) 1.5 + PG1500

Hot Box® Enclosures can be modified to meet your specific project requirements. Below are many of the options that are available:

- **Standard options include:** vents, exhaust fans, alarm and lighting packages, and special colors (see pages 45-49 for details).
- **Specialized options include:** penetrations, FDC boots, stainless steel anchors, hinged doors, acrylic windows, extra insulation, sound insulation, special voltage heaters, explosion proof heaters/equipment, and different material types like 3003 Mill Finish (.05") or 5052 Marine Grade aluminum (.050" or .125"). Contact your representative for details or other special requirements.

Vent Features:

- 4" diameter aluminum fixed blade wall vent with foam rubber winter cover that is sized to be pushed inside the vent itself. It is pliable and soft, molding into the opening without resistance.
- 12" x 12" aluminum fixed blade wall vent with integrated insect screen.
- Winter covers are included to help prevent heat loss in the winter. They slide against the back side of the vent and are constructed of the same stucco embossed aluminum as the enclosure (non-insulated).
- Vent location and quantities vary depending on the size of the enclosure.
- Vents come fully installed.

Vent Maintenance:

- Install the winter covers when temperatures hold at 40°F or less for any prolonged period of time.
- When temperatures rise above 40°F, remove winter covers. **Winter covers must be removed when a fan is in use.**

4" Diameter Round Vent

12" x 12" Square Vent (Outside)

12" x 12" Square Vent-Inside without Winter Cover

12" x 12" Square Vent-Inside with Winter Cover

Options: Exhaust Fan

Features:

- 10” diameter 5 blade exhaust fan
- Adjustable thermostat
- Automatic gravity shutter
- Wire fan guard
- Totally enclosed motor
- UL listed for US and Canada
- Fixed blade wall vent(s) & winter cover(s) to prevent heat loss in cold weather

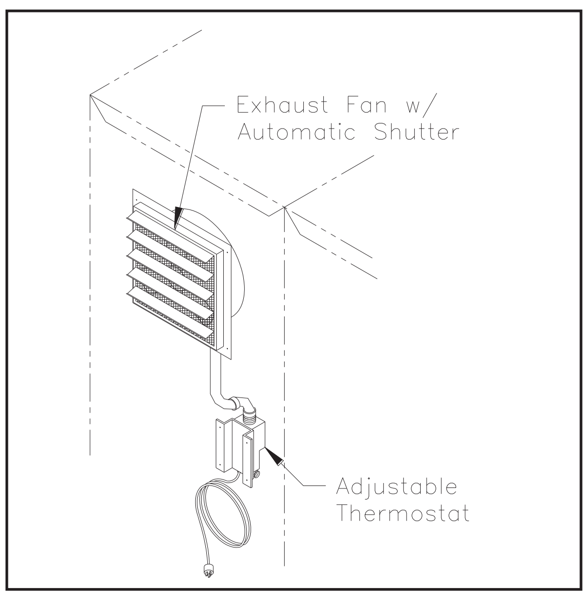
Complete Exhaust Fan (Interior View)

Technical Specs:

- 120 volt single phase
- 60 Hz
- 1/30 hp motor
- 1550 rpm
- 585cfm @ .00-In. SP
- Maximum 1.5 amps
- Maximum Ambient Temp. 104 degrees F
- Fan location, vent size, and quantity of fan(s) can vary, based on the size of the enclosure

Installation:

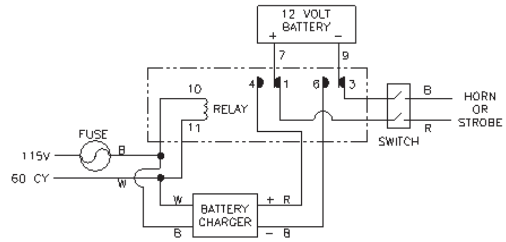
- Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected 15 amp, 120v, single phase service and receptacle. All installations to be in accordance with local and national codes.
- Plug the fan into the receptacle.
- Adjust the thermostat to the desired temperature.



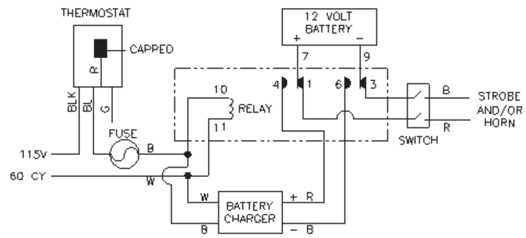
Maintenance:

- Install the winter covers into the vents when temperatures hold at 40°F or less for any prolonged period of time. **When the weather warms again, and the temperatures consistently reaches 40°F at night, winter covers must be removed.**
- Keep the area around the automatic shutter free of objects that could impede air flow.
- Lubricate the motor sleeve bearings annually using S.A.E. 20 (non detergent) oil.

Power Loss Alarm



Power Loss & Low Temperature Alarm



PLAHBO Audible Power Loss Alarm - The alarm consists of the cabinet, battery, battery charger, relays, 95-decible horn, six foot power cord and plug. The alarm is designed to activate the horn if the enclosure loses electrical power.

PLAHBOS Visual Power Loss Alarm - The alarm consists of the cabinet, battery, battery charger, relays, amber strobe light, six foot power cord and plug. The alarm is designed to activate the strobe light if the enclosure loses electrical power.

PLAHBO-T Audible Power Loss and Low Temperature Alarm - The alarm consists of the cabinet, battery, battery charger, relays, 95-decible horn, temperature sensor, six foot power cord and plug. The alarm is designed to activate the horn if the enclosure loses electrical power or if the temperature falls below the set “adjustable” temperature.

PLAHBOS-T Visual Power Loss and Low Temperature Alarm - The alarm consists of the cabinet, battery, battery charger, relays, amber strobe light, temperature sensor, six foot power cord and plug. The alarm is designed to activate the strobe light if the enclosure loses electrical power or if the temperature falls below the set “adjustable” temperature.

PLAHBOT-S Audible and Visual Power Loss and Low Temperature Alarm - The alarm consists of the cabinet, battery, battery charger, relays, 95-decible horn, amber strobe light, temperature sensor, six foot power cord and plug. The alarm is designed to activate both audible and visual notifications if the enclosure loses electrical power or if the temperature falls below the set “adjustable” temperature.

Note: With a fully charged battery the alarm should activate for a minimum of six hours or until deactivated. Alarms operate on 120V, single phase service and plugs into a G.F.I. receptacle.

Installation:

- Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected 20 amp, 120-240V, single phase service and receptacle. Alarm and Heater must be supplied by the same electrical service. All installations to be in accordance with the local and national codes.
- Simply plug the alarm into the receptacle and turn the switch to the on position.
- For low temperature alarms, adjust the thermostat to desired temperature (34°-38°F recommended).

Options: Lighting Packages

- **Increased Visibility -** Lighting illuminates equipment for easier maintenance.
- **Peace of Mind -** UL listing for wet & damp locations ensures safety.

Single Light Package (Installed)

Packages:

Single Light Package - One 24" fluorescent light fixture in a water tight enclosure and hardwired to a single electrical switch.

Double Light Package - Two 24" fluorescent light fixtures in water tight enclosures and hardwired to a single electrical switch.

Quad Light Package - Four 24" fluorescent light fixtures in water tight enclosures and hardwired to a single electrical switch.

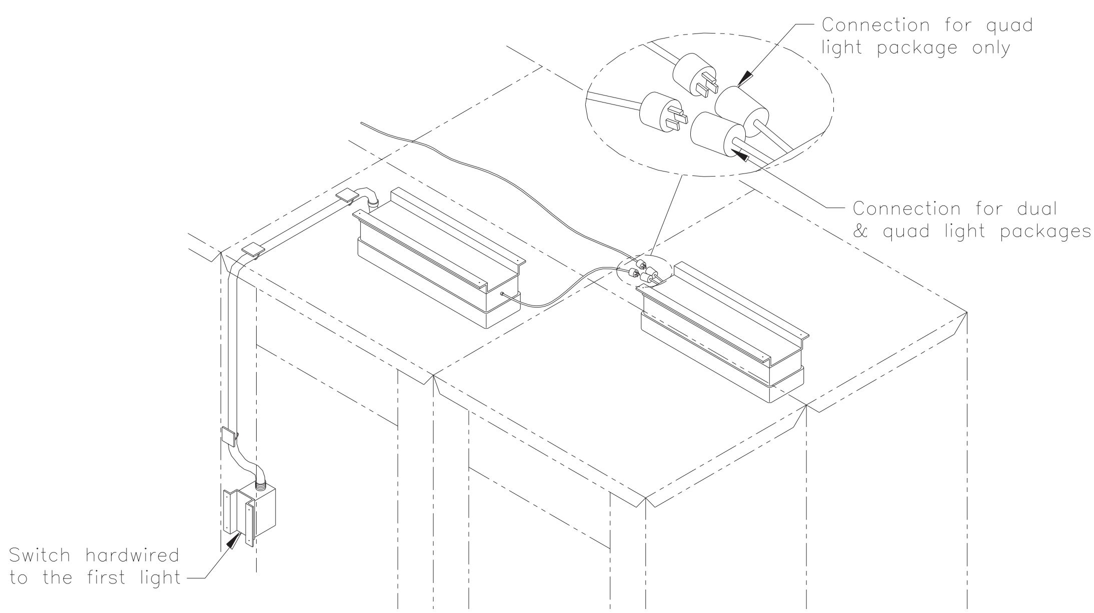
Note: The light package required will vary depending on the size of the enclosure.

Technical Specs:

- 24" fluorescent T8 bulb
- 17 watts (each)
- 120 volt single phase

Installation:

- Contractors other than Hot Box are responsible for the installation of the G.F.I. protected 120v, single phase service to the switch. All installations to be in accordance with the local and national codes.
- After enclosure installation is complete, plug in each light in tandem to the next light (if multiple lights are supplied).



Standard Colors:

- All standard Aluminum Sectionalized and Dura Fold® Enclosures come with a stucco embossed aluminum finish, except the Select Six enclosures (which are a smooth mill finished aluminum). No color code is required for the stucco embossed aluminum finish.
- All fiberglass enclosures come standard with a beige gelcoat (color code not required).
- All plastic Poly EZ Box® Enclosures are available in beige (T) or dark green (G) only. Please add color code suffix.
- All fiberglass Hot Rok® Enclosures are available in brown (E), granite (N), or desert rose (S) only. Please add color code suffix.
- All plastic PolyRok® Enclosures are available in brown (E) or granite (N). Please add color code suffix.

Optional Colors:


Beige
Color code = T


Federal Brown
Color code = M


Dark Green
Color code = G


Black
Color code = B


White (Sail)
Color code = W


Grey
Color code = C


Brown
Color code = E


Granite
Color code = N


Desert Rose
Color code = S

Notes:

- If non-standard color is required, please specify the color code in the 12th digit of the part number.
- The above shown colors may not be an accurate representation of the actual color. If needed, please request a sample from your local Hot Box representative before ordering. Customer approval is required prior to processing the order.
- Custom colors not shown above will require a color sample, Federal Standard color, Munsell color or Sherwin Williams color number.

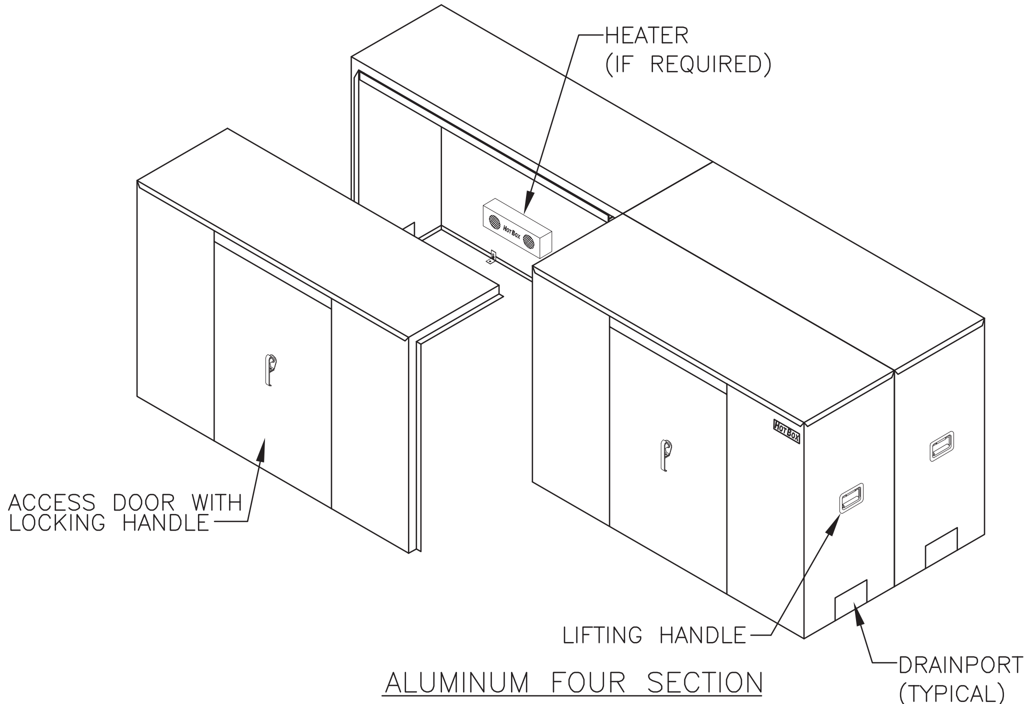
Aluminum/Prep Procedure:

Preparation of the exterior of the enclosure to accept paint involves sanding the aluminum and applying a solvent to remove dust and aluminum filings. A Mopoxy high build epoxy primer (Lead and Chromate free) is then applied to allow a Mothane Polyurethane enamel paint (Lead and Chromate free) to adhere properly. Prefinished aluminum sheets are used for the beige and federal brown colors.

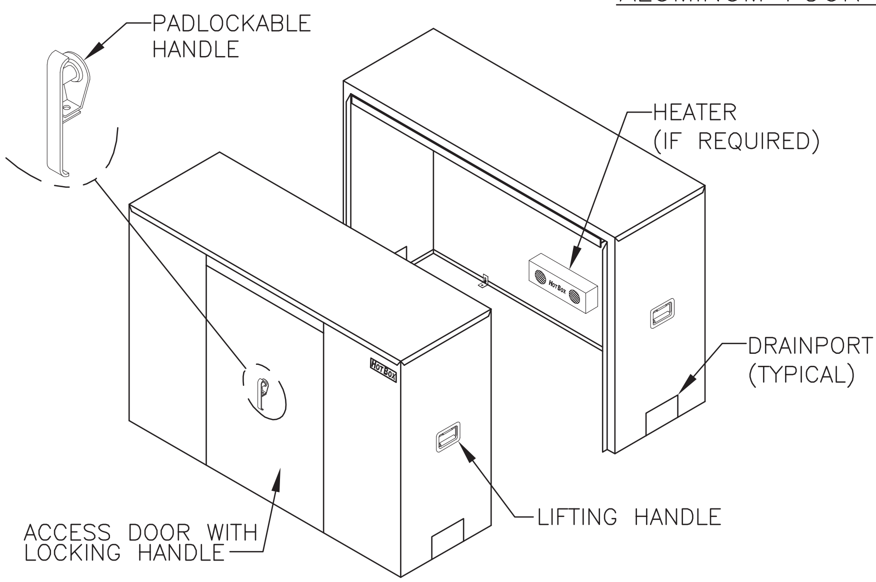
Fiberglass Gelcoat:

Any special gelcoat color will be applied at a thickness of 18 mils.

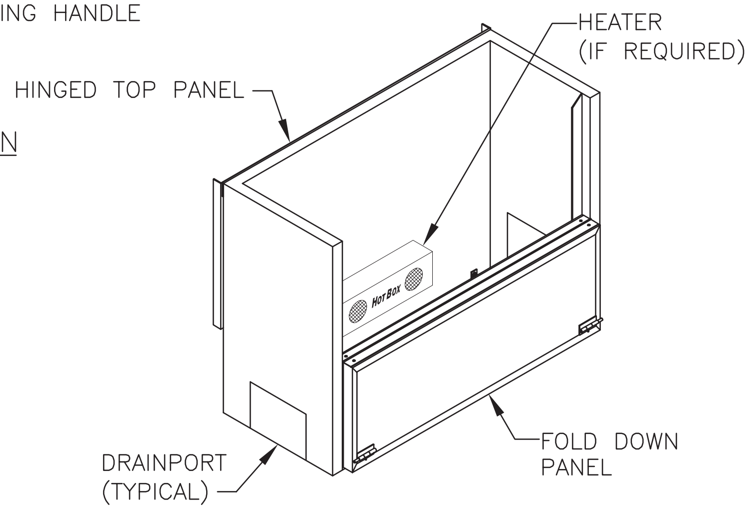
Standard Drawings



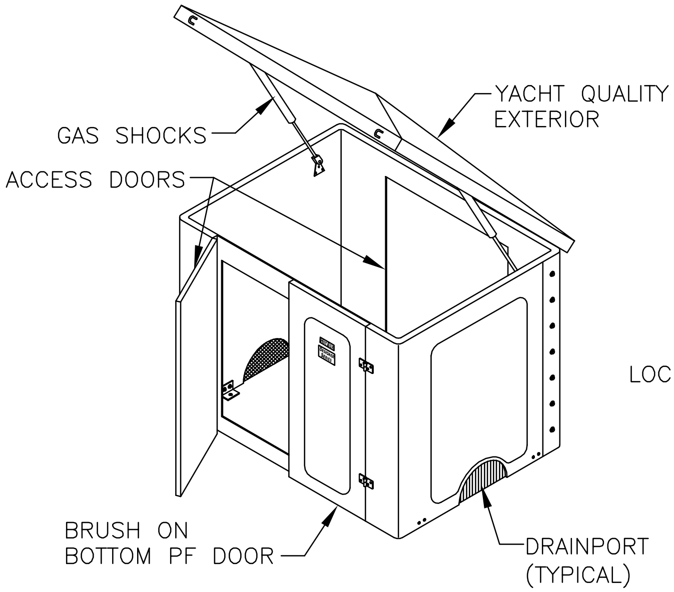
ALUMINUM FOUR SECTION



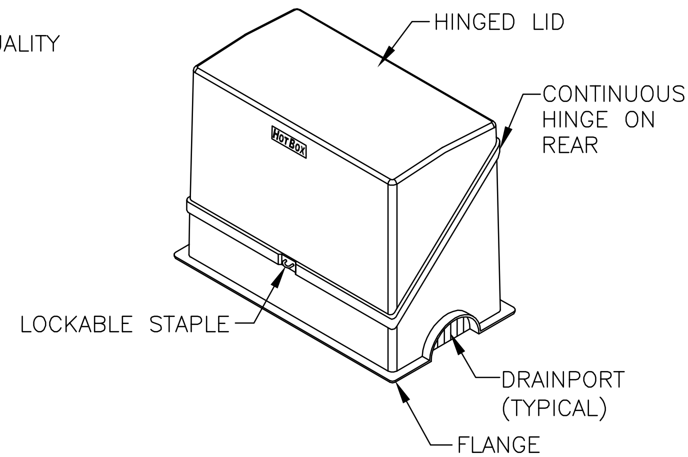
ALUMINUM TWO SECTION



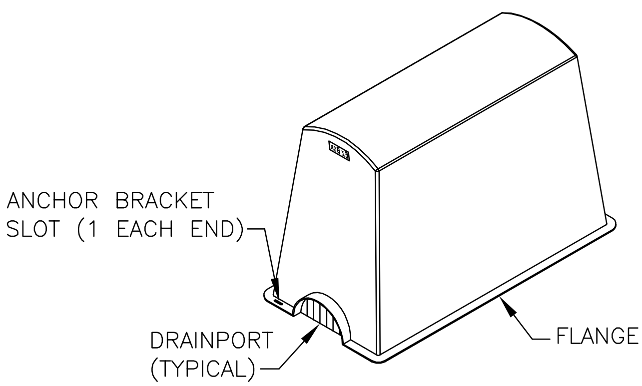
DURAFOLD



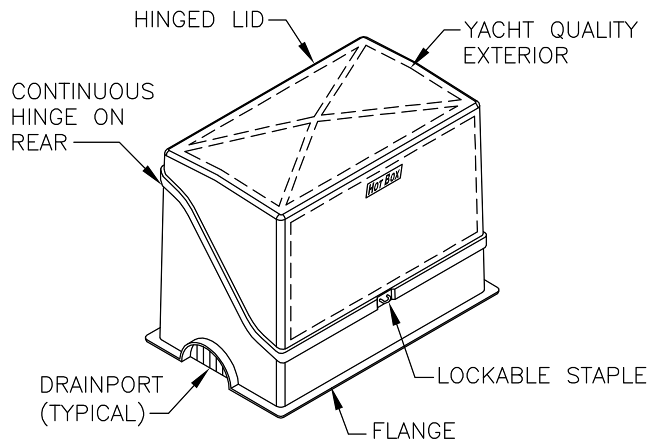
DESIGNER Series™



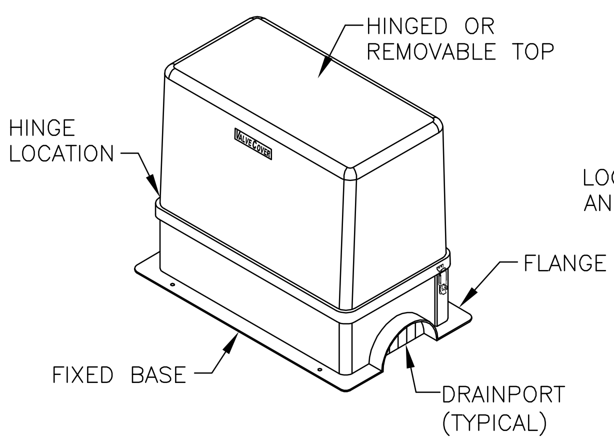
FIBERGLASS FLIP TOP



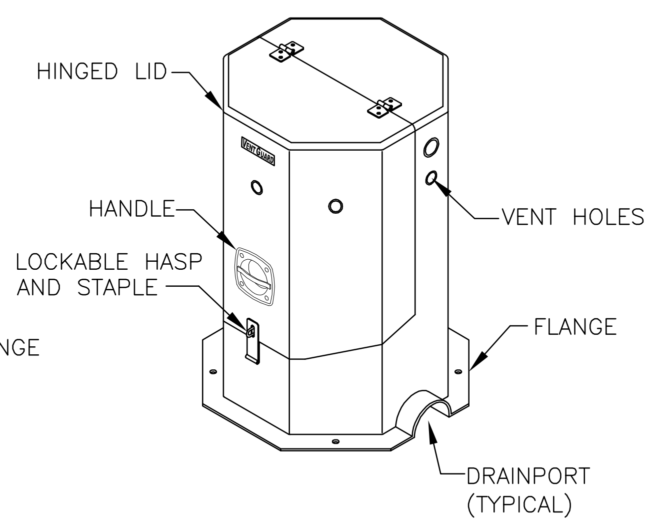
EZBOX DROP OVER



LOW PROFILE Series™



VALVE COVER



VENT GUARD

Frequently Asked Questions

Are Hot Box® Enclosures ASSE 1060 certified?

- Yes, standard Hot Box® Enclosures have been lab tested and ASSE 1060 certified for vertical roof load (100 lbs/ft2) capacities, freeze protection, drainage aptitude and material construction.
- Custom enclosures up to 87" W X 172" L x 85" H in size are certified. Larger enclosures are not certified by ASSE, but they are engineered in the same manner as certified enclosures.

Do I need a heated or unheated enclosure, or what ASSE class enclosure do I need?

This question is best answered by comparing the lowest average winter temperature at your location to the definition of the ASSE Class ratings. See below:

- **Class I - Freeze Protection Enclosures (Heated):** Designed and constructed to maintain a minimum internal temperature of 40°F with external temperatures as low as -30°F.
- **Class II - Freeze Retardant Enclosures (Insulated Non-Heated):** Designed and constructed to be installed in locations with minimum temperature of 33°F.
- **Class III - Non-Freeze Protection Enclosures (Uninsulated Non-Heated):** Designed and constructed to provide system security for components when freezing temperatures are not a consideration.

Can you manufacture custom size enclosures? If so, what are the maximum dimensions?

- We can create custom sizes with our aluminum sectional and Dura Fold® Enclosures. Please speak with your area sales representative for dimensions.
- Custom sectional aluminum enclosures are limited to a maximum interior width of 117" and a maximum interior height of 106.5" with the length being unlimited.
- Custom Dura Fold® Enclosures are limited to a maximum top surface area of 22 sq ft (3168 sq in) or less and a maximum interior length of 90" and height of 66".
- If project quantities are large enough to warrant new tooling, we can customize the sizes of our fiberglass or plastic enclosures.

What is the largest removable access panel?

- Due to weight constraints set by ASSE 1060 3.3.3 specification, 44" W x 77 ½" H is the largest removable access panel.
- When a wider opening is required two 36" W x 72 ½" H dual hinged access doors will give you a 72" W x 72 ½" H opening.

Will field penetrations affect the structural integrity or freeze protection of the enclosure?

- The structural integrity will not be affected when putting holes in an enclosure (maximum size of 12″ diameter). However, it is important to not modify any of the corners or seams of a Hot Box (where two different surfaces meet), since this will reduce the structural integrity of a Hot Box® Enclosure. When in doubt or for special requirements, please contact our Customer Service Team.
- To minimize heat loss it is recommended you make the hole ½” larger than the pipe diameter. Then after installation apply expanding foam (found at any hardware store) around the perimeter of the penetration.

Is it necessary to have 3” insulation (R19) in the roof or the walls?

- Hot Box® Heaters and 1 ½” (R10) insulation are more than sufficient to maintain an interior temperature of 40°F (4.4°C) and protect equipment from external temperatures as low as -30°F (-34.4°C) in accordance with ASSE 1060 3.6.1-3.
- Some competitors require 3” of insulation due to the use of less efficient slab mounted heaters.
- If desired, 3” (R19) insulation is available for an additional fee.

What is the recommended slab size for Hot Box® Enclosures?

- The slab should be 12” larger than the interior dimensions of the enclosure. The minimum recommended slab thickness is 4″.

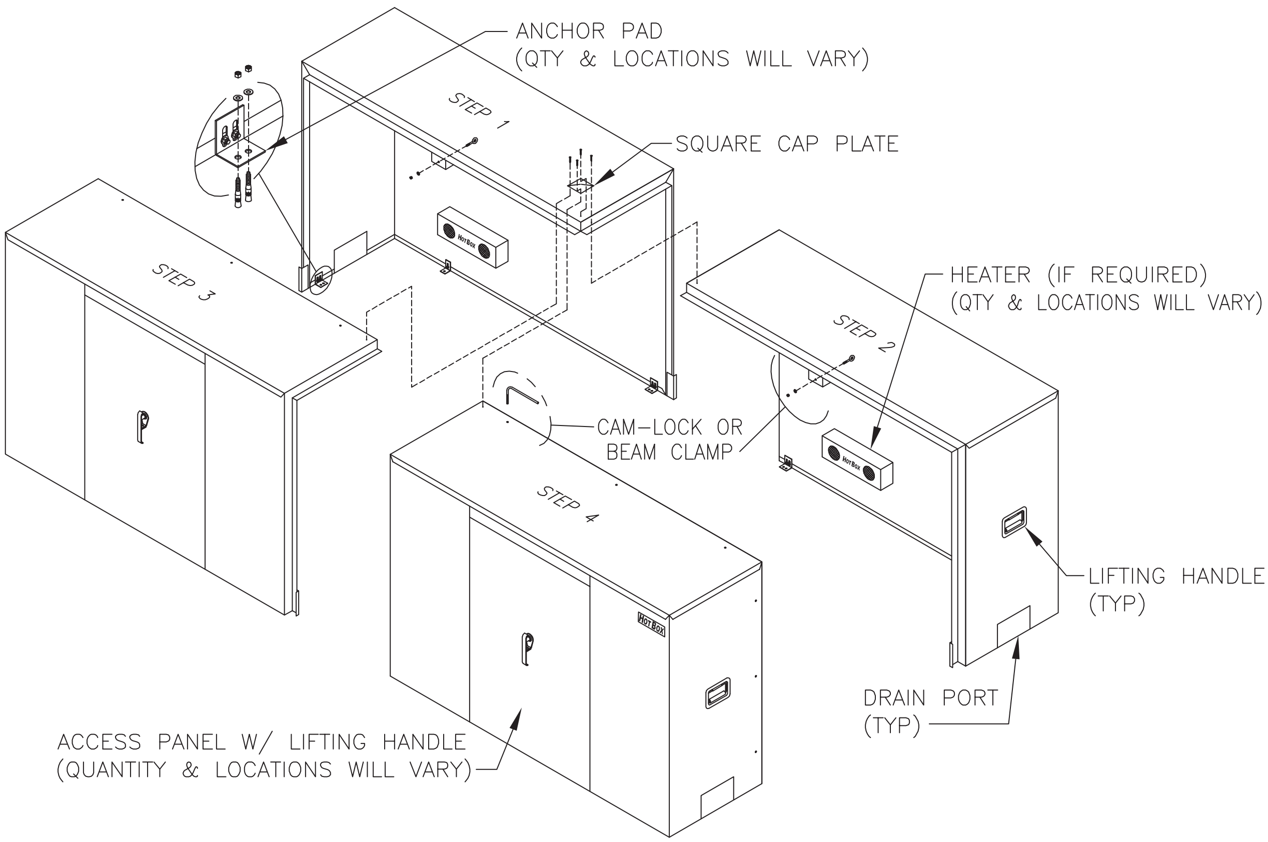
What are the standard heater electrical connection recommendations?

- Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (mounted a min. of 9” above the slab).
- We recommend that each heater be on separate 20 amp circuits. Separate circuits help provide redundancy in the event that one circuit fails.
- All installations must be in accordance with local and national codes.

What is the wind load rating for Hot Box enclosures?

- All standard fiberglass enclosures are suitable for wind speeds up to 120 mph.
- All standard Sectional Aluminum and Dura Fold® Enclosure sizes up to 36”W x 105”L x 64”H inside dimensions (i.e., LA036105064) and smaller are suitable for speeds up to 120 mph. Standard sizes larger than 36”W x 105”L x 64”H are suitable for use in areas where the design wind speed is 80 mph or less.
- Hot Box® Enclosures have not been certified to meet the wind-borne debris impact requirements in areas within a few miles of the coast (e.g. Florida Building Code).

Installation Guide for Sectional Enclosures



1. Remove the access panels from the sections and place aside. This will lighten the sections for an easier installation.

2. Place the sections as close to their final positions as possible. The order of installation is always “Rear” left to right and then “Front” left to right regardless of the number of sections your enclosure has (4 section shown).

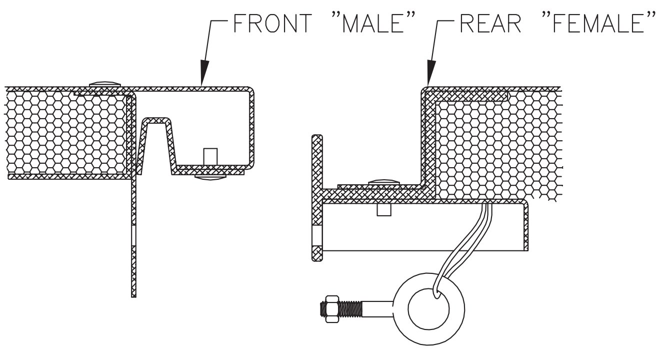
3. Each section has a male and a female edge. Lift each section (10”-12”) and position over the mating edge and carefully lower the section into position keeping it flush against the opposing section’s edge until it seats properly.

4. Place the enclosure in its final position. **Do not tear the gasket on the enclosure base or around the male/female edges while sliding the sections together or positioning the enclosure.**

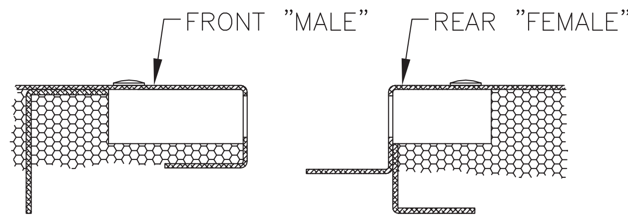
5. **The enclosures must be squared and leveled to assure proper fit of the sections.** The anchor pads within the enclosure double as levelers. If needed, loosen the bolts attaching the anchor pads to the enclosure. Each pad is slotted for vertical movement. When level, tighten the pad bolts to the enclosure wall.

6. Once the enclosure is level and square, set the access panels in place. If the fit is not right or if light may be seen through any seam, the square of the enclosure is incorrect and must be reassessed.

7. After all is in place, remove the access panels once more. Install the anchors to secure the enclosure. Anchors and drill bit are included.



"BEAM CLAMP" STYLE CONNECTION



"CAM-LOCK" STYLE CONNECTION

8. Determine if your enclosure has Beam clamp or Cam-locks (see diagram above). Only one type should exist per enclosure.

9. For Beam clamp style enclosures: tighten the Beam clamp eyebolts and wing nuts (located at the top seam inside the enclosure).

10. For Cam-lock style enclosures: fully engage the Cam-locks (located on the exterior walls along the seams) using the supplied allen wrench tool. Place the plastic plugs in the keyholes for protection.

11. Enclosures larger than 72" wide (inside) will be supplied with 2 x 1 support channels. They are attached with the supplied hardware to the underside of the horizontal roof bracing. Use a ratchet and a 1/2" deep socket to attach.

12. In some cases the size of the enclosure (typically 4 sections and larger) may cause a slight leaking during inclement weather. To prevent this, Aluminum tape has been provided (for 4 sections and larger). We recommend that the contractor lay a bead of silicon caulking in all seams and tape over the entire seam on the top of the enclosure. This is for situations where the enclosure is to be a "permanent" structure.

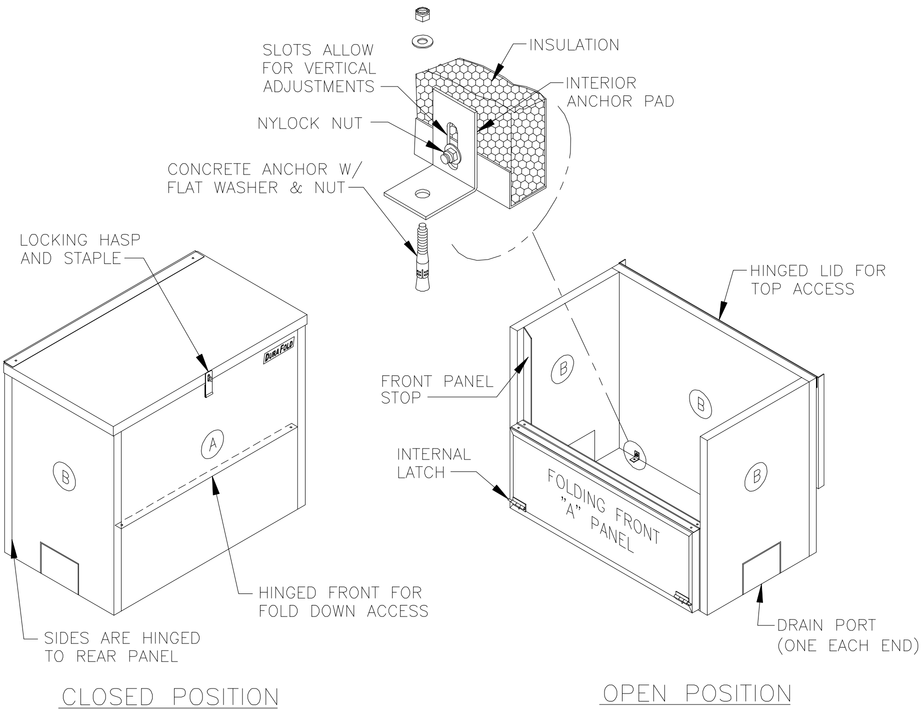
13. For enclosures with four or more sections, square cap plates have been supplied to cover the areas where the four corners of the sections come together on the top of the enclosure. Place the caps over the intersection and screw into place.

14. Hang the heater(s) on the heater plate(s) and plug into the receptacle(s).

15. Place the access panels in their respective openings and insert padlocks (not included) through the handles.

Warning! A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can be a damp location. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 20 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. Consult local and national codes for electrical connections.

Installation Guide for Standard Dura Fold® Enclosures



In most cases, Dura Fold® Enclosures are shipped assembled. If so, please skip to step 3.

***Note: The receptacles and the concrete slab should be prepared and fully cured before the enclosure is uncrated.**

1. Position the "B" Panels around the installed valve maintaining clearance between the enclosure and the installed valve. **Do not tear the gasket on the enclosure base while positioning or joining the enclosure panels.**

2. Secure Panel "A" to Panel "B" using 5/16" wing nuts.

3. **The enclosure must be squared and leveled.** The L-shaped anchor pad brackets supplied with the enclosure double as levelers. If needed, loosen the bolts attaching the anchor pads to the enclosure. Each pad is slotted for vertical movement. When level, tighten the pad bolts to the enclosure wall. **If the enclosure is not properly squared and leveled, then the lids may not close properly. Do not force lids closed as this may cause damage.**

4. To install the concrete anchors in the slab, drill through the anchor pads and drive each concrete anchor into each drilled hole. Place the washer and nut on the top of the anchor and tighten. Concrete anchors and a drill bit are included.

5. If applicable, mount the heater to the heater plate using the supplied screws.

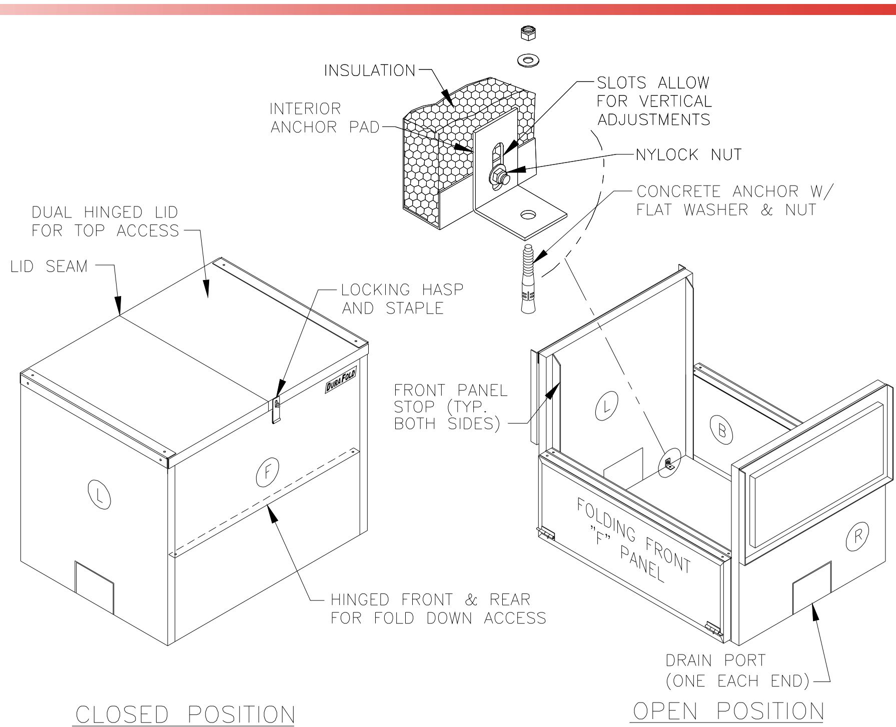
6. When vents are present, install the winter cover (according to the season).

7. Raise hinged front and back panels into place, and latch the internal latches inside.

8. Close the lid and hang a padlock on each hasp and staple to secure (padlock not included).

Warning! A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can be a damp location. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 20 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. Consult local and national codes for electrical connections.

Installation Guide for Double Dura Fold® Enclosures



In most cases, Dura Fold® Enclosures are shipped assembled. If so, please skip to step 4.

***Note: The receptacles and the concrete slab should be prepared and fully cured before the enclosure is uncrated.**

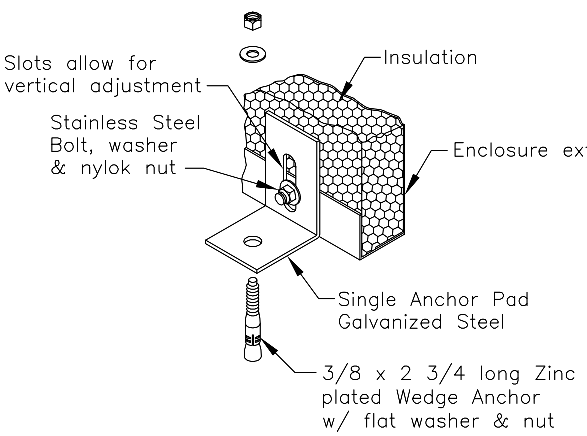
1. Position “L” and “R” panels against the installed valve. **Do not tear the gasket on the enclosure base while positioning or joining the enclosure panels.**
2. Secure Panel “F” to Panel “L” and “R” using 5/16” wing nuts.
3. 3. Secure Panel “B” to Panel “L” and “R” using 5/16” wing nuts.
4. **The enclosure must be squared and leveled.** The L-shaped anchor pad brackets supplied with the enclosure double as levelers. If needed, loosen the bolts attaching the anchor pads to the enclosure. Each pad is slotted for vertical movement. When level, tighten the pad bolts to the enclosure wall. **If the enclosure is not properly squared and leveled, then the lids may not close properly. Do not force lids closed as this may cause damage.**
5. To install the concrete anchors in the slab, drill through the anchor pads and drive each concrete anchor into each drilled hole. Place the washer and nut on the top of the anchor and tighten. Concrete anchors and a drill bit are included.
6. If applicable, mount the heater to the heater plate using the supplied screws.
7. When vents are present, install the winter cover (according to the season).
8. Raise hinged front and back panels into place, and latch the internal latches inside.
9. Close the lid and hang a padlock on each hasp and staple to secure (padlock not included).

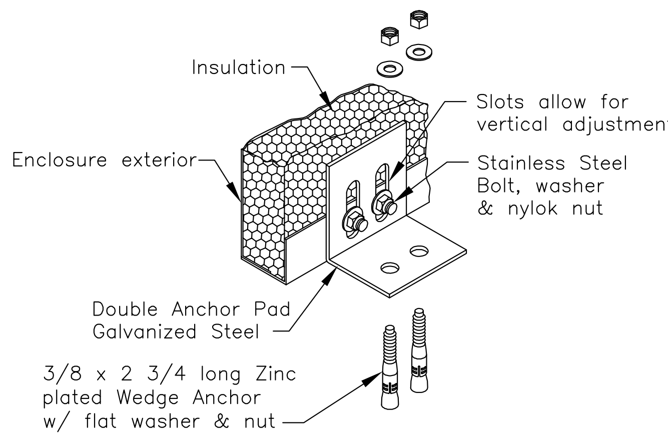
Warning! A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can be a damp location. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 20 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. Consult local and national codes for electrical connections.

Anchor Installation & Specification

Single and Double Anchor Kit:

- Used on Sectionalized Aluminum, Dura Fold®, Designer Series™ and F/G Flip-Top Enclosures.





Note: Anchor type and quantity will vary depending on the type of the enclosure.

Technical information:

- Ultimate strength of wedge anchor: Pull out: 2,300lbs - Shear: 2,400lbs.

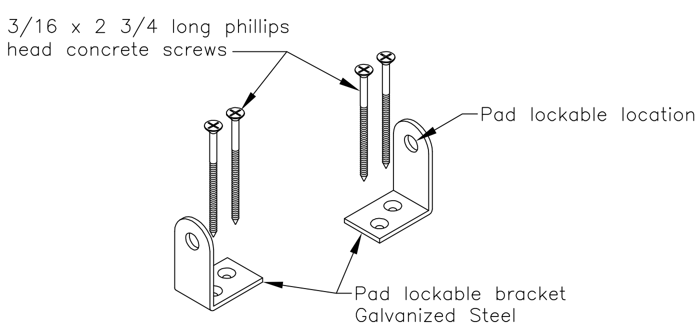
Installation:

1. Locate the Anchors. Mark and drill 3/8" diameter holes x 1 3/4" - 2" deep with the supplied bit.

2. Drive the anchor into the hole, place the anchor pad over the anchor and tighten the washer and nut.

EZ Anchor Kit:

- Used on fiberglass EZ Box® & fiberglass Hot Rok® Enclosures.



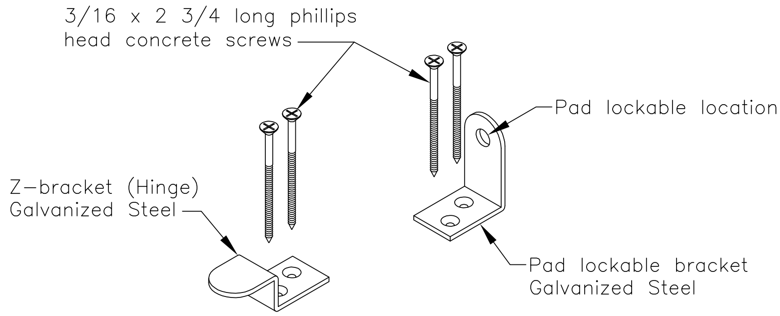
Installation:

1. Locate the brackets. Mark and drill 5/32" diameter holes x 3" deep with the supplied bit.

2. Attach the brackets with the supplied concrete screws. Screws will be hidden under the flange of the enclosure.

PEZ Anchor Kit:

- Used on Poly EZ Box® and PolyRok® Enclosures.



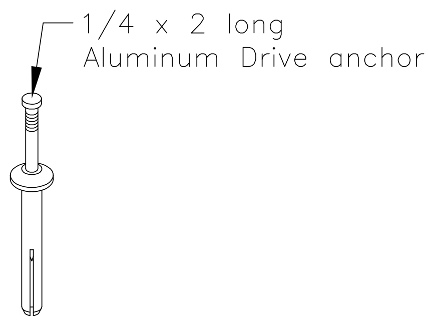
Installation:

1. Locate the brackets. Mark and drill 5/32” diameter holes x 3” deep with the supplied bit.

2. Attach the brackets with the supplied concrete screws. Screws will be hidden under the flange of the enclosure.

Drive Anchor Kit:

- Used on Vent Guard® and Valve Cover™ Enclosures.



Note: Anchor quantity is typically four per enclosure.

Installation:

1. Locate the holes in the flange. Mark and drill 1/4” diameter holes x 2 1/2” deep with the supplied bit.

2. Place the anchor through the enclosure flange and into the drilled hole, then hit with a hammer.

Warning! A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can be a damp location. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 20 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. Consult local and national codes for electrical connections.

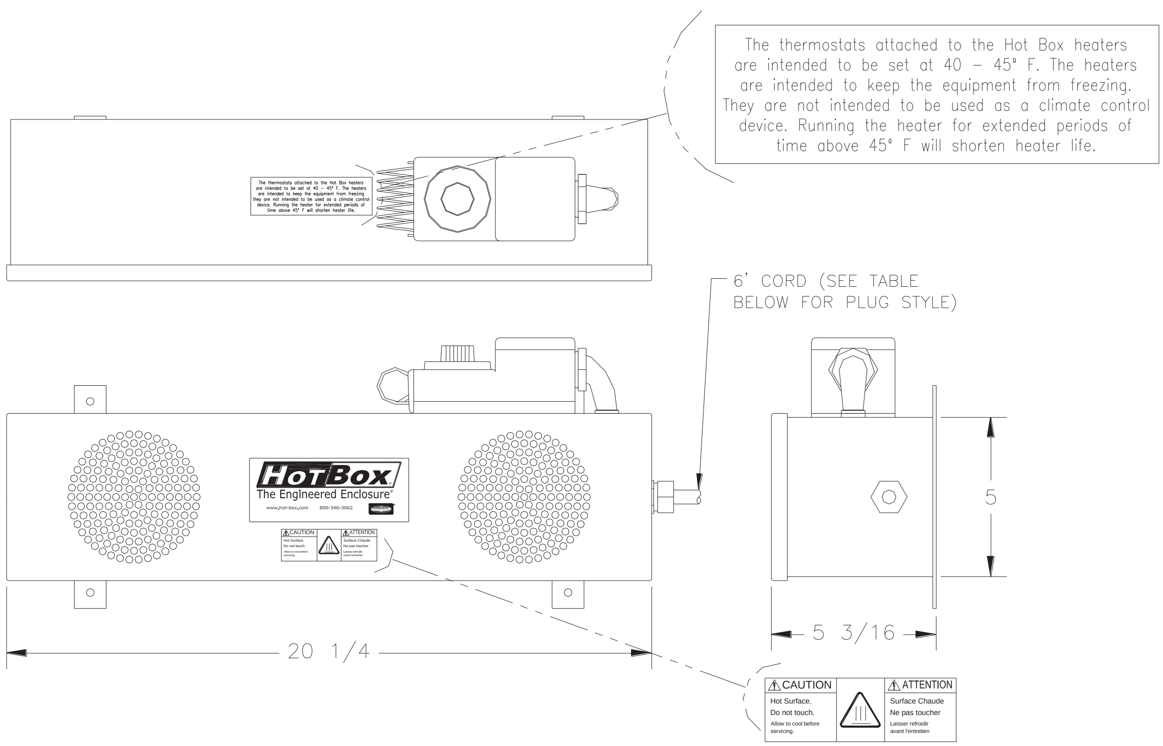
Standard Convection Heaters

Benefits and Features:

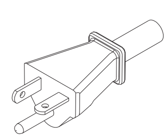
- **Better Freeze Protection -** Heater is thermostatically controlled to maintain an interior temperature of 40°F (4.4°C) to protect equipment from external temperatures as low as -30°F (-34.4°C) in accordance with ASSE 1060 1.2.2.1.
- **Better Performance and Safety -** Wall-mounted design elevates heater above discharge point.
- **Fast and Easy Installation -** 6' power cord and plug.
- **Quiet Operation -** Factory lubricated 100 cfm fan.

Meets or Exceeds Standards:

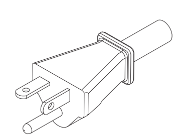
- ETL listed (tested for wet/damp locations).
- Dielectric Voltage Withstand Test (Section 44.0 of the UL 499 Standard & Section 6.4 of the CAN/CSA C22.2, No. 88 standard).
- Grounding Continuity Test (Section 45.1 of the UL 499 Standard & Section 6.5 of the CAN/CSA C22.2, No. 88 standard).



MODEL	WATTAGE	VOLTAGE	PHASE	BTU/hr	WEIGHT lb.	RECOMMENDED CIRCUITS	PLUG
ACI1000–120	1000	120	1	3412	12	20 AMP	NEMA 5–20P
ACI1500–120	1500	120	1	5118	12	20 AMP	NEMA 5–20P
ACI2000–120	1900	120	1	6824	12	20 AMP	NEMA 5–20P
ACI1000–208/240	867/1000	208–240	1	2957/3412	12	20 AMP	NEMA 6–20P
ACI1500–208/240	1300/1500	208–240	1	4436/5118	12	20 AMP	NEMA 6–20P
ACI2000–208/240	1733/2000	208–240	1	5914/6824	12	20 AMP	NEMA 6–20P



NEMA 5–20P (120V)



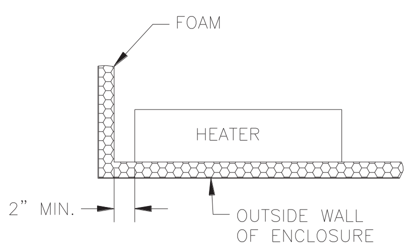
NEMA 6–20P (240V)

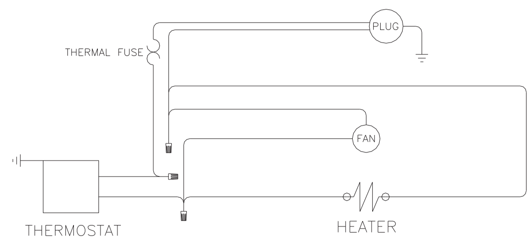
Contractors other than Hot Box are responsible for the installation of the G.F.I. protected service and receptacles. We recommend that each heater be on separate 20 amp circuits so in the event a circuit fails, all other circuits will remain powered. We recommend that all installations be in accordance with the local and national codes.

Installation:

1. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 20 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. All installations to be in accordance with local and national codes.
2. Locate the aluminum heater plate(s) inside the enclosure and hang the heater(s) on the provided hangers.
3. Plug the heater into the ground fault circuit protected outlet.

Note: The heater assembly may be installed on any vertical wall no closer than 2 inches from the adjacent box wall or seam.





Maintenance:

Perform the following maintenance prior to installation and at least once per season, preferably before energizing the system, or immediately after any work has taken place on the piping system:

- Check to be sure heater power cord is free from mechanical or thermal damage (cuts or nicks in the cable insulation from utility knife, use of metal clamps, solder or overheating).
- To test heaters with adjustable thermostats, the thermostat should be turned clockwise until the heater activates and then reset to the minimum setting (40-45°F) by turning the knob counter-clockwise, after testing is completed.
- To test heaters with older pre-set thermostats, spray CO_2 on the thermostat bulb to simulate cold temperature until the heater activates.
- Vacuum occasionally using standard vacuum attachments.

Note: The heaters are intended to keep the equipment from freezing and are not to be used as a climate control device. Running the heaters for extended periods of time above 45°F will shorten heater life.

Warning! - *A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can a damp location.*

Warning! - *Hazard of severe shock, disconnect all power before servicing.*

Warning! - *Do not block air flow in any way.*

Warning! - *Avoid contact. The heater surface is HOT.*

For replacement heaters please contact your local Hot Box Representative.

Heat Trace Tape

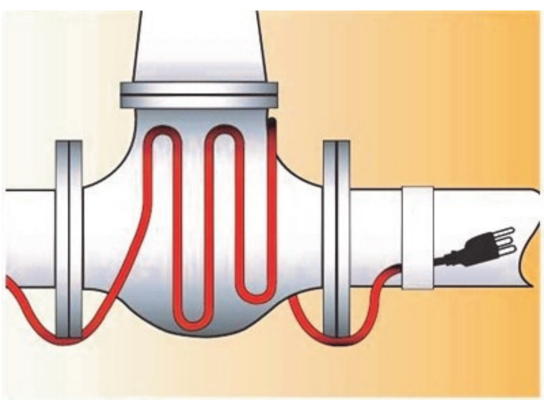
Benefits and Features:

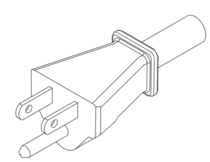
- **Energy Efficient & Self-Regulating -** The electrical resistance of the heat trace tape varies with temperature. As the process temperature drops the heat output increases; as the process temperature rises the heat output decreases.
- **Fast and Easy Installation -** Single overlap cable and 3' power cord and plug.
- **Freeze Protection -** Protects equipment from external temperatures as low as -30°F (-34.4°C).
- **Durable -** Commercial grade design suitable for wet environments.

Note: Heat trace tape does not respond to a drop in ambient temperature. It responds to abject cooling of surfaces such as the piping risers and backflow prevention device. It does not heat along the entire cable at one time. The tape uses a sensory bulb and is self regulating, heating only those sections of tape that are required to warm the cooled portions of the piping risers and backflow prevention device.

Standards:

- UL Listed
- CSA Certified for commercial/residential pipe freeze protection applications





NEMA 5–15P
(120V)

MODEL	WATTAGE	VOLTAGE	PHASE	CABLE LENGTH (ft)	WEIGHT (lbs)	RECOMMENDED CIRCUITS	PLUG
C001266	30	120	1	6	.50	15 AMP	NEMA 5–15P
C001267	60	120	1	12	1.00	15 AMP	NEMA 5–15P
C001269	90	120	1	18	1.50	15 AMP	NEMA 5–15P

Contact Hot Box if you do not see the heat trace tape you are looking for.

Installation:

1. Contractors other than Hot Box® are responsible for the installation of the G.F.I. protected service and receptacles (ref. UL 943, NEMA 3R). When multiple heaters are required it is recommended that each heater be on a separate 15 amp circuit. Separate circuits help provide redundancy in the event that one circuit fails. All installations to be in accordance with the local and national codes.
2. Wrap heat trace tape in a spiral or straight line (depending on length of the heat tape) about the pipe risers and backflow device. Avoid overlapping the heat tape.
3. Secure heat trace tape on 12” centers using only glass cloth tape or plastic cable ties. Restrain the plug end of the cord to provide proper strain relief.
4. Pipe insulation is not a requirement. If insulating the pipe, use only a fire resistant thermal insulation, such as fiberglass pipe wrap.
5. Plug cable into 120V ground fault circuit protected outlet.

Maintenance:

Perform the following maintenance prior to installation and at least once per season, preferably before energizing the system, or immediately after any work has taken place on the piping system:

- Check to be sure heating cable is free from mechanical or thermal damage (cuts or nicks in the cable insulation from utility knife, use of metal clamps, solder or overheating).
- Use Megohmmeter to test each circuit (see below).

Megohmmeter Testing Procedure (Use only 2500VDC megohmmeter for this test):

- Check insulation resistance between each lead of the heating cable and the round ground lug on the power cord plug.
- Perform the test by placing one lead of the megohmmeter on the round ground lug and the other on one of the rectangular power lugs. You should read 1000 megohms minimum.
- Perform the test again by checking the opposite rectangular power lug. Again the reading should be 1000 megohms minimum.

Note: If you read less than 1000 megohms on either lead, the cable needs to be replaced. Do not attempt to repair the unit. Replace with new product. The megohm readings along with the test date should be recorded.

Warning! - *A ground fault circuit interrupting device shall be installed in the electrical supply circuit to the heater(s). Failure to do so may result in injury or death. The interior of this enclosure can be a damp location.*

Warning! - *Hazard of severe shock, disconnect all power before servicing.*

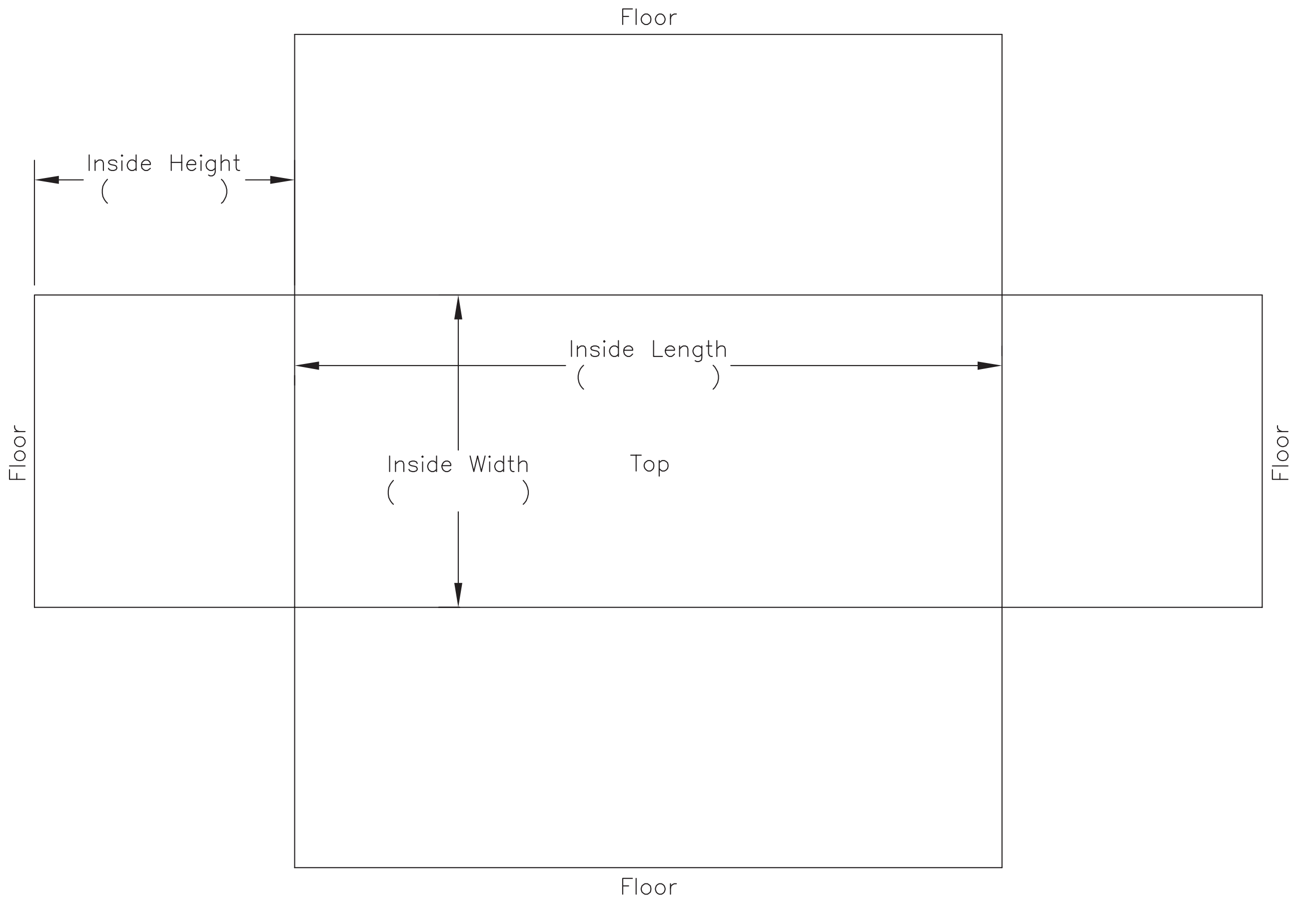
Warning! - *Avoid contact. The heater surface is HOT.*

For replacement heaters please contact your local Hot Box Representative.

Hot Box Order Form

HOT BOX ORDER FORM

Catalog #____________________________________. Size____________________________________.

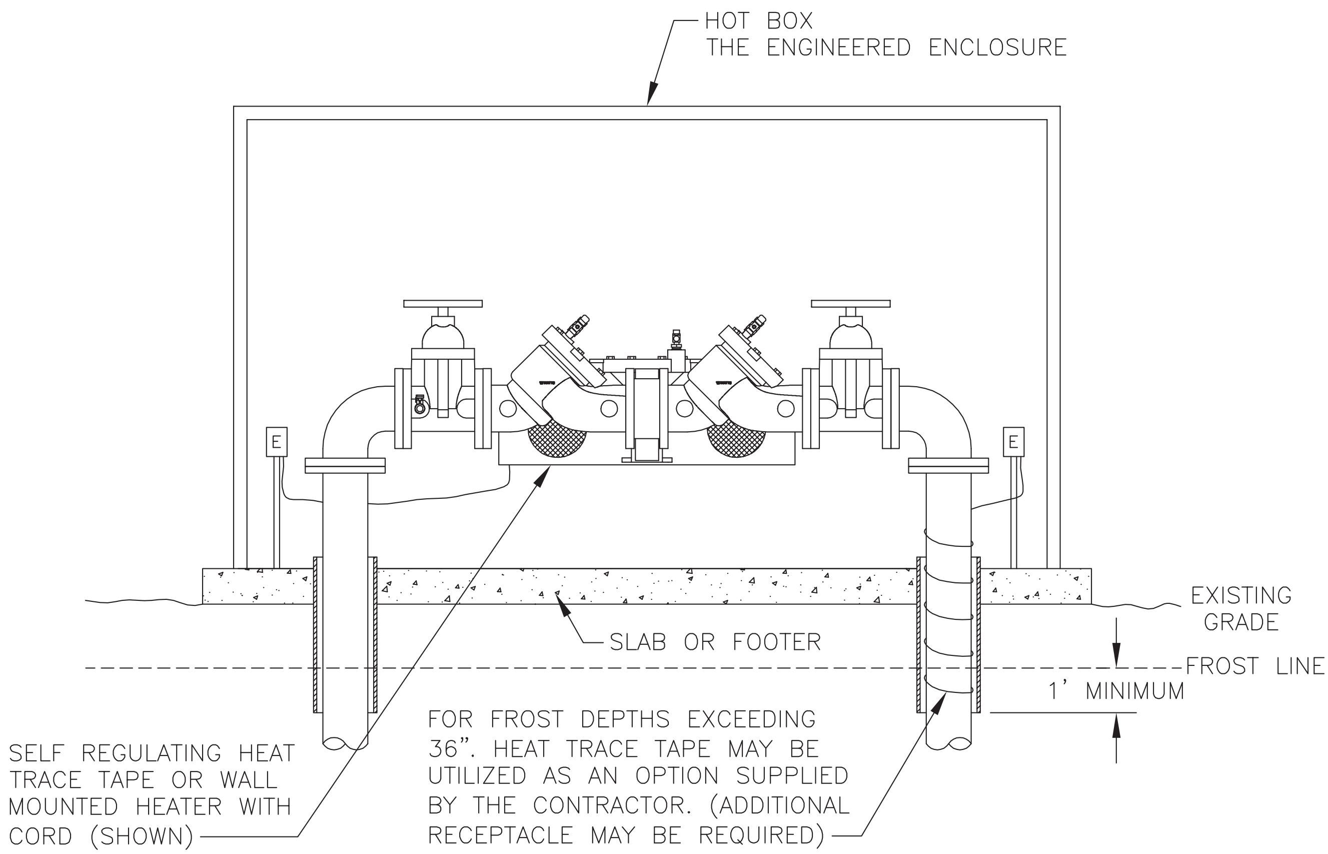


Locate penetrations by giving dimensions from the centerline to the floor.

________	Enclosure Style	________	FDC boot
________	Heat (yes/no)	________	Penetrations/Size
________	Vented	________	Special Door/location
________	Exhaust Fan	________	Color
________	Alarm/Style	________	BFP Model/optional
________	Lights		

TYPICAL WINTERIZATION FOR 3"–10" BFP RISERS

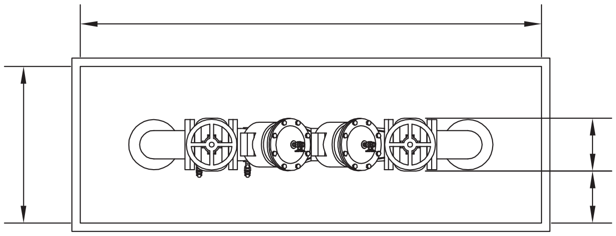
(RECOMMENDED COLD WEATHER INSTALLATION)



NOTE: UTILIZATION OF THIS RECOMMENDATION LIES WITH THE PROJECT ENGINEER AND/OR UTILITY. HOW IT IS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH THE ENGINEERING AND/OR UTILITY SPECIFICATION.

Typical Installation-Single

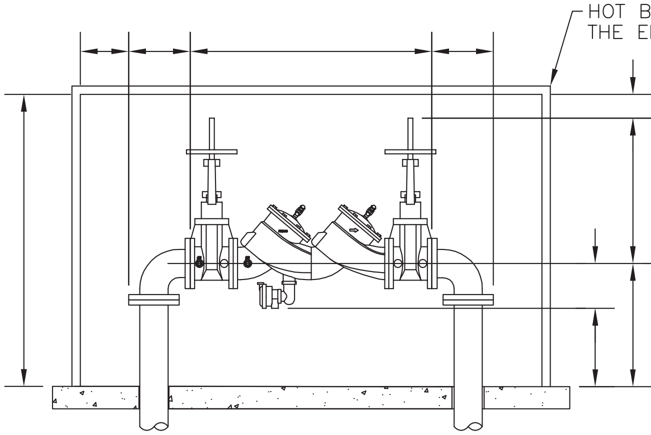
SINGLE INSTALLATION



PIPE SIZE: ____________________
BACKFLOW: ____________________
VALVE TYPE: ____________________

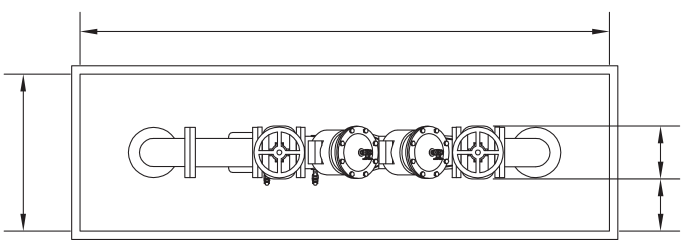
HOTBOX P/N: ____________________

HOT BOX
THE ENGINEERED ENCLOSURE



- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
- INSULATED ENCLOSURES ARE INTERNALLY LINED WITH POLYISOCYANATE FOAM FOR A MINIMUM R8 VALUE.
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

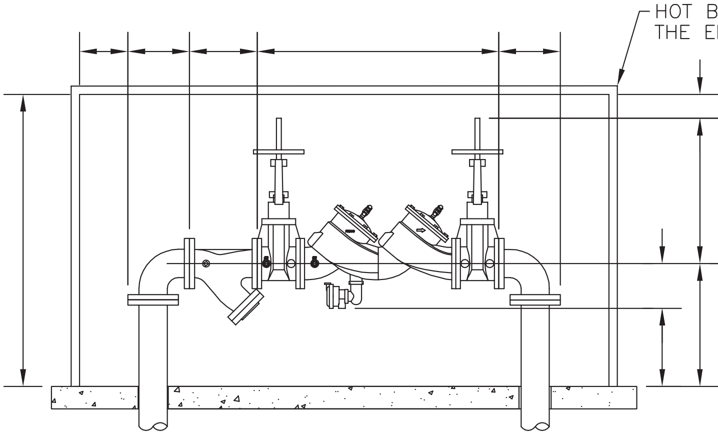
SINGLE W/ STRAINER INSTALLATION



PIPE SIZE: ____________________
BACKFLOW: ____________________
VALVE TYPE: ____________________
STRAINER: ____________________

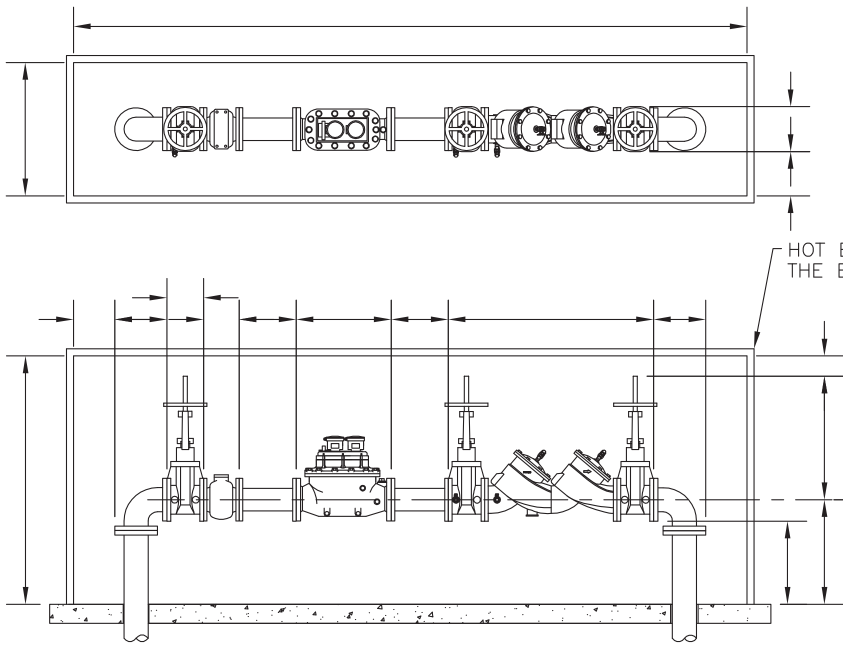
HOTBOX P/N: ____________________

HOT BOX
THE ENGINEERED ENCLOSURE



- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
- INSULATED ENCLOSURES ARE INTERNALLY LINED WITH POLYISOCYANATE FOAM FOR A MINIMUM R8 VALUE.
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

SINGLE W/ METER INSTALLATION

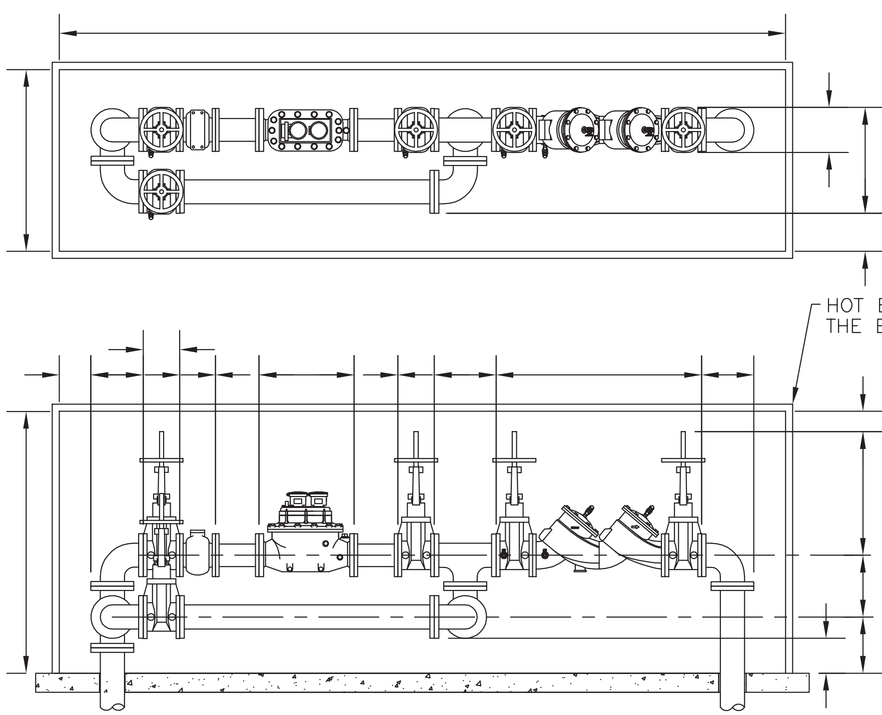


PIPE SIZE: ____________________
BACKFLOW: ____________________
METER: ____________________
STRAINER: ____________________
VALVE: ____________________

HOTBOX P/N: ____________________

- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
- INSULATED ENCLOSURES ARE INTERNALLY LINED WITH POLYISOCYANATE FOAM FOR A MINIMUM R8 VALUE.
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

SINGLE W/ METER & BYPASS INSTALLATION



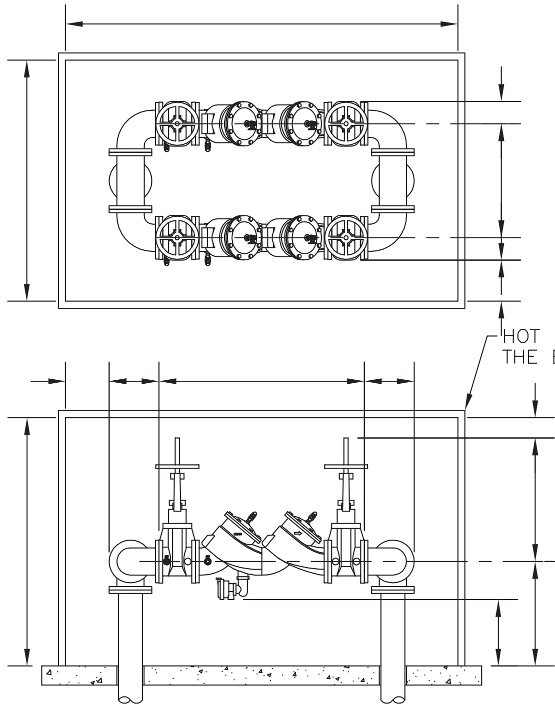
PIPE SIZE: ____________________
BACKFLOW: ____________________
METER: ____________________
STRAINER: ____________________
VALVE: ____________________

HOTBOX P/N: ____________________

- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
- INSULATED ENCLOSURES ARE INTERNALLY LINED WITH POLYISOCYANATE FOAM FOR A MINIMUM R8 VALUE.
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

Typical Installation-Dual

DUAL INSTALLATION



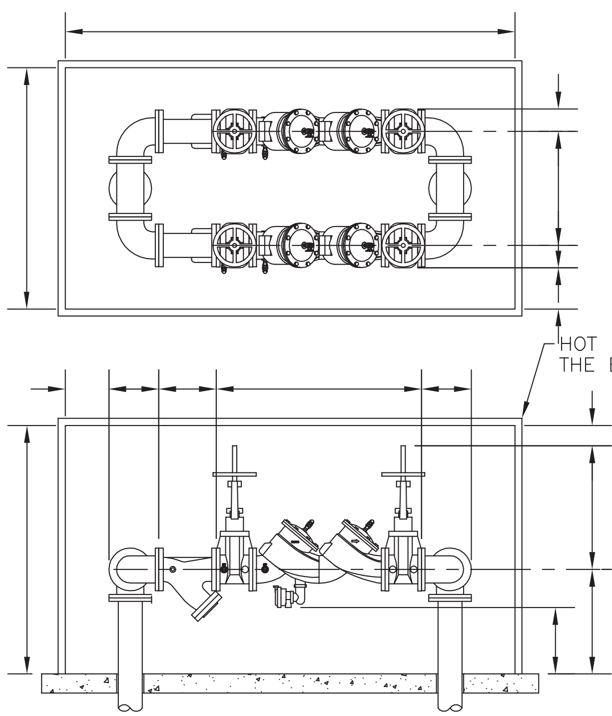
PIPE SIZE "A": ____________
BACKFLOW "A": ____________

PIPE SIZE "B": ____________
BACKFLOW "B": ____________

HOTBOX P/N: ____________

- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
- INSULATED ENCLOSURES ARE INTERNALLY LINED WITH POLYISOCYANATE FOAM FOR A MINIMUM R8 VALUE.
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

DUAL W/ STRAINER INSTALLATION



PIPE SIZE "A": ____________
BACKFLOW "A": ____________
STRAINER "A": ____________

PIPE SIZE "B": ____________
BACKFLOW "B": ____________
STRAINER "B": ____________

HOTBOX P/N: ____________

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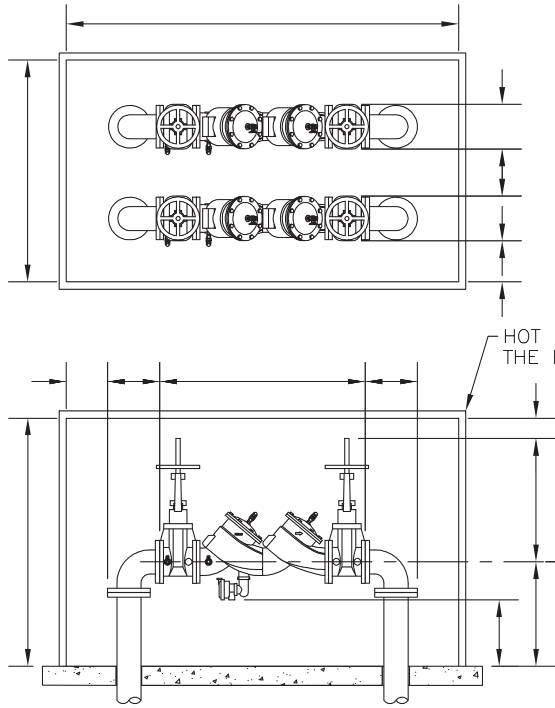
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

TANDEM INSTALLATION



PIPE SIZE "A": ____________

BACKFLOW "A": ____________

PIPE SIZE "B": ____________

BACKFLOW "B": ____________

HOTBOX P/N: ____________

- RECOMMENDED SLAB SIZE IS 12" LARGER THAN THE INTERIOR DIMENSIONS OF THE SPECIFIED ENCLOSURE AND 4" THICK.
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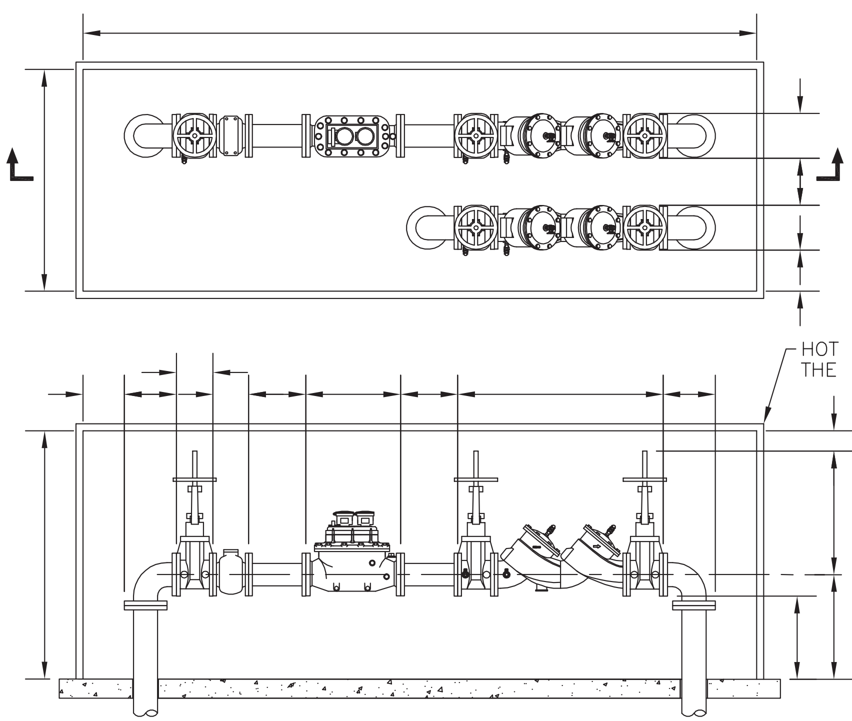
- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

TANDEM W/ METER INSTALLATION



PIPE SIZE "A": ____________

BACKFLOW "A": ____________

METER "A": ____________

STRAINER "A": ____________

VALVE "A": ____________

PIPE SIZE "B": ____________

BACKFLOW "B": ____________

HOTBOX P/N: ____________

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- MANUFACTURER RECOMMENDS ENCLOSURES HAVE A UL OR ETL LISTED HEAT SOURCE WHEN IT IS DETERMINED THAT FREEZE PROTECTION IS NEEDED. HEATED ENCLOSURES HAVE A "H" PREFIX AND UNHEATED ENCLOSURES HAVE A "L" PREFIX.
- IF A STRAINER IS REQUIRED IT IS LOCATED BEFORE THE BFP.

BACKFLOW PREVENTION ASSEMBLY ENCLOSURE SPECIFICATION-DURA FOLD®

GENERAL

1.1 WORK INCLUDED

A. Provide and install manufactured backflow prevention assembly enclosure.

1.2 QUALITY ASSURANCE

A. Qualifications: The backflow prevention assembly enclosure manufacturer shall be a company specializing in the manufacture of backflow prevention assembly enclosures with at least 29 years of successful experience designing and selling enclosures to various customers in different climatic regions.

1.3 STORAGE AND HANDLING

A. Store products in shipping containers and maintain in dry place until installation.

1.4 ACCEPTABLE MANUFACTURERS

A. Hot Box® or Engineer approved equal.

1.5 REFERENCES

A. ASTM B209.

B. ASTM B221.

C. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Backflow Prevention assemblies.

PRODUCTS

2.1 DURA FOLD® ENCLOSURES

A. Dura Fold® Enclosures ship assembled to allow quick installation by securing to the concrete pad with the supplied anchor pads and wedge anchors. The design includes hinged walls, as well as front and top lids, to provide easy access. Also the front wall is easily removed to provide unobstructed access for equipment testing and maintenance after installation.

B. Drain ports are sized for full port backflow discharge and are designed for a one way operation allowing backflow discharge but not allowing wind, debris and small animals to enter the enclosure.

C. Standard enclosures shall be designed to support a minimum vertical load of 100 lb/sf.

D. Standard enclosures shall be designed to support wind speeds up to 80 mph.

E. Standard enclosures are ASSE 1060 certified.

F. Custom Dura Fold Enclosures are designed and constructed in the same manner as standard certified enclosures, but have not been lab tested and listed by ASSE.

2.2 MATERIALS OF FABRICATION

A. Aluminum sheeting shall be 3003 aluminum (.050”/18 gauge), stucco embossed finish and shall meet ASTM B209. Stucco embossed finish reduces the glare and helps hide surface scratches or imperfections received in the field.

B. Bracing shall be 6063-T52 aluminum and shall meet ASTM B221

C. No wood or particle board should be used in the construction of the enclosure.

D. Anchor pads shall be galvanized steel. 3/8-16 unc x 2 ¾ long zinc plated wedge anchors are supplied.

E. Insulation shall be approximately 1.5″ unicellular, non-wicking, polyisocyanate foam sprayed in place that forms a monolithic bond between the aluminum bracing and aluminum sheeting.

F. The Insulation shall have the following properties:

- R-Value: 10
- Dimensional Stability: <2% linear change
- Compressive Strength: 51 psi
- Flame point: 325 degrees
- Water absorption: .037 psf
- Porosity: 91%

3.1 HEATING EQUIPMENT (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

A. Heating equipment will protect the piping and equipment from exterior temperatures to -30F. ETL listed thermostatically controlled wall mounted air forced heaters or UL listed self regulating cable(s) shall be furnished and designed by the manufacturer of the enclosure to maintain the equipment at +40F, In accordance with ASSE 1060 1.2.2.1.

B. Heating equipment shall be wall mounted to the supplied heater plates and a minimum 8” above the slab unless it is UL or ETL certified and NEC approved for submersion.

C. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA 3R. Mounted a minimum of 8” from the bottom of the receptacle to the top of the slab.

D. Separate 20 amp circuits are recommended for each heater, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.

E. The heaters shall be ETL listed for wet/damp locations.

4.1 RECOMMENDED SLAB SIZE & INSTALLATION

A. The recommended slab size shall be 12” larger than the interior dimensions of the enclosure and a minimum of 4” thick.

B. The enclosure shall be assembled per the manufacturer's instructions provided with the enclosure.

GENERAL

1.1 WORK INCLUDED

A. Provide and install manufactured backflow prevention assembly enclosure.

1.2 QUALITY ASSURANCE

A. Qualifications: The backflow prevention assembly enclosure manufacturer shall be a company specializing in the manufacture of backflow prevention assembly enclosures with at least 29 years of successful experience designing and selling enclosures to various customers in different climatic regions.

1.3 STORAGE AND HANDLING

A. Store products in shipping containers and maintain in dry place until installation.

1.4 ACCEPTABLE MANUFACTURERS

A. Hot Box® or Engineer approved equal.

1.5 REFERENCES

A. ASTM B209.

B. ASTM B221.

C. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Backflow Prevention assemblies.

PRODUCTS

2.1 SECTIONALIZED ALUMINUM ENCLOSURES

A. Sectionalized enclosures are factory assembled with tongue and grooved sections that slide together and are then secured to the concrete pad with the supplied anchor pads and wedge anchors.

B. Access panels have a four point locking system with pad lockable handle and are completely removable.

C. Drain ports are sized for full port backflow discharge and are designed for a one way operation allowing backflow discharge but not allowing wind, debris and small animals to enter the enclosure.

D. Standard enclosures shall be designed to support a minimum vertical load of 100lb/sf.

E. Standard enclosures up to 36"W x 105"L x 64"H shall be designed to support wind speeds up to 120 mph, all larger sizes shall be designed to support wind speeds up to 80 mph.

F. Standard enclosures are ASSE 1060 certified.

G. Custom enclosures are designed and constructed in the same manner as standard certified enclosures, but have not been lab tested and listed by ASSE.

2.2 MATERIALS OF FABRICATION

A. Aluminum sheeting shall be 3003 aluminum (.050/18 gauge), stucco embossed finish and shall meet ASTM B209. Stucco embossed finish reduces the glare and helps hide any surface scratches or imperfections received in the field.

B. Bracing shall be 6063-T52 aluminum and shall meet ASTM B221.

C. No wood or particle board should be used in the construction of the enclosure.

D. Anchor pads shall be galvanized steel. 3/8-16 unc x 2 ¾ long zinc plated wedge anchors are supplied.

E. Insulation shall be approximately 1.5" unicellular, non-wicking, polyisocyanate foam sprayed in place that forms a monolithic bond between the aluminum bracing and aluminum sheeting.

F. The Insulation shall have the following properties:

• R-Value:	10
• Dimensional Stability:	<2% linear change
• Compressive Strength:	51 psi
• Flame point:	325 degrees
• Water absorption:	.037 psf
• Porosity:	91%

3.1 HEATING EQUIPMENT (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

A. Heating equipment will protect the piping and equipment from exterior temperatures to -30F. ETL listed thermostatically controlled wall mounted air forced heaters shall be furnished and designed by the manufacturer of the enclosure to maintain the equipment at +40F, In accordance with ASSE 1060 1.2.2.1.

B. Heating equipment shall be wall mounted to the supplied heater plates and a minimum of 8" above the slab unless it is UL or ETL certified and NEC approved for submersion.

C. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA 3R. Mounted a minimum of 8" from the bottom of the receptacle to the top of the slab.

D. Separate 20 amp circuits are recommended for each heater, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.

E. The heaters shall be ETL listed for wet/damp locations.

4.1 RECOMMENDED SLAB SIZE & INSTALLATION

A. The recommended slab size shall be 12" larger than the interior dimensions of the enclosure and a minimum of 4" thick.

B. The enclosure shall be assembled per the manufacturer's instructions provided with the enclosure.

GENERAL

1.1 WORK INCLUDED

A. Provide and install manufactured backflow prevention assembly enclosure.

1.2 QUALITY ASSURANCE

A. Qualifications: The backflow prevention assembly enclosure manufacturer shall be a company specializing in the manufacture of backflow prevention assembly enclosures with at least 29 years of successful experience designing and selling enclosures to various customers in different climatic regions.

1.3 STORAGE AND HANDLING

A. Store products in shipping containers and maintain in dry place until installation.

1.4 ACCEPTABLE MANUFACTURERS

A. Hot Box® or Engineer approved equal.

1.5 REFERENCES

A. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Backflow Prevention assemblies.

PRODUCTS

2.1 DESIGNER SERIES™ ENCLOSURES

A. Enclosures shall have front and back hinged doors that are removable for full access to both sides of the equipment for maintenance and testing.

B. Enclosures shall have a removable hinged top with gas shocks to support and secure the lid in an upright position for full access to the top of the equipment for maintenance and testing.

C. Doors shall be secured from the interior of the enclosure and shall have no exterior handles or lock exposed to the elements.

D. The top is lockable to deter unauthorized entry, theft and vandalism.

E. Anchoring is supplied to secure to the concrete pad.

F. Drain ports are sized for full port backflow discharge and are designed for a one way operation allowing backflow discharge but not allowing wind, debris and small animals to enter the enclosure.

G. Standard enclosures shall be designed to support a minimum vertical load of 100 lb/sf.

H. Standard enclosures shall be designed to support wind speeds up to 120 mph.

I. Standard enclosures shall be ASSE 1060 certified.

2.2 MATERIALS OF FABRICATION

A. Fiberglass is minimum of 1/8" thick Thixotropic polyester resin reinforced with fiberglass strand. A smooth yacht quality finish, protected with UV inhibited isophthalic polyester gel coat.

B. No wood or particle board should be used in the construction of the enclosure.

C. Anchor pads shall be galvanized steel. 3/8-16 unc x 2 ¾ long zinc plated wedge anchors and drill bit are supplied.

D. Insulation shall be 1.5" unicellular, non-wicking, polyisocyanate foam frothed applied to form a monolithic bond to the fiberglass and is not affected by heat or cold. No clips or fasteners shall be used.

E. The Insulation shall have the following properties:

• R-Value:	10
• Dimensional Stability:	<2% linear change
• Compressive Strength:	51 psi
• Flame point:	325 degrees
• Water absorption:	.037 psf
• Porosity:	91%

3.1 HEATING EQUIPMENT (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

A. Heating equipment will protect the piping and equipment from exterior temperatures to -30F. ETL listed thermostatically controlled wall mounted air forced heaters shall be furnished and designed by the manufacturer of the enclosure to maintain the equipment at +40F, In accordance with ASSE 1060 1.2.2.1.

B. Heating equipment shall be wall mounted to the supplied heater plates and a minimum 8" above the slab unless it is UL or ETL certified and NEC approved for submersion.

C. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA 3R. Mounted a minimum of 8" from the bottom of the receptacle to the top of the slab.

D. Separate 20 amp circuits are recommended for each heater, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.

E. The heaters shall be ETL listed for wet/damp locations.

4.1 RECOMMENDED SLAB SIZE & INSTALLATION

A. The recommended slab size shall be 12" larger than the interior dimensions of the enclosure and a minimum of 4" thick.

B. The enclosure shall be assembled per the manufacturer's instructions provided with the enclosure.

GENERAL

1.1 WORK INCLUDED

A. Provide and install manufactured backflow prevention assembly enclosure.

1.2 QUALITY ASSURANCE

A. Qualifications: The backflow prevention assembly enclosure manufacturer shall be a company specializing in the manufacture of backflow prevention assembly enclosures with at least 29 years of successful experience designing and selling enclosures to various customers in different climatic regions.

1.3 STORAGE AND HANDLING

A. Store products in shipping containers and maintain in dry place until installation.

1.4 ACCEPTABLE MANUFACTURERS

A. Hot Box® or Engineer approved equal.

1.5 REFERENCES

A. ASTM B209.

B. ASTM B221.

C. ASSE 1060 - Performance Requirements for Outdoor Enclosures for Backflow Prevention assemblies.

PRODUCTS

2.1 FIBERGLASS ENCLOSURES

A. Available in Drop over, Flip top, Vent Guard, Valve Cover & Roks.

B. All fiberglass enclosures are lockable.

C. Anchoring is supplied to secure to the concrete pad.

D. Drain ports are sized for full port backflow discharge and are designed for a one way operation allowing backflow discharge but not allowing wind, debris and small animals to enter the enclosure.

E. Standard enclosures shall be designed to support a minimum vertical load of 100 lb/sf.

F. Standard enclosures shall be designed to support wind speeds up to 120 mph.

G. Standard enclosures are ASSE 1060 certified.

2.2 MATERIALS OF FABRICATION

A. Fiberglass is minimum of 1/8" thick Thixotropic polyester resin reinforced with fiberglass strand. A smooth yacht quality finish, protected with UV inhibited isophthalic polyester gel coat.

B. Non molded products will utilize an Industrial exterior texture.

C. No wood or particle board should be used in the construction of the enclosure.

D. Insulation shall be 1"-1.5" unicellular, non-wicking, polyisocyanate foam frothed or sprayed in place.

E. The Insulation shall have the following properties:

• R-Value:	8
• Dimensional Stability:	<2% linear change
• Compressive Strength:	51 psi
• Flame point:	325 degrees
• Water absorption:	.037 psf
• Porosity:	91%

3.1 HEATING EQUIPMENT (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

A. Heating equipment will protect the piping and equipment from exterior temperatures to -30F. ETL listed thermostatically controlled wall mounted air forced heaters or UL listed self regulating cable(s) shall be furnished and designed by the manufacturer of the enclosure to maintain the equipment at +40F, In accordance with ASSE 1060 1.2.2.1.

B. Heating equipment shall be wall mounted to the supplied heater plates and a minimum 8" above the slab unless it is UL or ETL certified and NEC approved for submersion.

C. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA 3R. Mounted a minimum of 8" from the bottom of the receptacle to the top of the slab.

D. Separate 20 amp circuits are recommended for each heater, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.

E. The heaters shall be ETL listed for wet/damp locations.

4.1 RECOMMENDED SLAB SIZE & INSTALLATION

A. The recommended slab size shall be 12" larger than the interior dimensions of the enclosure and a minimum of 4" thick.

B. The enclosure shall be assembled per the manufacturer's instructions provided with the enclosure.

Hot Box® Catalog Numbering System

1 Type	2 Hot Box Style	3, 4, 5 Width	6, 7, 8 Length	9, 10, 11 Height	12 Color Options***	13 Lights
H-Heated (Hotbox)	A-Aluminum	**(Interior Width)**	**(Interior Length)**	**(Interior Height)**	A-Standard	A-Standard
L-Unheated (Lokbox)	C-Valve Cover				B-Black	B-(1) 24" light
V-Non-Insulated (Valve Guard)	D-Dura Fold				C-Grey	C-(2) 24" light
G-Glass Pad	E-EZ Box				E-Brown (Roks Only)	E-(4) 24" light
	F-Flip-Top Fiberglass				G-Dark Green	F-(1) Haz light
	G-Glass Pad				L-Smooth Mill Finish Aluminum	G-(2) Haz light
	L-Low Profile				M-Federal Brown	
	M-Designer Series				N-Granite	
	N-EZ Box w/ doors				S-Desert Rose	
	P-Poly EZ Box				T-Beige	
	Q-PolyRock				W-White (Sail)	
	R-Hot Rock Fiberglass				**Specials "500#" Digits 12, 13, & 14**	
	V-Vent guard					

*****Note: When no options are needed, no color code is needed for standard colors. With ordering options, if standard color is acceptable, then use an "A" in the 12th digit. See page 49 for details on color and finish options.**

14 **Fans**	15 **Alarms**
A-Standard	A-Standard
B-7″ Fan	B-PLAHBO audible pwr loss
C-10″ Fan	C-PLAHBOS strobe pwr loss
D-12″ Fan	D-PLAHBO-T audible pwr & temp
E-12″ Expl Proof	E-PLAHBOS-T strobe pwr & temp
F- FDC (4″-9″)	F-PLAHBOT-S aud/ strobe pwr loss & low temp
G- FDC (9″-16″)	
V-Vents	

Sample Hot Box Catalog Number

HD03209 0057 M A AB

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Type (Heated)

Style (Dura Fold)

Size (32 x 90 x 57)

Color Option (Federal Brown)

Lights (None-Standard)

Fans (None-Standard)

Alarms (PLAHBO audible pwr loss)

HUBBELL LENOIR CITY, INC.
TERMS & CONDITIONS OF SALES

Hubbell Lenoir City, Inc. (hereinafter called HLC) hereby gives notice of its exception to any different or additional terms and conditions other than as stated herein. All sales are expressly made conditional on Buyer's assent to the following terms and conditions. Buyer's acceptance of the provisions of HLC's terms and conditions as recited herein shall be conclusively presumed upon Buyer's receipt of the goods, or if no written objection is received by HLC within fifteen (15) days from the date on HLC's order acknowledgment, whichever event shall first occur. These terms and conditions constitute the entire agreement between HLC and Buyer, and supersede other communications between the two parties, whether written or oral.

PRICING

Refer to appropriate Price Schedule, unless otherwise quoted.

TERMS

HLC's payment terms are net 30 days. Invoices will be dated the day of shipment. A service charge of 1-1/2% per month or, if such rate exceeds the maximum lawful rate, the maximum lawful rate shall be assessed on all past due accounts and shall be payable on demand.

QUOTATIONS

Unless otherwise stated in writing, HLC's quotations are subject to acceptance by the Buyer within thirty (30) days from the date of issue.

SALES AND SIMILAR TAXES

HLC's prices do not include any sales, use, excise or similar taxes. Consequently, in addition to the price specified herein, the amount of any present or future sales, use, excise or other similar tax applicable to the sale or use of the goods hereunder, shall be paid by the Buyer, or in lieu thereof the Buyer shall provide HLC with a tax exemption certificate acceptable to the taxing authorities.

ACCEPTANCE OF ORDERS

All orders are subject to acceptance by HLC at its main office at 3621 Industrial Park Drive, Lenoir City, TN, USA, and to "HLC Terms and Conditions of Sales". Any other terms proposed by Buyer are rejected unless expressly accepted in writing. Orders shall be deemed to be executed in the State of Tennessee and shall be construed and performed in accordance with the Laws of that State. Acceptance of any order is subject to availability of product and the ability of HLC to deliver. Orders will be billed at prices in effect at time of shipment unless otherwise agreed. Unless, otherwise stated in writing, HLC reserves the right to ship plus or minus 10% of specified quality for special products that are made to order.

SALES BY AGENTS

Sales by agents or through overseas representatives shall be at prices, terms and conditions of sale specified by HLC. All invoices will be issued by and payment remitted to HLC.

DELAY

HLC will use reasonable efforts to meet shipment or delivery dates specified by HLC, but such dates are estimates only. HLC shall in no event be liable for any delay or nondelivery if such delay or nondelivery is caused directly or indirectly by Acts of God, fire, flood, strike or lockout or other labor dispute, accident, civil commotion, riot, war, governmental regulation or order, whether or not it later proves to be invalid, or from any other cause or causes (whether or not similar to any of the foregoing) beyond HLC's control. In no case will HLC be liable for loss of profits or any special or consequential damages on account of any delay in delivery or nondelivery whether or not excused hereunder.

SHIPPING DEFERMENT

Buyer requests for shipping deferment must be approved by HLC and are subject to price negotiation.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

MATERIAL: HLC warrants all products sold by it to be merchantable (as such term is defined in the Uniform Commercial Code) and to be free from defects in material and workmanship for a period of one (1) year (or as otherwise specified) from the date of original shipment by HLC when stored, installed, operated or maintained in accordance with recommendations of HLC and standard industry practice and when used under proper and normal use. Buyer must notify HLC promptly of any claim under this warranty. NO OTHER WARRANTY, WHETHER EXPRESS OR ARISING BY OPERATION OF THE LAW, COURSE OF DEALING, USAGE OF TRADE OR OTHERWISE IMPLIED, SHALL EXIST IN CONNECTION WITH HLC'S PRODUCTS OR ANY SALE OR USE THEREOF. HLC SHALL IN NO EVENT BE LIABLE FOR ANY LOSS OF PROFITS OR CONSEQUENTIAL OR SPECIAL DAMAGES INCURRED BY BUYER. HLC's warranty shall run only to the first Buyer of a product from HLC, from HLC's Buyer, or from an original goods manufacturer reselling HLC's product, and is non-assignable and non-transferable and shall be of no force and effect if asserted by any person other than such first Buyer. This warranty applies only to the use of the product as intended by HLC and does not cover any modification, misapplication, alteration, repair or misuse of said product by Buyer or others, or for damage caused thereto by negligence, accident, or improper use by Buyer or others. This warranty does not include reimbursement for the expenses of labor, transportation, removal or reinstallation of products. Products may contain certain cosmetic imperfections that do not impact the Product's performance;

these cosmetic imperfections are not considered defects in material or workmanship and shall not be covered by any HLC warranty.

APPLICATION: HLC does not warrant the accuracy of and results from product or system performance recommendations resulting from any engineering analysis or study. This applies regardless of whether a charge is made for the recommendation, or if it is provided free of charge. Responsibility for selection of the proper product of application rests solely with the Buyer. In the event of errors or inaccuracies determined to be caused by HLC, its liability will be limited to the reperformance of any such analysis or study.

BUYER INSPECTIONS: Tests, inspections and acceptance of all material must be made at the factory. Buyer's inspectors are welcome at the factories and are provided with the necessary facilities for carrying out their work. Name and phone number of who should be contacted for inspection should be given to HLC no later than two weeks prior to scheduled shipment date.

LIMITATION OF LIABILITY: IN NO EVENT AND UNDER NO CIRCUMSTANCES, WHETHER AS A RESULT OF BREACH OF CONTRACT OR WARRANTY OR ALLEGED NEGLIGENCE, SHALL HLC BE LIABLE TO BUYER OR ANY OTHER PERSON FOR ANY INDIRECT , SPECIAL OR CONSEQUENTIAL, OR INCIDENTIAL LOSSES OR DAMAGES INCLUDING, WITHOUT LIMITATION DAMAGE TO OR LOSS OF PROFITS OR REVENUE, LOST SALES, LOSS OF USE OF THE GOODS OR ANY ASSOCIATED GOODS, OR DELAY OR FAILURE TO PERFORM THIS WARRANTY OBLIGATION, LOSS OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES OR SERVICES, DOWNTIME COSTS, OR CLAIMS OF THIRD PARTIES OF THE BUYER FOR SUCH DAMAGES ARISING OUT OF OUR IN CONNECTION WITH THE SALE, INSTALLATION, USE OF, INABILITY TO USE, OR THE REPAIR OR REPLACMENT OF, HLC's PRODUCTS. Any warranty claim by Buyer shall be deemed waived by Buyer unless submitted to HLC in writing within thirty (30) days from the date Buyer discovered, or by reasonable inspection should have discovered the alleged breach. Any warranty claim shall be brought within one year of discovery of alleged defect or non-conformity. Upon prompt written notice by the Buyer that a product is defective or non-conformity, HLC's liability shall be limited to repairing or replacing the product, at HLC's option.

<u>DISCLAIMER OF WARRANTY</u>: THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, EXPRESSED OR IMPLIED. THERE IS NO WARRANTY OF FITNESS OF ANY PRODUCT FOR A PARTICULAR PURPOSE.

FREIGHT ALLOWANCE and F.O.B. POINT

All shipments are F.O.B. origin. Risk of loss and title of goods shall pass to Buyer upon delivery to the designated carrier. Freight is prepaid and allowed on all shipments of products with a net order value of $7,500 and above to destinations within the Continental United States and Canada. Shipments to Alaska and Hawaii are F.O.B. Pacific Coast docks, collect beyond. Tool trailers will be F.O.B. HLC's dock – no freight allowed.

HLC reserves the right to route all qualified freight allowed shipments via least expensive surface route within the Continental United States and Canada. Buyer will assume all charges for transportation specified via more expensive means. Acceptance of a specified routing does not constitute a guarantee of ship date, transit time or arrival date. HLC will not be responsible for any cartage or storage charges at destination.

HLC's responsibility for exception-free delivery ceases when the transportation company receives shipment in good condition. Claims for loss or damage must be reported directly to the carrier. HLC's willingness to assist does not indicate liability for claim or replacement.

PARTIAL RELEASE

If an order has multiple releases specified by the Buyer, each release will be treated as individual orders, relative to freight allowance and minimum billing.

BACK ORDERS

Back orders that are the responsibility of HLC will be shipped F.O.B. factory or point of shipment with freight prepaid and allowed via the most cost effective method, providing the original order qualified for freight allowance.

MINIMUM BILLING

Standard Orders -- $400 net per order. Minimum waived on <u>hardware only</u> orders. $40 surcharge for below minimum orders.

ORDER ADD-ON POLICY

HLC's "Add-On" policy allows you to add items to an existing unshipped order for up to fifteen (15) days from the entry date of the original order.

DELIVERY SCHEDULE

Shipping dates provided by HLC are estimates only. Based on these estimated shipping dates, HLC makes every reasonable effort to meet Buyer's shipping requirements provided HLC promptly receives all necessary information from Buyer and approved drawings if required by HLC. HLC will not assume liability because of delayed shipment for any reason. HLC's responsibility ceases upon acceptance of shipment by carrier.

CANCELLATIONS

Cancellation of an order for current stock product requires a minimum of five (5) days' notice prior to actual ship date. Stock item orders shipped after cancellation notice is received, but before expiration of the five-day requirement, will be subject to all standard Returned Goods conditions, noted below.

Cancellation on non-stock items may be made only if no work has been performed or material purchased. If cancellation is requested after work is in progress, there will be a cancellation charge as established by HLC.

Orders may not be cancelled unless HLC gives its written consent, and then only upon agreement as to applicable cancellation charges.

RETURNED GOODS CONDITIONS

GENERAL CONDITIONS applying to all transactions in which Buyer seeks to return goods to HLC:

1. *Merchandise is not returnable without the written consent of HLC.*
2. *Request for permission to return merchandise must be made in writing within one year from date of shipment, and Buyer must provide original HLC invoice number with request.*
3. *Material to be returned must be considered standard material by HLC.*
4. *HLC reserves the right to refuse returns of any special or made-to-order material, regardless of condition.*
5. *All returned goods must be in excellent, resaleable condition, and packaged in the original carton. Products will be inspected upon return; and any service or repair needed to place them in first class, saleable condition will be charged and added to the restocking charge.*
6. *A 30% restocking charge will be deducted from all credits issued on authorized returns.*
7. *Return Goods Authorization (RGA) Packing List, supplied by the factory, must accompany the return shipment.*
8. *Return freight must be prepaid. Material must be received by HLC within sixty (60) days of issuance of RGA.*
9. *Net value of the return must not be less than $250.*
10. *HLC reserves the right to deduct for any damage sustained in transit.*
11. *Unauthorized returns will be refused. Goods returned without proper authorization from HLC will, at the sole option of HLC, be returned to the Buyer freight collect or scrapped immediately with no issuance of credit. Unauthorized material included in a return will not be credited.*

BROKEN PACKAGE POLICY

Shipments will be made in standard package quantities or multiples thereof. HLC Customer Service will notify the Buyer of any orders that do not comply. The Buyer must authorize an adjustment to comply with standard package quantities before the order will be entered.

QUOTATION PRICE PROTECTION

All prices shown in the price lists are subject to change without notice.

All quotations on special products or modifications to catalog items are binding only if confirmed in writing by the factory for the period shown on the quotation. Price protection will be provided for a period of thirty (30) days from date of quotation from HLC.

ORDERS

All orders are taken and prices quoted only with the understanding that each order shall be subject to the acceptance of HLC at its principal office upon such terms as we may specify when order is received. Prices to cover amount of any sales or excise tax which now or hereinafter may be imposed by any taxing authority upon this merchandise or the sale or manufacture thereof.

PRODUCT SPECIFICATION

HLC reserves the right to discontinue items, modify designs, and change specifications or prices without incurring obligation.

INVOICING

All invoices are due and payable per the standard terms stated herein. In the case of an apparent discrepancy in a line item charge, Buyer is obligated to advise HLC Customer Service in writing of the nature of the claimed discrepancy within five (5) days of receipt of the invoice. This includes all requests for proof of delivery. A claim of discrepancy does not relieve Buyer of the absolute obligation to pay the remaining balance of the invoice in accordance with the standard terms of payment. HLC, after review, will have sole discretion to resolve the discrepancy; and the Buyer expressly agrees to abide by HLC's decision. HLC will promptly advise Buyer of its decision regarding any disputed items or charges.

OSHA

HLC warrants that at time of shipment, the goods will conform to the applicable occupational safety and health standards promulgated pursuant to the Federal Occupational Safety and Health Act of 1970, which are in effect on the date that HLC enters its acknowledgment of Buyer’s order. The Buyer’s exclusive remedy and HLC's liability for breach of this warranty is limited to replacement of the nonconforming goods.

FAIR LABOR STANDARDS ACT AS AMENDED

HLC represents that any goods to be delivered hereunder will be produced in compliance with the requirements of the Fair Labor Standards Act of 1938, as amended.

NOTE - *These Terms and Conditions supersede all those published and issued previously by Hubbell Lenoir City, Inc., Quazite, CDR Systems, CDR, PenCell, Pen-Cell Plastics, Inc., Polycast, Electrimold, Custom Composites, Western Power Products, Comcore, Hot Box, Windbreaker, and Jandec.*

NOTES:



Hubbell Enclosures
Hubbell Lenoir City, Inc
3621 Industrial Park Drive • Lenoir City, Tennessee 37771
Phone: 800.346.3062 or 865.986.9726 • Fax: 865.986.0585
hotboxsales@hubbell.com
www.hot-box.com

HB-9

www.haleyaldrich.com

BUILDING 1 - SUB-SLAB DEPRESSURIZATION (SSD) SYSTEM
OPERATION AND MAINTENANCE MANUAL
DELPHI AUTOMOTIVE SYSTEMS SITE NO. 828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

by Haley & Aldrich of New York
Rochester, New York

for GM Components Holdings, LLC
Rochester, New York

File No. 127982-012
March 2022

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1. OPERATIONS, MAINTENANCE AND MONITORING PLAN

1.1 Introduction

This Operations, Maintenance, and Monitoring (OM&M) Plan describes the measures necessary to operate, monitor and maintain the mechanical components of the Sub-Slab Depressurization (SSD) systems installed in Building 1. This O&M Plan:

- Includes the steps necessary to operate and maintain the SSD systems at the Site;
- Includes an operation and maintenance contingency plan; and
- Will be updated periodically to incorporate changes in GMCH facility conditions or the manner in which the SSD systems are operated and maintained.

A copy of this OM&M Plan, along with the complete Site Management Plan (SMP), will be kept at the Site. This OM&M Plan is not to be used as a stand-alone document, but as a component of the SMP.

1.2 SSD System Operation and Maintenance

A SSD system was installed within Building 1 at the Site with guidance from the New York State Department of Health (NYSDOH) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006, to mitigate the potential for sub-slab soil vapor intrusion of volatile organic compounds (VOC) into the indoor airspace. The SSD system consists of a six (6) sub-slab suction pits that are each connected via schedule 40 PVC piping to dedicated Radonaway HV-5000, suction fans to provide negative pressure (depressurization) of the sub-slab within occupied areas of Building 1. Each suction fan has a vacuum operating range between 70 cubic feet per minute (CFM) at free air conditions to 15 CFM at 40 inches water column ("W.C."). The location of the installed suction pit locations and rooftop suction fans are presented on Figure 1.

Operation and monitoring of the SSD system is conducted utilizing magnehelic direct reading pressure gauges installed in the conveyance piping. Blower units and associated control panels are located on the roof of the facility along with the exhaust points at least seven (7) feet above roof surfaces and at least the recommended 25-feet from any roof or sidewall openings, or HVAC air intakes per U.S. Environmental Protection Agency (EPA) guidance.

Appendix A provides the as-built drawings indicating the location and configuration of the installed SSD systems in Building 1.

1.2.1 Scope

Operations, maintenance, and monitoring (OM&M) of the SSD systems is intended to be conducted by facility and/or environmental professionals. OM&M will be documented by manually recording observed operating parameters on system operations logs.

1.2.2 System Start-Up and Testing

Prior to initial start-up of the SSD system for each building, electrical checks and pipe pressure testing were completed to ensure a leak tight conveyance system and suction fan operability.

The SSD system suction fans are designed to operate continuously and do not need to be turned on or off as part of routine operations. The systems have vacuum gauges located at the suction pit piping on the (vacuum) side of the SSD suction fans that can be inspected to evaluate performance and to indicate system failure. GMCH Environmental Engineering personnel can view the suction pit vacuum gauge and identify the operating status of the suction fan.

Appendix B provides the equipment manuals and data sheets for the principle components of the installed SSD system.

1.2.3 System Operation: Routine Operation Procedures and Maintenance

The SSD systems operate continuously and do not require manual system operation except for manufacturer recommended maintenance performed in accordance with the SSD system Operations, Maintenance, Monitoring, and Sampling Schedule below.

If equipment readings are not within specification or equipment is observed to be malfunctioning, the system should be shut down to perform maintenance and repair or replacement. Once the repair is complete, the SSD system will be restarted.

The SSD system Operating Data and Maintenance, Monitoring, and Sampling Tracking Sheet will be completed during each routine monitoring event and will include the following information:

- Vacuum measured at Suction Pit Areas (Monthly)
- Sub-slab differential Pressure at the VMPs (Quarterly)
- Effluent Vapor Concentration (as measured by Photo-ionization Detector system) (Annually)

A visual inspection of the accessible components of the system will be conducted during the monitoring event.

1.2.4 System Operation: Non-Routine Equipment & System Maintenance

If the operational devices (vacuum gauges) indicate that the system is not working properly, a system check will be conducted. In general, typical observed conditions requiring non-routine maintenance activities will include assessment of conditions such as:

- Low vacuum readings at the suction pits
- Audible piping system leaks or visible damage

For all troubleshooting and maintenance activities will be conducted in accordance with approved Facility Health and Safety requirements including coordination with GMCH facility Safety Security and Environmental Engineering personnel before conducting maintenance or repair of the SSD systems.

In addition, all maintenance activities shall consider the following procedures:

- If maintenance is needed for the piping from the suction pit isolation butterfly valve to the suction fan inlet valves, the suction pit isolation valve must be closed to prevent sub-slab vapors from entering the piping section during maintenance activities.

- If damage has occurred to or repairs are needed for the piping section from the subsurface suction pit to inlet side of the suction pit isolation butterfly valve, appropriately trained personnel must be used to prevent the potential migration of sub-slab vapors into the facility.

Operational problems and completed maintenance measures must be recorded on the Operations, Maintenance, Monitoring, and Sampling Tracking Sheet provided in Appendix D.

1.3 SSD System Performance Monitoring

Performance monitoring reports and other information generated during regular operations must be kept on-file at the facility. Reports, forms, and other relevant information generated will be available upon request to the NYSDEC and will be submitted as part of the Periodic Review Report (PRR), as specified in Section 5 of the SMP.

1.3.1 Monitoring Schedule

The SSD system monitoring will be in accordance with the SSD system Operations, Maintenance, Monitoring, and Sampling Schedule included in Appendix C. The SSD system Operating Data - Suction Pits Log Sheet, Sub Slab Vacuum Monitoring Data Log Sheet, and Operations, Maintenance, Monitoring, and Sampling Tracking Sheet Forms must be completed during each routine monitoring event and will include, but not be limited to the following information:

- Operating Data at Suction Pits
- Operating Data at Blower Areas
- Vacuum Readings at Sub-Slab Monitoring Points
- Visually Check Blower In-Filter
- Visually Check Blower Noise Adsorbing Foam Filter
- Visually Check Blower Motor
- Visually Check Piping System for Damage or Unusual Conditions

Inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections, maintenance and/or sampling may take place when a suspected failure of the SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the SSD system are specified in Section 1.4.

1.3.2 Vapor Discharge Sampling

System performance will be assessed by collecting SSD system vapor discharge samples and measuring for the total volatile organic compounds (VOC) concentration using a pre-calibrated handheld VOC detector (MicroRAE 3000 or equivalent) equipped with a photo-ionization detector (PID) (with a minimum 10.6 eV ionization potential). The SSD system discharge sampling will be performed by connecting Teflon tubing from the sample port installed within the SSD system piping on the vacuum side of the suction fans and the collection of a representative sample within a Tedlar® Sampling Bag using an evacuated canister. Connect the sample bag to the inlet to the PID and record the total VOC concentration on the SSD system Operating Data - Suction Pits Log Sheet, along with the Magnehelic gauge vacuum reading at the time of sample collection.

Annually, the three (3) Tedlar® Bag samples collected from the suction pits that exhibit the highest PID readings will be submitted for laboratory analysis at a NYSDOH ELAP certified laboratory in accordance with U.S. Environmental Protection Agency (EPA) Method TO-15 for the concentration of vinyl chloride (VC), cis 1,2-dichloroethene (DCE), trichloroethene (TCE) and tetrachloroethene (PCE).

The results of the Tedlar® bag samples will be correlated with the field PID screening measurements obtained from the remaining suction pits at the time of sample collection to estimate the annual emission for the entire SSD system.

1.3.3 Sub-Slab Vacuum Measurements

Sub-slab vacuum measurements will be conducted quarterly at each permanent sub-slab vacuum monitoring point installed within the SSD system operating area and shall consist of:

- Confirming the suction fan operation and suction pit vacuum levels; and,
- Recording the differential pressure in the sub-slab area utilizing a micro-manometer device with a sensitivity of 0.002 inches of water (vacuum) connected to the vacuum monitoring point to determine the radius of influence of the system.

All vacuum confirmation testing activities will be reported in the Periodic Review Report.

1.3.4 Verification Indoor Air Quality Sampling

Verification indoor air sampling will be performed in the SSD system operating area where the building floor is in direct contact with the soil. Indoor air sampling locations will be biased in active manufacturing areas or areas where employees are present (e.g. break rooms and office areas).

Sampling will be performed using a SUMMA® canister with flow regulator set to fill at a rate of less than (<) 0.1 liters/minute. The samples will be submitted for analysis at a NYSDOH ELAP certified laboratory in accordance with U.S. Environmental Protection Agency (EPA) Method TO-15 for vinyl chloride (VC), cis 1,2-dichloroethene (DCE), trichloroethene (TCE) and tetrachloroethene (PCE).

Results of the indoor air quality sampling program will be presented in the Periodic Review Report.

1.4 Maintenance and Performance Monitoring Reporting Requirements

Maintenance reports and any other information generated during regular operations of the SSD system will be maintained. All reports, forms, and other relevant information generated will be available upon request and submitted as part of the PRR, as specified in Section 5 of the SMP.

1.4.1 Routine Maintenance Reports

The Operations, Maintenance, Monitoring, and Sampling Tracking Sheet included in Appendix D will be completed during each routine maintenance event and will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;
- Where appropriate, color photographs (per Plant authorization requirements) or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc. (attached to the form).

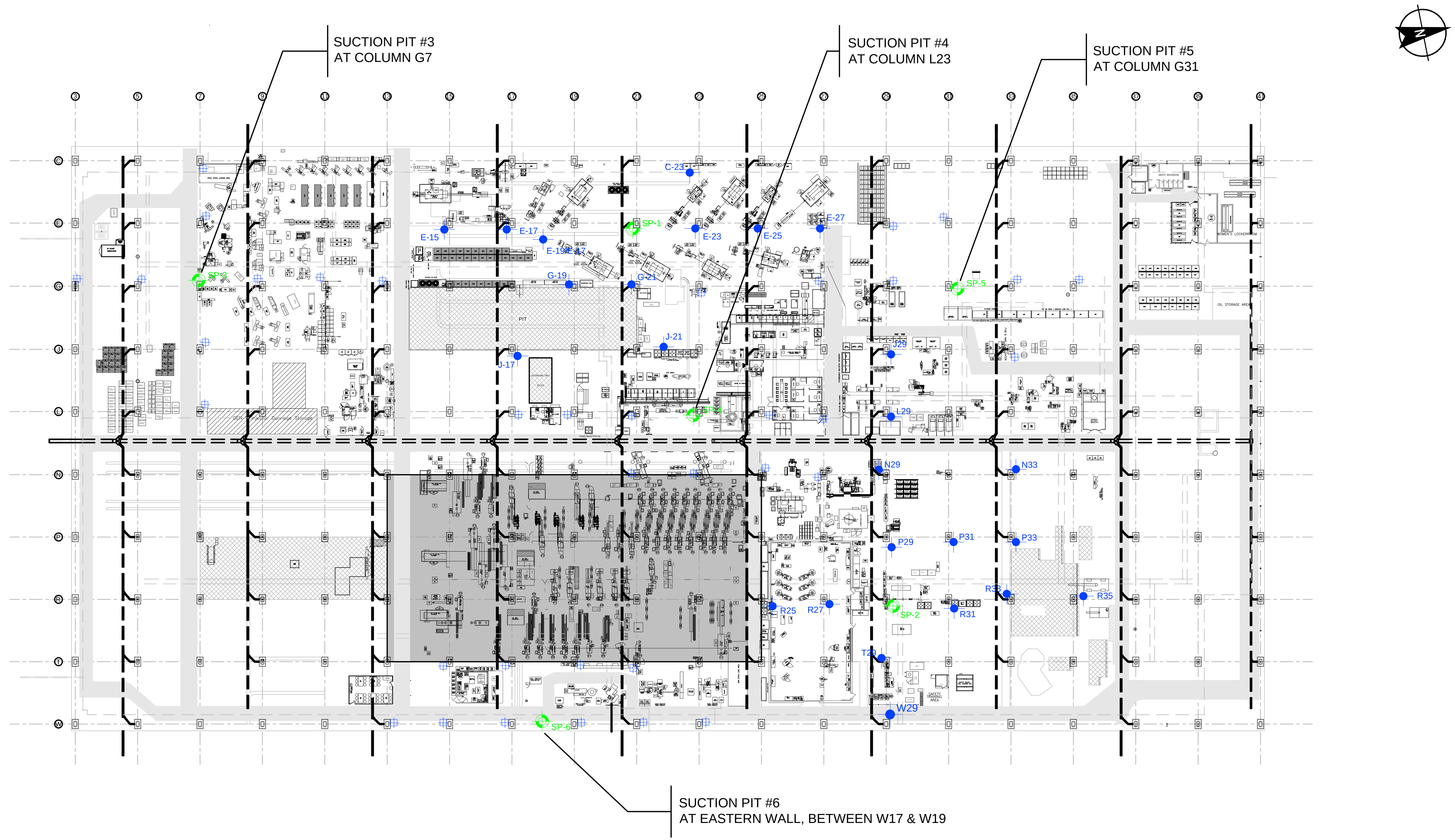
1.4.2 Non-Routine Maintenance Reports

The Operations, Maintenance, Monitoring, and Sampling Tracking Sheet included in Appendix D will be completed during each non-routine maintenance event, and will include, but not be limited to, the following information:

- Date;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Date of repair;
- Other repairs or adjustments made to the system;
- Where appropriate, color photographs (per Plant authorization requirements) or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and,
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc.

Recommendations for additional monitoring activities and/or modification of the SSDS based on the results of annual indoor air quality monitoring program and routine and non-routine maintenance activities conducted during the reporting period will be included in the PRR for the Department's review and approval.

End of Section



LEGEND

COLUMN LINE

SUCTION PITS (SP-1 & SP-2 INSTALLED; SP-3, SP-4 & SP-5 PROPOSED)

INSTALLED PILOT TEST VACUUM MONITORING POINT LOCATIONS

PROPOSED ADDITIONAL LONG TERM VACUUM MONITORING POINT LOCATIONS

PIT OR VAULT THAT EXTENDS BELOW THE FLOOR

RESTRICTED AREA DUE TO OPERATIONS (E.G., CRANE)

HALEY ALDRICH

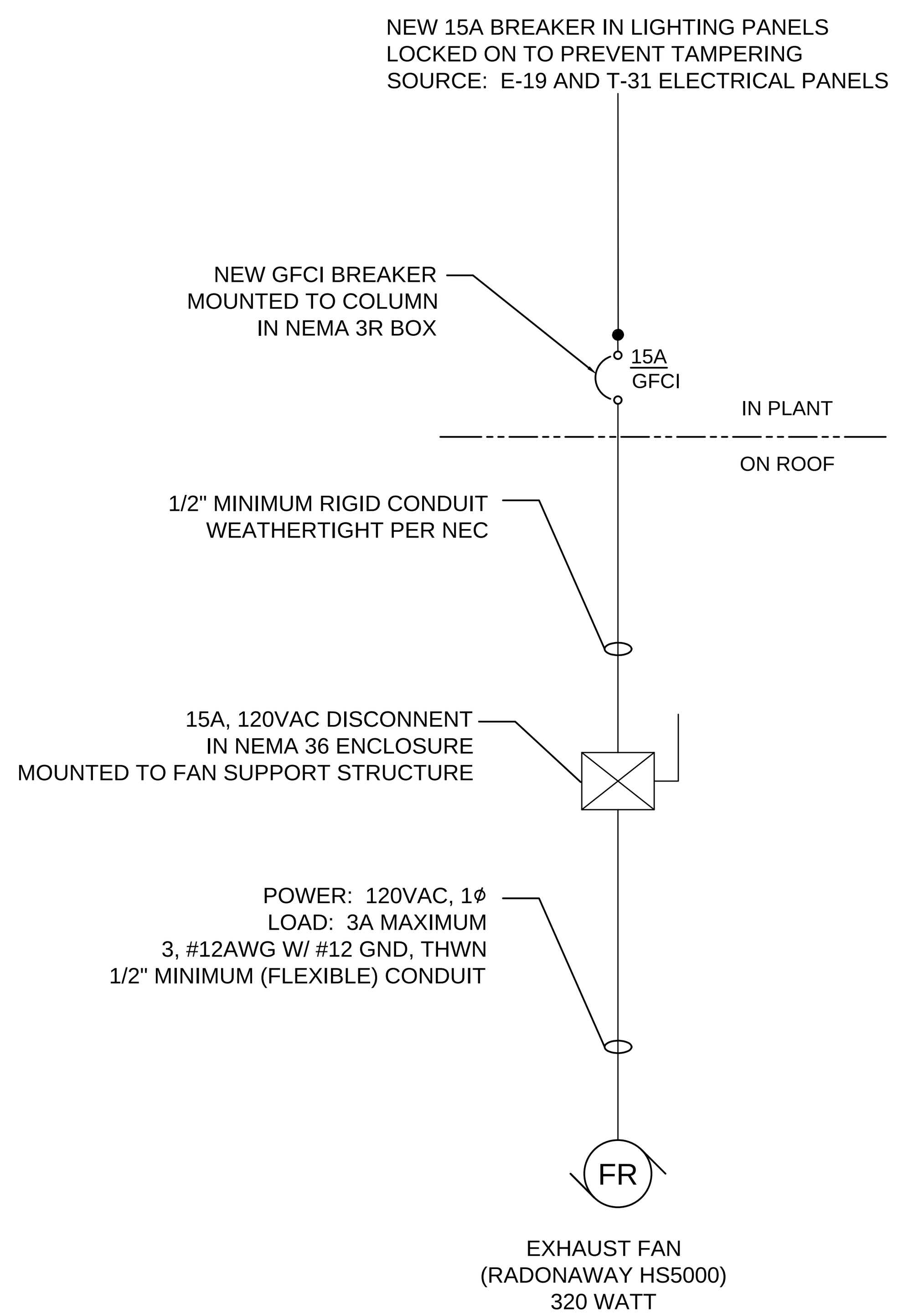
SUB SLAB DEPRESSURIZATION PILOT TEST REPORT
DELPHI AUTOMOTIVE SYSTEMS SITE #828064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

SUCTION PIT LOCATIONS
PHASE II SSDS INSTALLATION

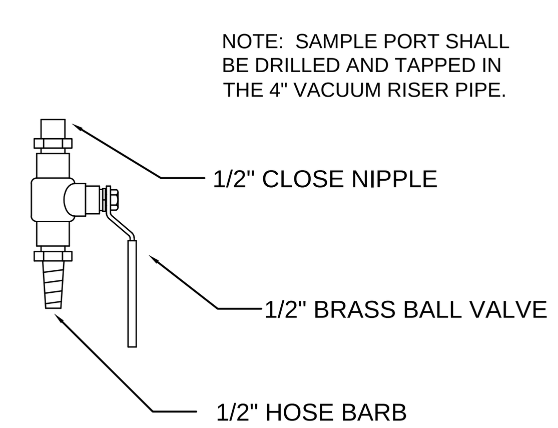
SCALE: AS SHOWN
MAY 2017

FIGURE 1

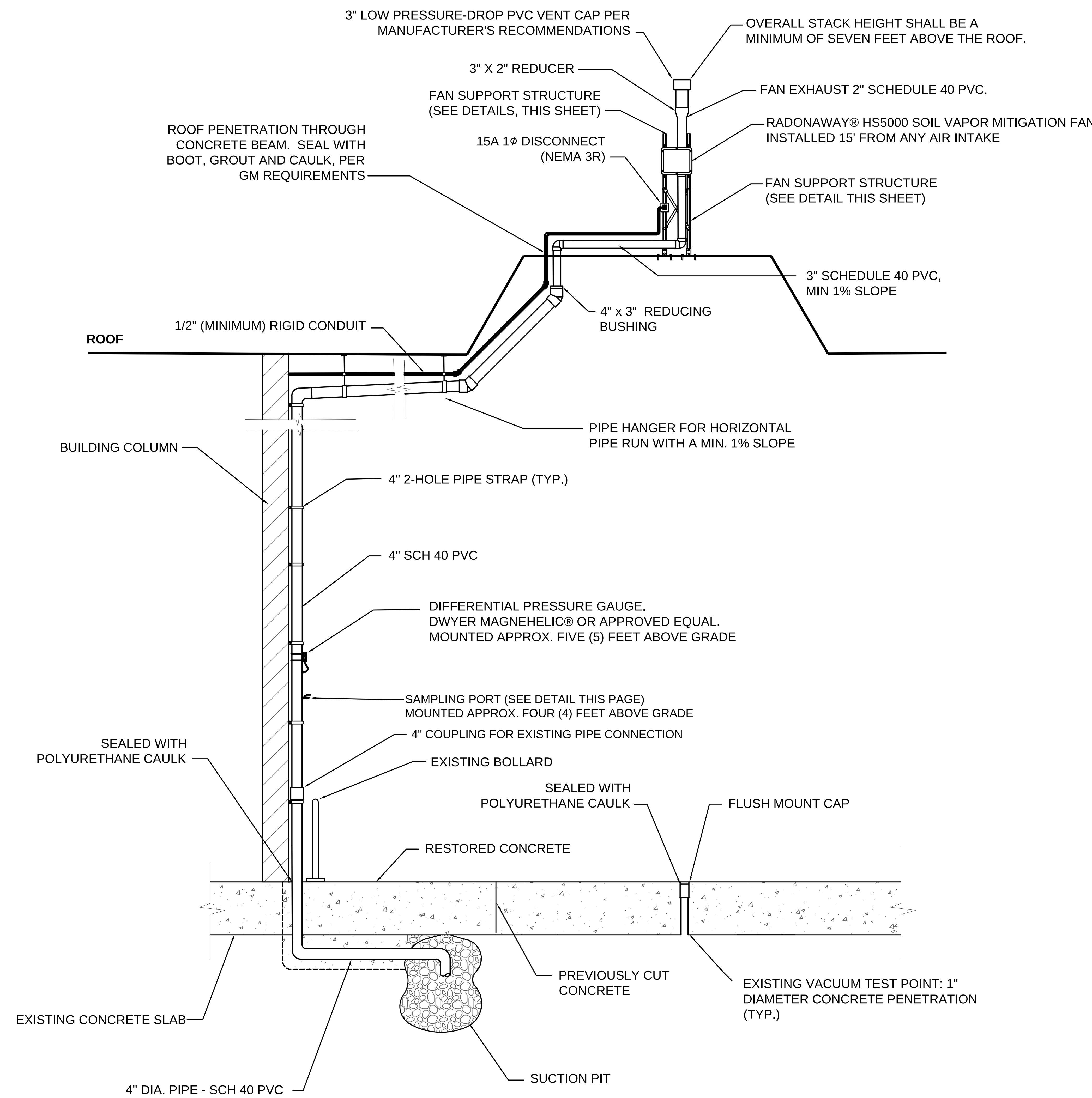
COSTANTINI, DARRIN Printed: 9/11/2017 10:50 AM Layout: SITE FIG 1
G:\PROJECTS\70014\119 - SVI WORK PLAN 2014\CAD\SSD PILOT TEST REPORT 2015\70014_119_0009_SECOND PHASE - PERMIT SUBMITTAL.DWG



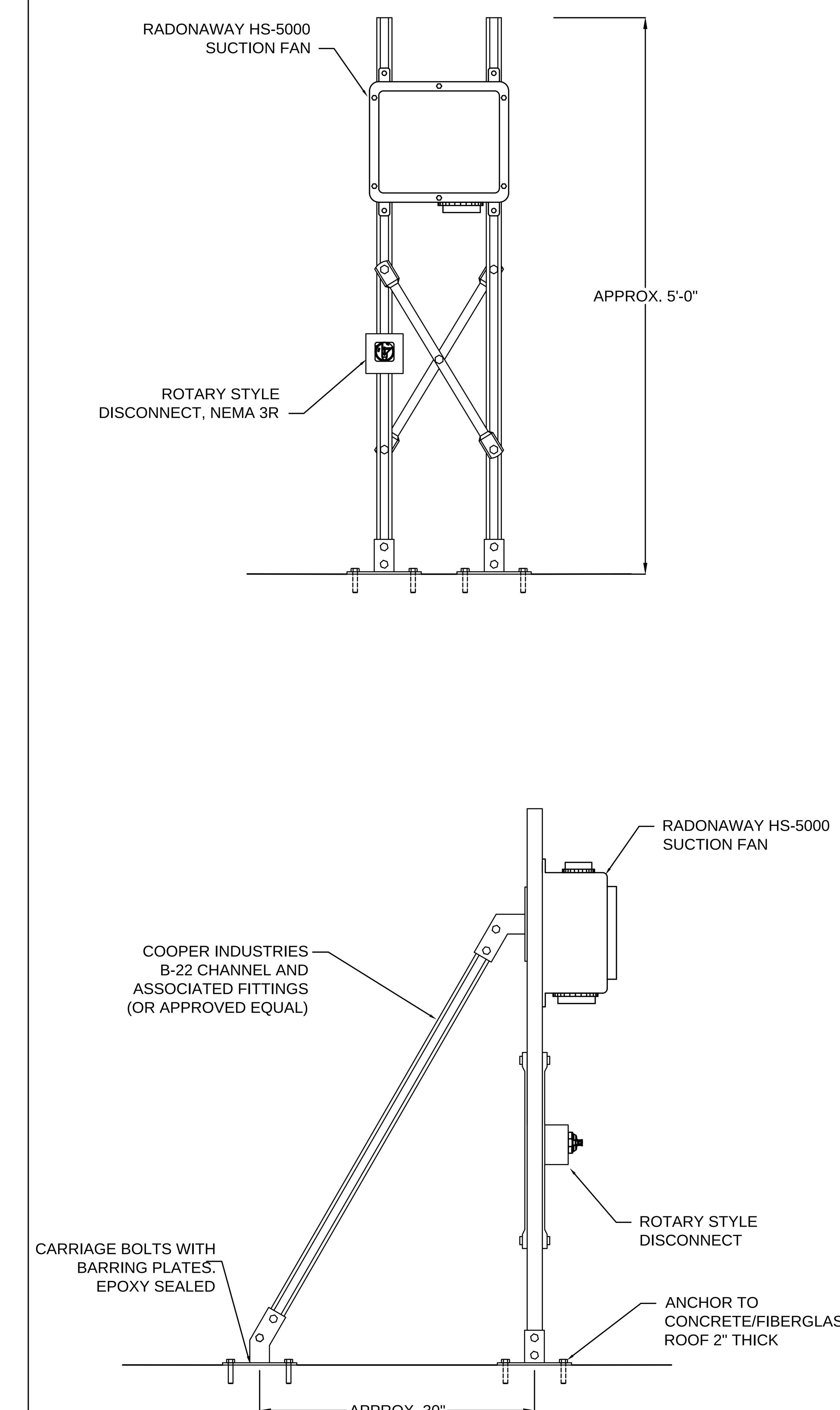
1 / X-101 LOW VOLTAGE ONE-LINE DIAGRAM
NO SCALE



2 / X-101 SAMPLE PORT ASSEMBLY
NTS



3 / X-101 PIPING SCHEMATIC
NTS



4 / X-101 FAN SUPPORT STRUCTURE
NTS

NOTES

1. THE CONTRACTOR SHALL COORDINATE WITH GENERAL MOTORS FOR ALL WORK, INCLUDING ELECTRICAL, PIPING & CONDUIT ROUTING, AND ROOF PENETRATIONS & ANCHORING.
2. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS, INCLUDING REVISIONS TO DATE OF CONTRACT.

HALEY ALDRICH

HALEY & ALDRICH OF NEW YORK
200 Town Centre Drive, Suite 2
Rochester, NY 14623-4264
Tel: 585.359.9000
Fax: 585.359.4650
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Project No.:	
Scale:	AS SHOWN
Date:	31 OCT 2016
Drawn By:	
Designed By:	
Checked By:	
Approved By:	
Stamp:	

Rev.	Description	By	Date

DELPHI AUTOMOTIVE
SYSTEMS SITE #826064
1000 LEXINGTON AVENUE
ROCHESTER, NEW YORK

CONSTRUCTION DETAILS

X-101

Sheet: 2 of 2

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Magnehelic® Differential Pressure Gage High and Medium Pressure

Specifications — Installation and Operating Instructions

SPECIFICATIONS

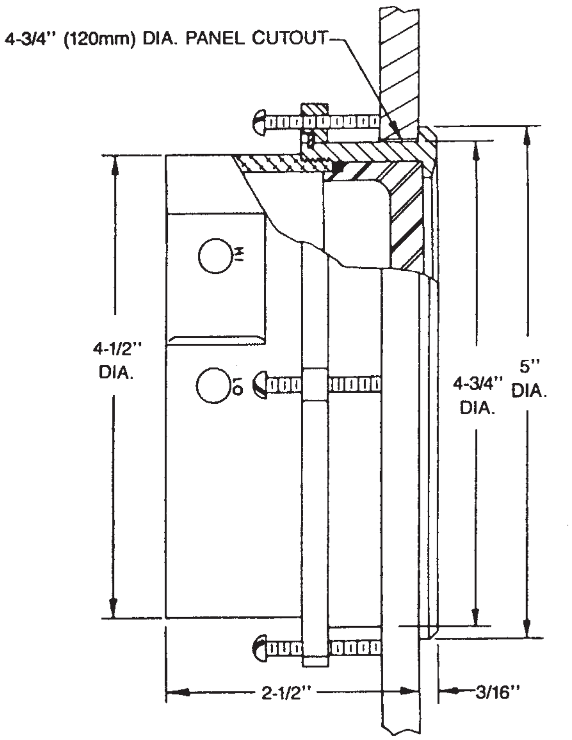
HP MODEL
For maximum internal pressures to 80 psig on one or both sides of diaphragm in all standard Magnehelic® ranges. Cover is clear cast acrylic machined to finish dimensions.

MP MODEL
For maximum internal pressures to 35 psig on one or both sides of diaphragm in all standard Magnehelic® ranges. Cover is clear molded polycarbonate.

BOTH MODELS
Accuracy: Plus or minus 2 percent of full scale, at 70 degrees fahrenheit.
Ambient Temperature Range: 20 degrees to 140 degrees fahrenheit.
Leak check, no bubbles while immersed in water, for 1 minute using air at rated maximum internal pressure.
Bezel, die cast aluminum.
Case, impregnated die cast aluminum.

Mounting: Same as standard model gage, except for size of hole in panel for flush mounting. See Bulletin A-27. Will not fit into portable carrying case.
Connections: 1/8″ NPT high and low pressure taps, duplicated, one pair side and one pair back.
Accessories: Mounting ring, bezel snap ring, (2) 1/8″ N.P.T. pipe plugs, (2) l/8″ NPT x 1/4″ compression fittings, (4) 6-32 x 2″ RH machine screws.
Weight: 2 lbs. 4 oz.

CAUTION: For use with air or compatible gases only. For repetitive over-ranging or high cycle rates, refer to factory.



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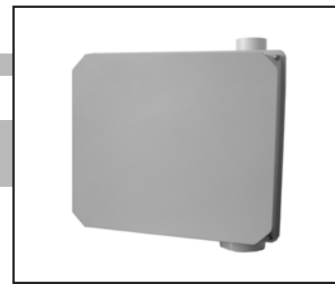
e-mail: info@dwyer-inst.com

RadonAway

The World's Leading
Radon Fan Manufacturer



HS Series

Installation & Operating Instructions

RadonAway

3 Saber Way | Ward Hill, MA 01835

www.radonaway.com

P/N IN007-REV K

10/15

RadonAway Ward Hill, MA.

HS Series Fan Installation & Operating Instructions

Please Read and Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.
See Vapor Intrusion Application Note #AN001 for important information on VI applications. RadonAway.com/vapor-intrusion

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit.
Do NOT attempt to open. Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

7. **WARNING!** In the event that the fan is immersed in water, return unit to factory for service before operating.

8. **WARNING!** Do not twist or torque fan inlet or outlet piping as Leakage may result.

9. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

10. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The HS Series Fan is intended for use by trained, certified/licensed, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of the HS Series Fan. This instruction should be considered as a supplement to EPA/Radon Industry standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The HS Series Fan is designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the HS Series Fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F. The HS Series Fan is thermally protected such that it will shut off when the internal temperature is above 104 degrees F. Thus if the HS Series Fan is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 104 degrees F.

1.3 ACOUSTICS

The HS Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. There are, however, some considerations to be taken into account in the system design and installation. When installing the HS Series Fan above sleeping areas, select a location for mounting which is as far away as possible from those areas. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Insure a solid mounting for the HS Series Fan to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, the "rushing" sound of the outlet air can be disturbing. The system design should incorporate a means to slow and quiet the outlet air. The use of the RadonAway Exhaust Muffler, p/n 24002, is strongly recommended.

1.4 GROUND WATER

Under no circumstances should water be allowed to be drawn into the inlet of the HS Series Fan as this may result in damage to the unit. The HS Series Fan should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the HS Series Fan with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the HS Series Fan. The lack of cooling air will result in the HS Series Fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the HS Series Fan be disconnected until the water recedes allowing for return to normal operation.

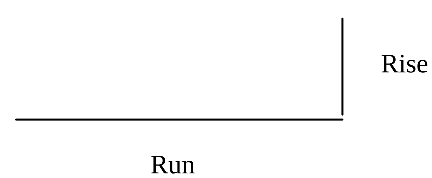
1.5 CONDENSATION & DRAINAGE

(WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the HS Series Fan).

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation.

The use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and at sufficient velocity it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For HS Series Fan inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system conditions. Use this chart to size piping for a system.

Pipe Diam.	Minimum Rise per Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4"	1/32 "	3/32 "	3/8 "
3"	1/8 "	3/8 "	1 1/2 "



*Typical operational flow rates:

HS3000, or HS5000	20 - 40 CFM
HS2000	50 - 90 CFM

All exhaust piping should be 2" PVC.

1.6 SYSTEM MONITOR AND LABEL

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A Magnehelic pressure gauge is recommended for this purpose. The indicator should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables. A System Label (P/N 15022) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted by the building occupants, must be conspicuously placed where the occupants frequent and can see the label.

1.7 SLAB COVERAGE

The HS Series Fan can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (2 to 10 gallons in size) be created below the slab at each suction hole.

1.8 ELECTRICAL WIRING

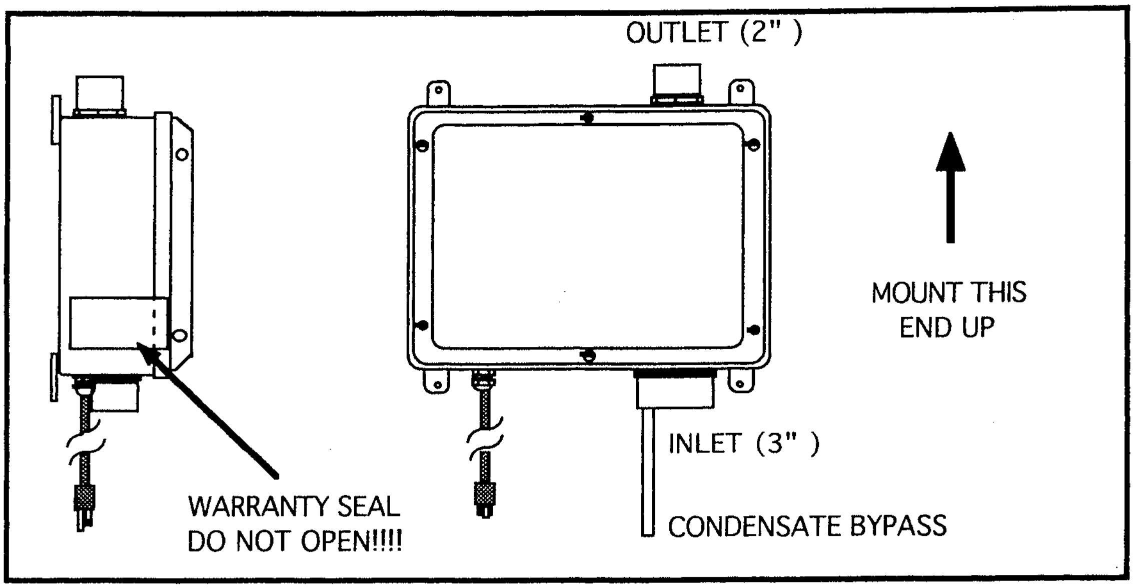
The HS Series Fan plugs into a standard 120V outlet. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.8a ELECTRICAL BOX (optional)

The optional Electrical Box (p/n 20003) provides a weather tight box with switch for outdoor hardwire connection. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.9 SPEED CONTROLS

Electronic speed controls can **NOT** be used on HS Series units.



2.0 INSTALLATION

2.1 MOUNTING

Mount the HS Series Fan to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Insure the HS Series Fan is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to HS Series Fan with flexible couplings. Insure all connections are tight. Do not twist or torque inlet and outlet piping on HS Series Fan or leaks may result.

2.3 VENT MUFFLER INSTALLATION

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed above the roofline at the end of the vent pipe.

2.5 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

____ Make final operation checks by verifying all connections are tight and leak-free.

____ Insure the HS Series Fan and all ducting is secure and vibration-free.

____ Verify system vacuum pressure with Magnehelic. Insure vacuum pressure is within normal operating range and less than the maximum recommended as shown below:

HS2000	14" WC
HS3000	21" WC
HS5000	40" WC

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.) If these are exceeded, increase number of suction points.

____ Verify Radon levels by testing to EPA protocol.

PRODUCT SPECIFICATIONS

Model	Maximum Static Suction	Typical CFM vs Static Suction WC (Recommended Operating Range)						Power* Watts @ 115 VAC
		0"	10"	15"	20"	25"	35"	
HS2000	18"	110	72	40	-	-	-	150-270
HS3000	27"	40	33	30	23	18	-	105-195
HS5000	50"	53	47	42	38	34	24	180-320

*Power consumption varies with actual load conditions

Inlet: 3.0" PVC

Outlet: 2.0" PVC

Mounting: Brackets for vertical mount

Weight: Approximately 18 lbs.

Size: Approximately 15"W x 13"H x 8"D

Minimum recommended inlet ducting (greater diameter may always be used):

HS3000, HS5000 --- 2.0" PVC Pipe

HS2000 --- Main feeder line of 3.0" or greater PVC Pipe

Branch lines (if 3 or more) may be 2.0" PVC Pipe

Outlet ducting: 2.0" PVC

Storage temperature range: 32 - 100 degrees F.

Thermally protected

Locked rotor protection

Internal Condensate Bypass

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the HS Series Fan for shipping damage within 15 days of receipt. Notify **RadonAway® of any damages immediately**. RadonAway® is not responsible for damages incurred during shipping. However, for your benefit, RadonAway® does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the HS Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

WARRANTY

RadonAway® warrants that the HS Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway® will replace any Fan which fails due to defects in materials or workmanship during the Warranty Term. The Fan must be returned (at Owner's cost) to the RadonAway® factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

1 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway® will extend the Warranty Term of the fan to one (1) year from date of purchase or fifteen (15) months from the date of manufacture, whichever is sooner, if the Fan is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement fan in a professionally designed and professionally installed active soil depressurization system by a qualified installer. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

LIMITATION OF WARRANTY

EXCEPT AS STATED ABOVE, THE HS SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

RadonAway® 3 Saber Way
Ward Hill, MA 01835 USA TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No.______________________________ Purchase Date______________________________

SSD System-Monthly Blower Logsheet

GMCH Rochester Operations Facility

Date: ______________________

Collected by: ______________________

Project No.: ______________________

Bldg Location - Fan/Pit Tag	Suction Pit Location (Col No.)	Time	Suction Pit Area				Notes/ Observations/ Recommendations
			Vacuum ("W.C.)	Historic Ops. Range	PID Reading (PPM)- collected annually	Historic Ops. Range	
SP-1	E-21			27 - 32		0 - 0.3	
SP-2	R-29			40		0 - 0.5	
SP-3	G-7			38 - 42			
SP-4	L-23			40 -44			
SP-5	G-31			10 - 16			
SP-6	W-19			40			

Nomenclature
"W.C. inches water column
"PPM" Parts per million

Notes: 1. If reading is 0 and fan operating, check tubing connections

Testing Equipment/ Instrumentation Used (list Make/ Model/ Serial No.s):

SSD System - Quarterly Vacuum Monitoring Data - Summary

GMCH Lexington Avenue-Rochester Operations Facility

Date:

Collected by:

Suction Point / Fan		Vacuum at Pit (in w.c.)	Historic Operating Range (in. w.c.)	Comments
SP-1			**30-35**	
SP-2			**39-41**	
SP-3			**35-39**	
SP-4			**40-43**	
SP-5			**14-18**	
SP-6			**40-45**	
Suction Pit Location	**Sub Slab Monitoring Point ID**	**Vacuum at Point (in w.c.)**	**Historic Operating Range (in. w.c.)**	**Comments**
SP-1	C-23		0.000	
	E-15		0.014 - 0.13	
	E-17		0.162- 0.74	
	E-19/17		0.020 - 0.96	
	E-23		0.330 - 0.715	
	E-25		0.513 - 0.545	
	E-27		0.000 -0.002	
	G-19		0.038 - 0.26	
	G-21		0.000 - 0.002	
	G-23		0.000	
	G-27		0.000 - 0.004	
SP-2	N-27		0.000 - 0.003	
	N-29			
	N-33		0.000	
	P-29		0.274 - 0.292	
	P-31		0.030 - 0.038	
	P-33		0.001	
	R-25			
	R-27			
	R-31		0.050 - 0.059	
	R-33		0.005	
	R-35		0.000 - 0.002	
	T-29		0.000	
	W-29		0.006	
	X-29		0.000	
SP-3	C-7			
	E-7			
	G-3			
	G-5			
	G-9			
	G-11			
	G-13			
	J-7			
	L-7			

Suction Pit Location	Sub Slab Monitoring Point ID	Vacuum at Point (in w.c.)	Historic Operating Range (in. w.c.)	Comments
SP-4	J-17		0.000	
	J-21		0.000 - 0.004	
	L-17			
	L-19			
	L-21			
	L-25			
	L-27			
	L-29		0.001	
	N-25			
SP-5	E-31			
	G-29			
	G-33			
	G-35			
	J-29		0.000 - 0.003	
SP-6	T-17			
	T-19			
	T-21			
	T-23			
	W-15			
	W-17			
	W-19			
	W-21			
	W-23			
	W-25			

Notes:
0.001 - Negative Pressure (Vacuum)
+0.001 - Positive Pressure
"in. w.c. is inches in water column

Summary/Observations:

SSD System-Annual Monitoring and Sampling Form: Fan, Suction Pits, Pipir

GMCH Rochester Operations Facility

Date: ____________________

Collected by: ____________________

Project No.: ____________________

Bldg Location - Fan/Pit Tag	Suction Pit Location (Col No.)	Time	PID Screening (ppm)	Sample ID	Visual Inspection of Piping	Notes/ Observations/ Recommendations
SP-1	E-21					
SP-2	R-29					
SP-3	G-7					
SP-4	L-23					
SP-5	G-31					
SP-6	W-19					

Nomenclature
"W.C. inches water column
°F degrees Fahrenheit

Notes:
1. If reading is 0 and fan operating, check tubing connections
2. Sample collected via Tedlar Bag

Testing Equipment/ Instrumentation Used (list Make/ Model/ Serial No.s):

APPENDIX I – QUALITY ASSURANCE PLAN

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Long Term Groundwater Monitoring Program

Delphi Automotive Systems Site No. 8-28-064
1000 Lexington Ave.
Rochester, New York

REVISION NUMBER 1
August 31, 2020

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

The following outlines the scope of the long-term monitoring that is part of the Site Management Plan (SMP) for the Delphi Automotive Systems Site No. 8-28-064 located at the GM Components Holdings LLC (GMCH) Rochester Operations facility, 1000 Lexington Avenue, Rochester, New York (Site). The long-term monitoring is to also be performed in accordance with the requirements of the Order on Consent Index # B8-0531-98-06, executed on September 18, 2020 between the NYSDEC and General Motors LLC (GM).

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the long-term monitoring for the Site. Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described or specifically referenced to related investigation documents.

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared on behalf of GM. The QAPP is a component of the Long-term Groundwater Quality Monitoring Plan that also includes project-specific Field Methods Guidelines (FMG), Health and Safety Plan (HASP), and Community Relations Plan (CRP).

1.1.1 PROJECT OBJECTIVES AND DECISION STATEMENT

The primary objectives for data collection activities include:

i) Long-term Monitoring to determine the nature and extent of releases of hazardous wastes and/or hazardous constituents in environmental media (groundwater, light non-aqueous phase liquid [LNAPL]) at the Site and,

ii) Collect sufficient data and information to monitor the risk to human health and the environment, if any, associated with hazardous waste and/or hazardous constituents.

The Decision Statement for the Long-term Monitoring Plan is as follows:

i) Determine changes in site environmental conditions and monitor progress toward achieving the remedial action objectives necessary to control current risks, if any, to human health or the environment; and

ii) Provide data to evaluate the effectiveness of the corrective measures in use at the Site to control current and future risks to human health and the environment.

Procedures to optimize design for obtaining data include:

i) Obtain samples in accordance with standard operating procedures (SOP) at the locations specified in the Long-Term Monitoring Work Plan; and,

ii) Perform field and laboratory testing in accordance with SOP specified in the Long-Term Monitoring Work Plan.

Associated specific objectives for field and laboratory data collection are discussed in Section 1.4 of this plan.

1.1.2 PROJECT STATUS/PHASE

The project status and investigation approach is presented in the Long-term Monitoring Plan. Section 1.2 summarizes the Site background. Section 1.4 describes the Engineering Controls (ECs) in place at the Site and gives a brief description of each area and the proposed monitoring for each at the Site. Section 8.0 describes how the data evaluation procedures for this project will be conducted.

1.1.3 QAPP PREPARATION GUIDELINES

As previously noted, this QAPP has been prepared to present the project specific QA/QC elements in accordance with the "U. S. EPA Region 2 Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Project" dated April 12, 2004 and the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigations and Remediation, dated May 2010.

1.2 SITE DESCRIPTION

The Site is located at 1000 Lexington Avenue in the City of Rochester, Monroe County, New York. Manufacturing of automotive components has occurred continuously at the Site since 1938 through the present. The Site was purchased by GMCH in January 2010 and is currently an active manufacturing facility. The Site consists of a 2-million square foot (ft) manufacturing building with administrative and engineering offices and numerous smaller buildings used for storage, utility, industrial-wastewater pretreatment and security activities that are related to the manufacturing operations.

Paved roadways, service and shipping courtyards, and vehicle parking lots cover most of the remainder of the Site. Outdoor areas that are not paved occupy less than 5 percent of the Site area, and they are either maintained as mowed lawns or, covered with coarse stone cobbles and gravel. The Site buildings and related industrial structures are enclosed by a security fence. Land uses on the properties surrounding the Site are primarily industrial and commercial. Residential neighborhoods are located to the east beyond adjacent commercial and industrial properties.

1.3 SITE HISTORY

Manufacturing processes at the Site have included the machining and forming of metal parts, metal tube manufacturing, metal plating, heat treating, die casting, solvent degreasing, injection molding of plastic parts, and the assembly of finished automotive parts and fuel systems.

A Remedial Investigation (RI) was performed between November 2001 and July 2005 to characterize the nature and extent of contamination at the Site. Generally, the RI determined that the following environmental conditions are present at the Site as summarized below:

- Site groundwater is impacted with chlorinated volatile organic compounds (cVOCs) at concentrations greater than background levels. Impacted groundwater extends down-gradient from the manufacturing building to the northern and slightly beyond the eastern Site boundaries. The vertical extent of the impact is limited to the overburden water bearing unit and the top 25 ft of underlying bedrock.
- Petroleum hydrocarbons are present in the subsurface as LNAPL in areas beneath the manufacturing building and beyond the building footprint to the north and east. The LNAPL consists of machining oils used as lubricants during metal-machining operations, and simulated fuels and calibration fluids used in engineering and product-

testing operations. In some areas, the LNAPL contains cVOCs and polychlorinated biphenyl compounds (PCBs). In the eastern portion of the Site, LNAPL is present in the intermediate bedrock at 10 to 25 ft below to top-of-bedrock and extends slightly beyond the eastern property boundary.

- Soil and soil vapor are impacted by cVOCs beneath the floor slab at the locations of former solvent degreaser systems.
- Soil impacts, due to the presence of metals including chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), mercury (Hg) and zinc (Zn), are present beneath the manufacturing building in former metal plating areas and in subsurface soils along the path of the former wastewater drainage ditch located in the north end of the Site.

Several engineering controls (EC) are installed at the Site that require long-term monitoring to evaluate the EC effectiveness to achieve the Site RAOs including:

Groundwater

A groundwater migration-control, collection, and treatment system designed to capture contaminated groundwater north from the manufacturing plant was constructed and placed in operation in the spring of 1992. The system controls off-site migration of impacted groundwater along the northern Site boundary. The system consists of a 1200-ft-long blasted bedrock trench located beneath the facility north parking lot. The migration-control trench was created using engineered-blasting techniques to enhance the permeability of the shallow and intermediate bedrock water bearing units. Two wells (GR-1 and GR-2) were installed in a 50-ft-deep blasted bedrock trench to recover groundwater for above-ground treatment. The average rate of groundwater extraction by the migration-control system is approximately 25 gallons (gals) per minute (approximately one million gallons per month). In 2013, two additional groundwater recovery wells, GR-3 and GR-4 were installed along the eastern property boundary to extend the migration control system to this area of the Site. The recovered groundwater is directed to an on-site treatment system consisting of an oil/water separator (OWS) and air stripper system with granulate activated carbon (GAC) filtration prior to discharge to the Monroe County sewer system for additional treatment.

LNAPL

Tank Farm Area LNAPL Recovery

An LNAPL recovery system has been in operation since 1989 in the tank farm area located outside the northeast corner of the manufacturing building. The LNAPL recovery system includes three (3) large-diameter recovery wells (RW-101, RW-2, and RW-3) installed along a 400-ft-long gravel-backfilled trench.

Recovered LNAPL and groundwater are piped to the wastewater treatment building where the LNAPL is separated and reclaimed. Recovered groundwater is treated prior to discharge with facility wastewater to the municipal sewer. The municipal sewer flows to the Monroe County Publicly Operated Treatment Works (POTW). Observed LNAPL thickness in down-gradient overburden observation wells and piezometers has declined since initiation of the recovery system (s).

Building 22 Area LNAPL-Recovery

Since 1995, a recovery system has been operating in the area of Building 22 to recover LNAPL impacted with PCBs. The LNAPL-recovery system consists of total-fluids pumping of LNAPL and groundwater at Well Z, located east of Building 22, and the collection of LNAPL and groundwater from the foundation-drain system for the Additional Waste Treatment Area (AWTA) building (Building 14) located north of Building 22.

The LNAPL and groundwater collected is routed through a coalescing filter oil-water separator inside the AWTA building. Collected LNAPL is containerized and shipped off-site for disposal, and the separated groundwater from the Building 22 system is blended with groundwater collected in the migration-control system recovery wells discharged to the POTW. Manual and automated LNAPL recovery systems are utilized to remove LNAPL from existing monitoring wells and engineered recovery wells from locations where recoverable.

1.4 PROJECT OBJECTIVES AND INTENDED DATA USE

1.4.1 TARGET PARAMETER LIST

The investigative program includes the sampling and analysis of environmental media for the presence of organic and inorganic constituents based on historical operations at the Site. The field and laboratory parameters are summarized below and presented in Table 1.1.

1.4.1.1 FIELD PARAMETERS

Groundwater sampling will be performed in accordance with the GM Field Method Guidelines (FMGs). Concurrent with sample collection, several field parameters will be determined by the field sampling personnel. For groundwater samples, at a minimum, the following parameters will be determined with field testing equipment: pH, specific conductivity, oxidation reduction potential (ORP) and temperature.

1.4.1.2 LABORATORY PARAMETERS

The laboratory parameters include target compound list (TCL) volatile organic compounds (VOCs).

1.5 SAMPLING LOCATIONS

Sampling locations are selected based on their position with respect to the operating groundwater migration control systems and water bearing unit, (e.g. overburden, shallow or intermediate bedrock zones). Changes in the sampling locations and methods will only be implemented after approval from the GM Project Manager and the NYSDEC.

1.6 PROJECT SCHEDULE

Groundwater sampling activities will be conducted on at least an annual basis with adjustments based on the findings of the sampling and analysis events and concurrence with GM and the NYSDEC.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The GM Project Manager will have the primary responsibility for the implementation of the Long-Term Groundwater Monitoring. This section defines the roles and responsibilities of the individuals who will perform the Long-Term Monitoring activities.

2.1 MANAGEMENT RESPONSIBILITIES

Management responsibilities are as follows:

NYSDEC Project Manager

The NYSDEC Project Manager has the overall responsibility for oversight of the monitoring program.

GM Project Manager

The GM Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The GM Project Manager will provide the primary point of contact and control matters concerning the project and represent the project team at regulatory agency and public meetings. The GM Project Manager will establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task.

Contractor Project Manager

The Contractor Project Manager is responsible for managing the implementation of the Long-Term Groundwater Monitoring and coordinating the collection of data pertaining to the ECs. The Project Manager is responsible for technical quality control and project oversight. The Project Manager also provides approval of the QAPP.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance team will consist of a Quality Assurance Officer and the Project Manager. Quality Assurance responsibilities are described as follows:

Contractor Quality Assurance (QA) Officer

The Contractor QA Officer reports directly to the GM Project Manager and will be responsible for ensuring that all QA/QC procedures are being followed. The QA Officer will be responsible for overseeing the review of all field and laboratory data. Additional responsibilities include:

i) Assuring the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
ii) Conducting internal QA/QC of the investigation activities;
iii) Providing input to the Project Director and the Project Manager as to corrective actions required resulting from the above-mentioned evaluations;
iv) Preparation and review of data validation and audit reports; and
v) Approval of the QAPP.

The QA Officer will be assisted by the data validation staff in the evaluation and validation of field and laboratory generated data. The QA Officer will monitor the performance of the laboratory to ensure that the Data Quality Objectives (DQO) for the project are met.

2.3 LABORATORY RESPONSIBILITIES

A qualified NYSDOH certified laboratory will provide analytical services in support of the Long-Term Groundwater Monitoring program.

Laboratory Project Manager

The Laboratory Project Manager will report directly to the H&A Project Manager and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports and approval of the laboratory's ability to adhere to the QAPP.

Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for review and validation of the analytical laboratory data generated as part of the program. The Laboratory QA Officer will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory.

Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Project Manager and will be responsible for the following:

i) Receiving and inspecting the incoming sample containers;
ii) Recording the condition of the incoming sample containers;
iii) Signing appropriate documents;
iv) Verifying chain-of-custody and its correctness;
v) Notifying the Project Manager of sample receipt and inspection;
vi) Assigning a unique identification number and customer number, and entering each into the sample receiving log;
vii) Initiating transfer of samples to lab sections; and
viii) Controlling and monitoring access/storage of samples and extracts.

Data Validation Staff

The data validation staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 9.2.2 of this document and be presented in a formal written report for submittal to the GM Project Manager .

2.4 FIELD RESPONSIBILITIES

Field QA Officer

The Field QA Officer is responsible for the overall operation of the field team and reports directly to the Project Director and Project Manager. The Field QA Officer works with the project Health & Safety Officer to conduct operations in compliance with the project Health & Safety Plan. The Field QA Officer will facilitate communication and coordinate efforts between the Project Director and the field team members. Other responsibilities include:

i) Developing and implementing field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
ii) Coordinating and managing field staff, including sampling and drilling;
iii) Performing field system audits;
iv) Overseeing quality control for technical data provided by the field staff;

v) Preparing, and approving of text and graphics required for field team efforts;

vi) Coordinating and overseeing technical efforts of subcontractors assisting the field team;

vii) Identifying problems in the field, resolving difficulties in consultation with the Project Director, Project QA Officer and Project Manager, implementing and documenting corrective action procedures; and

viii) Participating in preparation of the final reports.

<u>Field Team Personnel</u>

Field Team Personnel involved in the Long-Term Groundwater Monitoring program will be responsible for:

i) Performance of field activities in compliance with the DQO outlined in this QAPP; and

ii) Immediately reporting any accidents and/or unsafe conditions to the Site Health & Safety Officer and taking all reasonable precautions to prevent injury.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The Long-Term Monitoring Work Plan and associated QAPP are designed to produce data of the quality necessary to achieve the project objectives and meet or exceed the minimum standard requirements for field and analytical methods. The overall QA objective for measurement data is to develop and implement procedures for field sampling, chain-of-custody, laboratory analyses, and reporting that will provide results which are adequate for supporting the Long-Term Monitoring objectives. The QAPP program will include:

i) A mechanism for ongoing control of measurements and evaluation of data quality.

ii) A measure of data quality in terms of precision, accuracy, representativeness, completeness, and comparability.

The following section is a general discussion of the criteria used to measure the field and laboratory analytical data quality.

3.1 PRECISION

3.1.1 DEFINITION

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be stated in terms of relative percent difference (RPD). The overall precision of measurement data is a mixture of sampling and analytical factors. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The analytical results from the field duplicate samples will provide data on sampling precision. The results from the laboratory created duplicate samples will provide data on analytical precision.

3.1.2 FIELD PRECISION SAMPLE OBJECTIVES

Field precision will be assessed through collection and measurement of field duplicates at a rate of 1 duplicate per 20 investigative samples.

3.1.3 LABORATORY PRECISION SAMPLE OBJECTIVES

Laboratory duplicate analyses will be performed through the preparation and analysis of laboratory control sample and lab control sample duplicate (LCS/LCSD) and site-specific matrix spike/matrix spike duplicate (MS/MSD) samples.

3.2 ACCURACY

3.2.1 DEFINITION

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical procedure limitations.

3.2.2 FIELD ACCURACY OBJECTIVES

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Field equipment rinse and trip blanks will be collected as appropriate for each sampling effort.

Field equipment rinse blanks will be collected by passing laboratory purified water over and/or through the respective field equipment utilized during each sampling effort. One rinse blank will be collected for each type of field equipment used for the sampling effort. Field rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected. (Note: If dedicated or disposable sampling equipment is used, equipment rinse samples may not be collected as part of that field effort.)

Trip blank samples will be prepared by the laboratory and provided with each cooler that includes volatile organic compound (VOC) analysis containers. Trip blank samples will be analyzed for each VOC for which environmental media have been collected for analysis.

3.2.3 LABORATORY ACCURACY SAMPLE OBJECTIVES

Analytical bias will be assessed through the use of known laboratory control samples and site specific matrix spike sample analyses. Laboratory control samples (LCS) and MS/MSD sample analysis will be performed as prescribed by the analytical method SOPs. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One (1) set of MS/MSD analyses will be performed with each batch of twenty (20) project samples to assess the accuracy of identification and quantification of analytes within the site-specific sample matrices.

The results of the LCS and MS/MSD analyses will be presented in a summary table reporting format and evaluated versus the acceptance criteria presented in the laboratory analytical reports.

The accuracy of organic parameter analyses is also monitored through the analysis of system monitoring or surrogate compounds. Surrogate compounds are added to each sample, standard, blank, and QC samples prior to the sample preparation and analysis. Surrogate compound percent recoveries provide information on the effect of the sample matrix on the accuracy of the analyses and are evaluated against the acceptance criteria presented in laboratory analytical reports.

3.3 REPRESENTATIVENESS

3.3.1 DEFINITION

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied by proper selection of sampling locations and quantity of samples collected.

3.3.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA

Representativeness will be addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

For this project, sampling will be biased; that is, sampling locations will be based on the observed presence/absence of site specific contaminants, and/or site knowledge. Specific sampling technique descriptions, which allow consistency, repetitiveness and thus representativeness, are provided by the use of the FMGs.

3.3.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA

Representativeness in the laboratory is ensured by using proper analytical procedures, and analyzing field and laboratory duplicate samples. By definition, field duplicate samples are collected to be representative of a given point in space and time. Thus, sample duplicates provide both precision and representativeness information.

3.4 COMPLETENESS

3.4.1 DEFINITION

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the amount that was expected to be obtained under normal conditions. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a high degree of confidence.

3.4.2 FIELD COMPLETENESS OBJECTIVES

Completeness is a measure of the amount of valid measurements obtained from all measurements planned in this project. Field completeness objective for this project will be 90 percent.

3.4.3 LABORATORY COMPLETENESS OBJECTIVES

Laboratory data completeness objective is a measure of the amount of valid data obtained from all laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort. Corrective actions such as revised sample handling procedures will be implemented if problems are noted.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total data set. The completeness objective will be 90 percent.

3.5 COMPARABILITY

3.5.1 DEFINITION

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another.

3.5.2 MEASURES TO ENSURE COMPARABILITY OF FIELD DATA

Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through using standard operating procedures to collect, preserve, store, and analyze representative samples and the reporting of analytical results.

3.5.3 MEASURES TO ENSURE COMPARABILITY OF LABORATORY DATA

Comparability of laboratory data will also be measured with the results from the analysis of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST) for instrument initial and continuing calibration verification. The reported analytical data will be presented in standard units of mass of contaminant within a known volume of environmental media.

i) Aqueous Matrices – micrograms (μg) contaminant per liter (L) of media for organic analyses, and milligrams (mg) per liter (L) for inorganic analyses.
ii) Non-Aqueous Phase Liquids – (NAPL) – micrograms (ug) contaminant per kilogram (kg) of media.
iii) Soil Vapor and Ambient Air – micrograms (μg) contaminant per cubic meter (M^3) of media

3.6 LEVEL OF QUALITY CONTROL EFFORT

Equipment rinse, trip, and method blanks samples, field duplicate samples, laboratory control and MS/MSD samples will be prepared and analyzed to determine the data quality provided by the sampling and analysis activities conducted during the execution of the program.

Equipment rinse blanks will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blanks will provide the means to assess the quality of data resulting from the field program. Equipment rinse blank samples will be analyzed to check for contamination of equipment introduced during sampling at the Site. One equipment rinse blank will be collected for each type of non-dedicated or non-disposable equipment.

Trip blanks are used to assess the potential for contamination during sample storage and shipment. The trip blank consists of laboratory purified water that has been purged with an inert gas by the laboratory and provided with the sample containers to be used for the sampling of VOCs. Trip blanks will be preserved and handled in the same manner as the investigation samples. One trip blank will be included along with each shipment cooler containing project samples to be analyzed for VOCs.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

Field duplicate samples are analyzed to check for sampling and analytical reproducibility. One field duplicate will be collected for every 20 samples collected per event.

Matrix spikes will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected at the Site. Matrix spikes will be performed in duplicate for all TCL parameters. One MS/MSD will be collected for every 20 or fewer samples per sample matrix. Aqueous MS/MSD samples require triple the normal sample volume for VOCs analysis and double the volume for the remaining parameters.

4.0 SAMPLING PROCEDURES

Samples of groundwater, LNAPL and vapor will be obtained during the Long-Term Monitoring program. Refer to the Long-Term Monitoring Plan for the standard operating procedures (SOP) for collection of the environmental media.

4.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the project laboratory. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the U.S. EPA, "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used during the RFI will be maintained by the laboratory and will be available upon request.

The appropriate sample containers, preservation method, maximum holding times, and shipping information for each target parameter and sampling task are provided in Table 4.1.

4.2 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information. Field blank and field duplicate samples also will be numbered with a unique sample number to prevent analytical bias of field QC samples.

4.3 FIELD QC SAMPLE COLLECTION

4.3.1 EQUIPMENT RINSATE BLANK SAMPLE COLLECTION

Equipment rinse blank samples will be collected when non-dedicated or non-disposable sampling equipment is used to collect samples. Equipment rinse blanks consist of purified water that has been routed through decontaminated sampling equipment and collected into the appropriate containers.

4.3.2 FIELD DUPLICATE SAMPLE COLLECTION

4.3.2.1 WATER SAMPLES

Field duplicate samples will be collected concurrently with the sample alternating the filling of each sample container using the procedures identified in the Long-Term Monitoring Plan.

4.3.3 MS/MSD SAMPLE COLLECTION

MS/MSD sample collection for aqueous samples requires triple the sample volume for VOC analysis and double the volume for all remaining parameters. The sampling procedure specified in Section 4.3.2.1 is used to collect aqueous samples.

5.0 CUSTODY PROCEDURES

Custody is one of several factors necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample. A sample or evidence file is under your custody if:

1. the item is in actual possession of a person;
2. the item is in the view of the person after being in actual possession of the person;
3. the item was in actual possession but is stored to prevent tampering; or
4. the item is in a designated and identified secure area.

5.1 FIELD CUSTODY PROCEDURES

Field personnel will be required to keep written records of field activities on applicable preprinted field forms or in a bound field notebook and in accordance with GM FMG 1.4: *Data Recording - Field Books/Digital Recording*. The logbooks provide the means of recording data collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field QA Officer. Each member of the field team will be assigned a logbook. Each logbook title page should include field team member's name, project name, project start date, project end date, and unique logbook number.

The beginning of each entry in the logbook will contain the following information:

i) Date,
ii) Start time,
iii) Weather,
iv) Names of field personnel (including subcontractors),
v) Level of personal protection used at the Site, and
vi) Names of all visitors and the purpose of their visit.

For each measurement and sample collected the following will be recorded:

i) Detailed description of sample point,
ii) Equipment used to collect sample or make measurement and the date equipment was last calibrated,
iii) Time sample was collected,
iv) Sample description,
v) Depth sample was collected,
vi) Volume and number of containers, and
vii) Sampler identification.

5.1.1 FIELD PROCEDURES

The data quality can be affected by sample collection activities. If the integrity of collected samples is questionable, the data, regardless of its analytical quality, will also be questionable.

The following procedure describes the process to maintain the integrity of the samples:

i) Upon collection samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. The sample container, preservation methods, shipping, and packaging requirements are presented in Table 4.1.

ii) Samples will be assigned a unique sample number and will be affixed to a sample label. The information to be placed on the sample label will include the sample ID number, the sample type, the sampler's name, date collected, preservation technique, and analytical parameter and method to be performed. Information on the labels will be completed with a ballpoint pen or indelible marker.

iii) Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms. Sample aliquots that require preservation (pH adjustment) will be checked with pH paper at the time of preservation. Confirmation of preservation will include capping of the preserved sample, inverting the sample three times, uncapping and confirming the sample pH. If required, additional preservative will be added and the procedure repeated until proper preservation is achieved. Samples for VOC analysis will be collected in pre-preserved containers and will not undergo this procedure.

iv) Appropriate volumes will be collected to ensure that the reporting limits can be successfully achieved and that the required QC sample analyses can be completed.

5.1.2 TRANSFER OF CUSTODY AND SHIPMENT PROCEDURES

i) A chain-of-custody (COC) record will be completed during sample collection and will accompany each shipment identifying the contents of the shipment. The COC record will accompany the samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record. As few people as possible should handle the samples.

ii) Samples will be shipped or delivered in a timely fashion to the laboratory so that holding-times and/or analysis times as prescribed by the methodology can be met.

iii) Samples will be packaged for shipment and shipped to the appropriate laboratory for analysis with a separate signed chain-of-custody record enclosed in each sample cooler. VOC samples will be placed in bubble wrap bags that contain three containers per bag. The remaining samples in glass containers will be wrapped in bubble wrap and placed in the sample cooler. Samples in polyethylene containers will be placed upright directly in the sample cooler. All samples will be placed in an upright position and limited to one layer of samples per each cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.

iv) When samples are split with the NYSDEC and Site representatives, a separate chain-of-custody will be prepared for the samples and marked to indicate to whom the samples are being provided.

v) If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of permanent documentation. Commercial carriers are not required to sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.

vi) Samples will be picked up by a laboratory courier or transported overnight by a courier to the laboratory the same day they are collected unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the lab. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A full-time sample custodian will be assigned the responsibility of sample control. It will be the responsibility of the sample custodian to receive all incoming samples. Once received, the custodian will document that the custody tape on the coolers is unbroken, that each sample is received in good condition (i.e., unbroken, cooled, etc.), that the associated paperwork, such as chain-of-custody forms have been completed and will sign the chain-of-custody forms. In special cases, the custodian will document from appropriate sub-samples that chain-of-custody with proper preservation has been accomplished. The custodian will also document that sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage (refrigerated storage, if required). The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log. The laboratory date of receipt will also be noted.

Consistent with the analyses requested on the chain-of-custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage only after internal chain-of-custody sign-out procedures have been followed.

5.3 STORAGE OF SAMPLES

Sample containers with volume remaining will be returned to secure and limited access storage. Upon completion of all laboratory analyses for each sample submittal and generation of the laboratory report, samples will be stored by the sample custodian. Excess samples will be stored for at least thirty (30) days after final laboratory reports have been submitted to GM. Disposal of remaining samples will be completed in compliance with all Federal, State, and local requirements.

Laboratory custody procedures and document control for those samples analyzed by the project laboratory will be carried out using the laboratory’s standard operating procedures.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy for all the instruments and measurement equipment, which will be used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

6.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

The field instruments will include dissolved oxygen meters, pH meters, turbidity meters, specific conductance meters and PIDs. Field instruments will be used for real-time sample measurement during monitoring well sampling and organics screening for both on-site screening of soil samples and for health and safety air monitoring, as described in the HASP. On-site air monitoring for health and safety purposes and the screening of soil samples may be accomplished using PIDs. Field instruments will be calibrated prior to use and the calibration will be verified in accordance with the instrument manufacturer's specification. Satisfactory completion of the pre-operation inspection will be noted, along with the results of each field measurement.

6.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Calibration procedures for a specific laboratory instrument will consist of initial calibration, initial calibration verification and continuing calibration verification. The initial calibration will be verified using an independently prepared calibration verification solution.

The use of materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the use of all laboratory materials including solutions, standards and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be reagent grade or better. All gases will be high purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) Materials will be obtained from approved vendors of the National Institute of Standards and Technology (formerly National Bureau of Standards), the U.S. EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources.

All materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, expiration date and all other pertinent information.

7.0 ANALYTICAL PROCEDURES

Analytical procedures to be utilized for the analysis of environmental samples will be based on referenced U.S. EPA analytical protocols.

7.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH/temperature, specific conductivity, dissolved oxygen, turbidity and ORP during sampling of groundwater, and the qualitative measurement of VOC during the collection of samples at the Site.

7.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory preparation and analytical methods are based on the U.S. EPA methodology requirements promulgated in:

- "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 EPA, U.S. EPA Office of Solid Waste, 3rd Edition and promulgated updates, 1986;
- " Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983;
- "Standard Methods for the Examination of Water and Wastewater", APHA, AWWA & WEF, 19th Edition, 1995.

7.2.1 LIST OF PROJECT TARGET COMPOUNDS AND LABORATORY METHOD DETECTION LIMITS

Method Detection Limits (MDL) will be experimentally determined by the project laboratory using the procedure identified in 40 CFR, Part 136 Appendix B. Laboratory reporting limits will be developed by the laboratory based on the MDL developed.

8.0 INTERNAL QUALITY CONTROL CHECKS

This section presents the internal quality control checks that will be employed for field and laboratory measurements.

8.1 FIELD QUALITY CONTROL

Assessment of field sampling precision and accuracy will be performed through the collection of field duplicates and equipment rinse blanks for laboratory analysis. Collection of the samples will be in accordance with the applicable procedures in Section 4.3 of this QAPP.

8.1.1 EQUIPMENT RINSE BLANKS

Internal quality control checks will include analysis of equipment rinse blanks to validate successful equipment cleaning procedures. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

The frequency of equipment rinse blank sample preparation will be collected each type of sampling equipment on which decontamination procedures have been performed.

8.1.2 TRIP BLANKS

Trip blanks samples will be prepared by the project laboratory using laboratory purified water placed within pre-cleaned 40 milliliter (ml) VOC vials equipped with Teflon® septa. Trip blanks will accompany each cooler of environmental samples collected and submitted for analysis of VOCs.

Trip blank samples will be placed in each cooler which stores and transports project samples to be analyzed for VOCs along with the project samples.

8.1.3 FIELD DUPLICATE SAMPLES

Field duplicate samples are collected at a minimum frequency of one duplicate per at least one in every 20 or fewer samples per sampling event. Field duplicate samples will be analyzed by the laboratory to evaluate sampling and analytical reproducibility.

8.2 LABORATORY PROCEDURES

The internal quality control checks vary for each analytical procedure but in general will include the following QC requirements:

i) Calibration Standards;
ii) Instrument Performance Checks – Organics;
iii) Initial and Continuing Calibration Checks;
iv) Internal Standard Performance;
v) Method Blank Samples;
vi) Laboratory Control Samples and QC Check Samples;
vii) Matrix Spike/Matrix Spike Duplicates;
viii) Surrogates;
ix) Blind Check Samples.

All data will be properly recorded. The data package will include a summary of QC data as presented in Section 9.3.2. Any samples analyzed in nonconformance with QC criteria will be re-analyzed by the laboratory, if sufficient volume is available.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

All data generated through in field activities or by the laboratory operation shall be reduced and validated prior to reporting to the NYSDEC in accordance with the following procedures:

9.1 DATA REDUCTION

9.1.1 FIELD DATA REDUCTION PROCEDURES

The pH, conductivity, temperature, turbidity and ORP readings collected in the field will be generated from direct read instruments following calibration per manufacturer's recommendations. Such data will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry.

9.1.2 LABORATORY DATA REDUCTION PROCEDURES

Quality control data (e.g., laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QAO for review. If approved, data are logged into the project database format. Unacceptable data shall be appropriately qualified in the project report.

Case narratives will be prepared by the Laboratory QAO which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis. If errors are noted; the corrections will be made, but the original notations are crossed out legibly.

9.2 DATA VALIDATION

Data validation procedures shall be performed for both field and laboratory operations as described below.

9.2.1 PROCEDURES USED TO EVALUATE FIELD DATA

Procedures to evaluate field data for this project will include review of field logbooks and checking for transcription errors to project specific documents.

9.2.2 PROCEDURES TO VALIDATE LABORATORY DATA

The Project QA Officer or designee will evaluate the completeness of each data package and perform data validation. Completeness checks will be administered on all data to determine whether deliverables specified in the QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries and supporting raw data from instrument printouts. The review will determine whether all required items are present and request copies of missing deliverables.

Data validation will be performed on 100% of the laboratory quality control summary data deliverables and will consist of the following components:

VOC Analysis

- i) technical holding times;
- ii) GC/MS instrument performance check;
- iii) initial and continuing calibration;
- iv) internal standard performance
- v) method, trip and field blanks;
- vi) system monitoring compounds (surrogate spikes);
- vii) MS/MSD results;
- viii) laboratory control samples; and
- ix) field duplicate samples.

9.3 DATA REPORTING

Data reporting procedures shall be carried out for field and laboratory operations as indicated below.

9.3.1 FIELD DATA REPORTING

Field data reporting shall be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field and documentation of all field instrument calibration activities.

9.3.2 LABORATORY DATA REPORTING

The laboratory data reporting package will be sufficient to perform a data validation in accordance with protocols described in Section 9.2.2.

The Laboratory Project Manager will perform a final review of the QC data summary packages and case narratives to determine whether the report meets the project requirements. In addition to the record of the chain-of-custody, the final laboratory data report format shall consist of the following.

i). Title Page
- project name and number;
- laboratory project or lot number;
- signature of the Laboratory QA Officer or his designee; and
- date issued.

ii). Table of Contents - laboratory report contents

iii). Case Narrative

iv). Analytical Methods Summary - methods of sample preparation and analyses for samples.

v). Analytical Sample Summary - cross-reference table of laboratory sample to project sample identification numbers.

vi). Shipping and Receiving Documents
- sample container documentation; and
- sample reception information and original chain of custody record.

vii). Chemistry Data Package by Analysis
- Sample Results
- QC Summary Data with Current Control Limits
- Standard Data
- Raw QC Data - dated chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts of QC samples;

- Miscellaneous Data
  - instrument run logs,
  - sample preparation records, and
  - instrument conditions.

The project laboratory will provide electronic data deliverables (EDDs) in an EQuIS® 4-file format. The laboratory data will be downloaded into the EDDs directly from the laboratory information management system (LIMS). The EDDs are imported into EQuIS and the data are maintained in the database for manipulation and presentation.

10.0 PERFORMANCE AND SYSTEM AUDITS

A performance audit is an independently obtained quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 INTERNAL FIELD AUDIT RESPONSIBILITIES

Internal audits of field activities include the review of sampling and field measurements conducted by the Field QA Officer. The audits will verify that all procedures are being followed. Internal field audits will be conducted once during each phase of the sampling and at the conclusion of the project. The audits will include examination of the following:

i) Field sampling records, screening results, instrument operating records;
ii) Sample collection;
iii) Handling and packaging in compliance with procedures;
iv) Maintenance of QA procedures; and
v) Chain-of-custody reports.

Follow up audits will be conducted to correct deficiencies and to verify that procedures are maintained throughout the investigation.

10.1.2 EXTERNAL FIELD AUDIT RESPONSIBILITIES

External audits may be conducted by the NYSDEC at any time during the field operations. These audits may or may not be announced and are at the discretion of the regulatory agency. The external field audits can include (but are not limited to) the following:

i) Sampling equipment decontamination procedures;
ii) Sample bottle preparation procedures;
iii) Sampling procedures;
iv) Examination of health and safety plans;
v) Procedures for verification of QC samples

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 INTERNAL LABORATORY AUDIT RESPONSIBILITIES

The laboratory system audits will be conducted by the Project QA Officer or designee. The system audit will include an examination of laboratory documentation including: sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis, and instrument operating records.

System audits, as opposed to performance audits, are strictly qualitative and consist of an on-site review of a laboratory's quality assurance system and physical facilities for calibration and measurement.

At the conclusion of internal or external system audits, reports will be provided to the laboratory for appropriate comment and remedial/corrective action where necessary. Written response to internal as well as external audits will be required. Records of audits and corrective actions will be maintained by the Laboratory QA Officer.

10.2.2 EXTERNAL LABORATORY AUDIT RESPONSIBILITIES

External audits will be conducted as required, by appropriate personnel of the certifying regulatory agency. External audits may include any of the following:

i) Review of laboratory analytical procedures
ii) Laboratory on-site visits
iii) Submission of performance evaluation samples for analysis

Failure of any of the above audit procedures can lead to laboratory disqualification, and another suitable laboratory will have to be chosen. An on-site review can consist of:

i) Sample receipt procedures
ii) Custody, sample security, and log-in procedures
iii) Review of instrument calibration logs
iv) Review of QA procedures
v) Review of log books
vi) Review of analytical SOPs
vii) Personnel interviews

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

i) Comparison of resulting data to the SOP or method
ii) Verification of initial and continuing calibrations within control limits
iii) Verification of surrogate recoveries and instrument timing results
iv) Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable
v) Assurance that samples are run within holding times.

11.0 PREVENTATIVE MAINTENANCE

11.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

The field equipment preventative maintenance program ensures the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities.
- Maintenance schedules.
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for maintaining an adequate inventory of spare parts. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

11.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventative maintenance. The extent of the preventative maintenance will be a function of the complexity of the equipment.

Generally, annual preventative maintenance service will involve cleaning, adjusting, inspecting and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

Maintenance records will be placed on file at the laboratory and can be made available upon request.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The following sections include the procedures and formulae utilized to assess the levels of precision, accuracy and completeness achieved during the associated sample analyses.

12.1 FIELD MEASUREMENTS

Field generated information such as pH and specific conductance data will be reviewed for validity by the Field QA Officer and typically include bound logbooks/forms, data entry and calculation checks. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a single sample and will be measured by determining the relative percent difference (RPD) of the readings as defined in Section 12.2.1. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \quad \text{X} \quad 100$$

12.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy and completeness detailed in the following subsections:

12.2.1 PRECISION

The precision of laboratory analysis will be assessed by comparing the analytical results between LCS/LCSD and MS/MSD analyses. The relative percent difference (RPD) will be calculated for each pair of duplicate analyses (LCS/LCSD, MS/MSDs and field duplicates).

12.2.2 ACCURACY

The accuracy of laboratory results will be assessed for compliance with the established laboratory QC criteria for LCS/LCSD and MS/MSD samples. The percent recovery (%R) of QC samples will be calculated and reported in the final data package.

12.2.3 COMPLETENESS

Completeness will be assessed by comparing the number of valid (usable) results to the total possible number of results using the formula presented in Section 12.1.

12.3 STATISTICAL EVALUATIONS

In the examination of data and determination of their precision and accuracy, standard statistical formulae will be used. Further details are provided in the following subsections

12.3.1 PERCENT RECOVERY

The percent recovery of a parameter is calculated by dividing the amount recovered by the true amount added and multiplying by 100. The percent recoveries of spiked samples are evaluated to establish the analytical accuracy of a measurement. Percent recovery is calculated using the following formula:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

SSR = Spiked Sample Result
SR = Sample Result or Background
SA = Spike Added

12.3.2 RELATIVE PERCENT DIFFERENCE

The relative percent difference (RPD) is calculated by dividing the absolute value of the difference between two numbers by their arithmetic mean and multiplying by 100. The RPD is used to evaluate the analytical precision of two replicate measurements (e.g., matrix spike/matrix spike duplicate). RPD is calculated using the following formula:

$$RPD = \frac{(R_1 - R_2)}{R_1 + R_2} \times 100$$

where:

R_1 = first result
R_2 = second result

13.0 CORRECTIVE ACTION

13.1 FIELD CORRECTIVE ACTION

Corrective action is intended to address problems that arise by identification, recommendation, approval, and implementation of measures that counter unacceptable procedures or deficient quality control performance. The Project QAO will be responsible for ensuring the quality of the sampling procedures and environmental data and as such, will be responsible for initiating corrective action when appropriate.

The corrective action procedures will be as follows:

i) Identify/define the problem.
ii) Assign responsibility for investigating the problem.
iii) Investigate/determine the cause of the problem.
iv) Determine an appropriate corrective action to eliminate the problem.
v) Implement the corrective action.
vi) Evaluate the effectiveness of the corrective action.
vii) Verify that the corrective action has eliminated the problem.
viii) Prepare a written record detailing the problem, corrective action utilized, and solution of the problem.
ix) Submit the record to the Task Coordinator who initiated the corrective action and the Project QAO, and GM Project Manager.

Any Field Team member of the project may initiate corrective action procedures by reporting in writing the nature of the suspected problem to the Project Manager or QA Officer.

13.2 LABORATORY CORRECTIVE ACTION

Corrective actions will be initiated by the laboratory QA personnel and will be implemented by laboratory staff chemists under the oversight of the laboratory QA personnel. As with field corrective actions, the laboratory QA personnel will document the problem, the corrective action undertaken and the resolution of the problem. The corrective actions will be performed prior to release of the data from the laboratory. Documentation will be provided to the laboratory QA Officer, Project QAO, Project Manager and GM Project Manager.

13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT

The Project QAO may identify the need for corrective action during either the data validation or data assessment processes. Potential types of corrective action may include re-sampling by the field team or re-injection/reanalysis of samples by the laboratory (if possible).

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g., the holding time for samples is not exceeded). When the Project QA Officer identifies a corrective action situation, GM Project Manager will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment.

14.0 QUALITY ASSURANCE (QA) REPORTS

Critically important to the successful implementation of the Long term Groundwater Monitoring program is a reporting system that provides the means by which the program can be reviewed, problems identified and programmatic changes made to improve the program.

QA reports to management include:

- Audit reports, internal and external audits with responses
- Performance evaluation sample results; internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Project Manager when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of the laboratory management.

15.0 REFERENCES

1. United States Environmental Protection Agency, (1999). EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. EPA QA/R-5 Interim Final, November 1999.

2. New York State Department of Environmental Conservation, (2010). Technical Guidance for Site Investigation and Remediation/DER-10. Final, May, 2010

3. United States Environmental Protection Agency (1991). Preparation Aids for the Development of Category I Quality Assurance Project Plans. U.S. EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio, February 1991.

4. United States Environmental Protection Agency, (1993). Data Quality Objectives Process for Superfund Interim Final Guidance. U.S. EPA/540/R-93-071, Office of Solid Waste and Emergency Response (OSWER), September 1993.

5. United States Environmental Protection Agency, (1992). Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 9240.0-05A, April 1992.

6. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-99-012.

7. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.

8. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Office of Solid Waste, U.S. EPA, SW-846, November 1986, with updates.

APPENDIX J – SITE MANAGEMENT FORMS

NYSDEC Site ID: 828064	Bldg. 22 LNAPL Recovery System Documentation

Auxilliary Waste Treatment Area **GM Components Holdings** **1000 Lexington Ave. Rochester, NY**

Name	Date	Time	Total Flow Reading (gal)		Flow Rate (gpm)		GAC Vessel Pressure Diff. (psi)	Carbon Backwash	Bag Filter Diff. Pressure (psi)	Bag Filter Change Date	OWS Transfer Pump Pressure (psi)	Diaphragm Pump Pressure (psi)	Well-Z Counter (Pump Cycles)	Actions
			FM-100 (Foundation/OWS)	FM-200 (Total Flow)	FM-100 (327181)	FM-200 (327180)								

NYSDEC Site ID: 828064	Groundwater Recovery and Treatment System (GRTS) Documentation											
Eastside Groundwater Treatment Area				GM Components Holdings, LLC				1000 Lexington Ave. Rochester, NY				
Name	Date	Time	Total Flow (Gal)				Bag Filter Change	GAC Backwash	GAC Transfer Flow Rate (gpm)	GAC Backpressure (psi)	OWS Drum Level	
			FE-101	FE-102	FE-103	FE-105						

SSD System-Monthly Blower Vaccum Logsheet **Date:** ____________

GMCH Rochester Operations Facility **Collected by:** ____________

1000 Lexington Ave, Rochester, NY **Project No.:** ____________

Bldg Location - Fan/Pit Tag	Suction Pit Location (Col No.)	Time	Suction Pit Area Vacuum ("W.C.)	Suction Pit Area Historic Ops. Range	Notes/ Observations/ Recommendations
SP-1	E-21			**30-35**	
SP-2	R-29			**39-41**	
SP-3	G-7			**35-39**	
SP-4	L-23			**40-43**	
SP-5	G-31			**14-18**	
SP-6	W-19			**40-45**	

Notes:
1. If reading is 0 and fan operating, check tubing connections
2. '"W.C. inches water column
3. '"PPM" Parts per million

Testing Equipment/ Instrumentation Used (list Make/ Model/ Serial No.s):

SSD System - Quarterly Vacuum Monitoring Data Summary

GM Rochester Operations Facility **1000 Lexington Avenue Rochester, New York**

Date:

Collected by:

Suction Point / Fan		Vacuum at Pit (in w.c.)	Historic Operating Range (in. w.c.)	Comments
SP-1			**30-35**	
SP-2			**39-41**	
SP-3			**35-39**	
SP-4			**40-43**	
SP-5			**14-18**	
SP-6			**40-45**	
Suction Pit Location	**Sub Slab Monitoring Point ID**	**Vacuum at Point (in w.c.)**	**Historic Operating Range (in. w.c.)**	**Comments**
SP-1	C-23			
	E-15			
	E-17			
	E-19/17			
	E-23			
	E-25			
	E-27			
	G-19			
	G-21			
	G-23			
	G-27			
SP-2	N-27			
	N-29			
	N-33			
	P-29			
	P-31			
	P-33			
	R-25			
	R-27			
	R-31			
	R-33			
	R-35			
	T-29			
	W-29			
	X-29			
SP-3	C-7			
	E-7			
	G-3			
	G-5			
	G-9			
	G-11			
	G-13			
	J-7			
	L-7			

Suction Pit Location	Sub Slab Monitoring Point ID	Vacuum at Point (in w.c.)	Historic Operating Range (in. w.c.)	Comments
SP-4	J-17			
	J-21			
	L-17			
	L-19			
	L-21			
	L-25			
	L-27			
	L-29			
	N-25			
SP-5	E-31			
	G-29			
	G-33			
	G-35			
	J-29			
SP-6	T-17			
	T-19			
	T-21			
	T-23			
	W-15			
	W-17			
	W-19			
	W-21			
	W-23			
	W-25			

Notes:
0.001 - Negative Pressure (Vacuum)
+0.001 - Positive Pressure
"in. w.c. is inches in water column

Summary/Observations:

SSD System-Annual Monitoring and Sampling Form

GM Rochester Operations Facility

1000 Lexington Avenue, Rochester, NY

Date: ____________________

Collected by: ____________________

Project No.: ____________________

Bldg Location - Fan/Pit Tag	Suction Pit Location (Col No.)	Time	PID Screening (ppm)	Sample ID	Visual Inspection of Piping	Notes/ Observations/ Recommendations
SP-1	E-21					
SP-2	R-29					
SP-3	G-7					
SP-4	L-23					
SP-5	G-31					
SP-6	W-19					

Nomenclature

"W.C. inches water column

°F degrees Fahrenheit

Notes:

1. If reading is 0 and fan operating, check tubing connections
2. Sample collected via Tedlar Bag

Testing Equipment/ Instrumentation Used (list Make/ Model/ Serial No.s):

Site ID: 828064	GM Components Holdings	1000 Lexington Ave. Rochester, NY

		EWTA OWS Drum		Manual (PCB) Product Drum		Product (Non PCB) Recovery Drum		LR-1/R-309 Recovery Drum		LR-2 Recovery Drum		LR-3 Recovery Drum	
Annual Summary	Date	Product Level in drum (inches)	Accumulation (gallons)	Product Level in drum (inches)	Accumulation (gallons)	Product Level in drum (inches)	Accumulation (gallons)	Product Level in drum (inches)	Accumulation (gallons)	Product Level in drum (inches)	Accumulation (gallons)	Product Level in drum (inches)	Accumulation (gallons)
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0
Monthly Total			0		0		0		0		0		0

Site ID: 828064		GM Components Holdings			1000 Lexington Ave. Rochester, NY			
Well ID	Date	Name	Depth to Product (DTP) (ft)	Depth to Water (DTW) (ft)	NAPL Thickness (ft)	Product Recovered (gal)	Recovery Drum	Comment
SR-309								
R-309								
SR-310								
SR-312								
SR-313								
SR-326								
SR-503								
R-235								
R-236								
SR-102								
LR-2								
LR-3								
Field Comments:								

Well ID	Date	Name	Depth to Product (DTP) (ft)	Depth to Water (DTW) (ft)	NAPL Thickness (ft)	Product Recovered (gal)	Recovery Drum	Comment
SR-309								
R-309								
SR-310								
SR-312								
SR-313								
SR-326								
SR-503								
R-235								
R-236								
SR-102								
LR-2								
LR-3								
Field Comments:								

Well ID	Date	Name	Depth to Product (DTP) (ft)	Depth to Water (DTW) (ft)	NAPL Thickness (ft)	Product Recovered (gal)	Recovery Drum	Comment
SR-309								
R-309								
SR-310								
SR-312								
SR-313								
SR-326								
SR-503								
R-235								
R-236								
SR-102								
LR-2								
LR-3								
Field Comments:								

SITE INSPECTION FORM

DRAFT

1. SITE DETAILS			
Site No.: 828064			
Site Name: GM Components Holdings LLC			
Site Address: 1000 Lexington Avenue, Rochester NY			
2. PERSON PERFORMING INSPECTION			
NAME:	EMAIL:		
OTHERS PRESENT:	PHONE NUMBER:		
COMPANY:			
3. INSPECTION DATE AND SITE CONDITIONS			
INSPECTION DATE:	INSPECTION TIME:		
WEATHER CONDITIONS:			
4. REASON FOR SITE INSPECTION			
Scheduled Annual Inspection:	YES	NO	
Inspection after a Severe Condition that could effect site controls:	YES	NO	
describe severe conditions triggering inspection:			
5. VERIFICATION OF SITE DETAILS			
Current Site Owner:			
Current Site Operators:			
Describe Current Site Use (check all that apply):			
Industrial	Commercial	Residential	Other
briefly describe observed site uses:			
Has some or all of the Site property been sold, subdivided, merged, or undergone a tax map amendment since the initial/last inspection?	YES	NO	
If YES, is documentation or evidence of documentation submittal to NYSDEC attached?	YES		
Have any federal, state and/or local permits (e.g., building or discharge) been issued for the property since the initial/last inspection?	YES	NO	
If YES, is documentation or evidence of documentation submittal to NYSDEC attached?	YES		
Has a change in Site usage per NYCRR 375-1.11(d) occurred since the last inspection?	YES	NO	
If YES, is documentation or evidence of documentation submittal to NYSDEC attached?	YES		
Has any new information come to your attention to indicate that assumptions made in the qualitative exposure assessment for off-site contamination are no longer valid?	YES	NO	
If YES, is this information or evidence of submittal to NYSDEC attached?	YES		
Note any additional pertinent information to Verification of Site Details (use additional pages if necessary):			
6. DESCRIPTION OF INSTITUTIONAL/ENGINEERING CONTROLS			
Is Environmental Easement still in place?	YES	NO	
If no, explain:			
Is the Site Management Plan in place?	YES	NO	
If no, explain:			
Is the Cover System in place and functioning as intended?	YES	NO	if no, explain in section 6A below:
Comments:			

Is the Groundwater Migration Control System in place and functioning as intended?	YES	NO	if no, explain in section 6A below:
Comments:			
Is the LNAPL Recovery in place and functioning as intended?	YES	NO	if no, explain in section 6A below:
Comments:			
Is the Sub-Slab Depressurization System in place and functioning as intended?	YES	NO	if no, explain in section 6A below:
Comments:			
6A. AREAS IN NEED OF REPAIR OR MAINTENANCE			
Area discussed in this section must be shown on a figure and have photographic documentation. (Photos collected must follow GMCH approved protocols).			
Building Structures/ Concrete Sidewalks			
Pavement			
Soil Cover			
Groundwater Migration Control			
LNAPL			
Sub-Slab Depressurization System			

DRAFT

6B. HAVE INTRUSIVE ACTIVITIES BEEN PERFORMED AT THE SITE THAT IMPACTED THE COVER SYSTEM (if "Yes" Describe below)	LOCATION	DATE	WAS SMP FOLLOWED FOR THESE ACTIVITIES (YES or NO)

7. REVIEW OF SITE RECORDS

Are site records being properly generated and maintained? YES NO

Provide summary of recordkeeping review and adequacy:

DRAFT

8. ADDITIONAL NOTES & COMMENTS

9. INSPECTION CERTIFICATION

I hereby certify that the information included in this report is complete and accurate to the best of my knowledge.

Inspector Signature: Date: ______________________________

END OF INSPECTION FORM

Summary of Green Remediation Metrics for Site Management

Site Name:__________________________________Site Code: _______
Address:____________________________________City: ___________________________
State:_______________ Zip Code:___________County: _________________________

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: ______________________

Current Reporting Period
Reporting Period From:________________________To: ____________________________

Contact Information
Preparer's Name: Phone No.: _____________________
Preparer's Affiliation: _

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M[1] generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

[1] *Operation, Maintenance and Monitoring (OM&M)*

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I,______________________________(**Name**) do hereby certify that I am _______________________(**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. **Date** **Contractor**

APPENDIX K – FIELD SAMPLING PLAN

FIELD METHOD GUIDELINES MANUAL

VERSION 0
AUGUST 17, 2018
REF. NO. 17300 (2)
Revision 1, August 17, 2018

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INTRODUCTION

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

PURPOSE

Field investigation and remediation services required by the General Motors (GM) are performed by the Eco Restorers/GM Remediation Team and the Remediation Team consultants (RTC). It is expected that the RTC field staff will:

- Provide Eco Restorers/GM Remediation Team with state-of-the-art field services.
- Provide that level of service to the best of RTC's capabilities.
- Provide that level of service where and when Eco Restorers/GM Remediation Team dictates it to be done.
- Perform the work conscientiously and efficiently.
- Perform the work in a manner that is consistent with proper health and safety practices and ensure that you, your co-workers, the public, and the environment are protected.
- Keep an eye open for activities and situations around your work that could impact Eco Restorers/GM Remediation Team operations.
- Keep GM Remediation Team Project Manager informed.

The purpose of this manual is to identify the preferred Eco Restorers/GM Remediation Team guidelines for field activities performed during investigation/remedial activities at GM facilities. The standardization of field methods will impart consistency to the manner in which field data is collected and prepared for evaluation/presentation. It is intended that the individual Field Method Guideline (FMG) elements presented within this compilation be utilized separately or in groups as attachments to project Work Plans to define the field activity procedures and that they be utilized (unless a deviation is approved by the GM Project Manager or Team Leader) for all new work plans for Eco Restorers/GM Remediation Team projects. It is highly recommended that these guidelines be followed. Deviation is allowed with the approval of the GM Project Manager if documented with the particular reason for the variance. A copy of this documentation should be supplied to the GM Remediation Team Project Manager. It should also be supplied to the FMG Technical Committee (TC) as a way to evaluate use of existing FMGs and as a check on whether particular FMGs should be revised. An alternative written methodology will be required if the Eco Restorers/GM Remediation Team FMG is not used. On projects where the Work Plans/Sampling Methodologies/Quality Assurance Project Plans (QAPPs) have been previously negotiated and approved by regulatory agencies, it is not required that existing approved methodologies be changed to meet FMGs. It is recommended that the project team document this reason in the project file. It is also recommended that the team does a review of the site methodologies against the FMGs to see if there may be a reason to propose a modification to the regulatory agency for a particular method because of potentially higher quality and more representative results using a newer method. If a team member believes that the Eco Restorers/GM Remediation Team FMG is not the best or most currently accepted practice and that the FMG should be modified, documentation of the suggested variance should be provided to the FMG TC in order that the proposed change can be evaluated. A decision on the proposed change will be provided through email and Share Point.

This manual provides practical information to assist in the implementation of the goals set forth in all project Work Plans, HASPs, and QAPPs. The Work Plan will dictate the specific field method required. Attachment of the appropriate guideline to the Work Plan document will form the final set of guidance documents necessary to conduct the field activity.

LAYOUT OF THE MANUAL

The manual is presented in three sections. The following is a brief summary of the intent of each section.

PART A: GENERAL FIELD ACTIVITIES POLICY

This section describes Eco Restorers/GM Remediation Team policies pertaining to health, safety, training, records, and relations with site personnel which are applicable to all Eco Restorers/GM Remediation Team field activities. The policies described are not project specific.

PART B: FIELD ACTIVITY SUPPORT

This section provides detailed guidance on a wide range of field support activities. It should be noted that the topics of this section are not in themselves the reason for the field work. The topics covered are strictly activities which support the conduct of the field guidelines described in Part C - Field Method Guidelines.

PART C: FIELD METHOD GUIDELINES

This section provides detailed guidance for the actual conduct of individual field activities by RTC personnel. Each field activity discussed is individually indexed. In many cases, the instructions of one field activity will refer you to another field activity or to Part B - Field

Activity Support, for more specific information. Typically, each field activity index is broken down into subsections. These are:

1. Introduction

   Provides a brief description of the purpose of the activity.

2. Procedures Referenced

   Provides related FMGs that may require to be referenced prior to performing the field activity.

3. Procedural Guidelines

   Provides detailed instruction for the actual conduct of the specific field activity. The information provided here will, in most cases, meet or exceed the commonly known standards for the conduct of the subject activity.

4. Equipment/Materials

   Provides a listing of equipment and materials typically employed to complete the field activity.

5. References

   For additional information pertaining to select topics within the procedures, relevant reference sources are listed such as ASTM documents or other external resources available. It is the user's responsibility to verify that external control documents (i.e., ASTM information) are current.

USAGE

General

Field personnel should be aware of differences between the Eco Restorers/GM Remediation Team Field Procedures and those provided in the site-specific documents. Whenever these differences are substantial, the field personnel must question the Project Managers to ensure that the reason for the difference is justifiable for this particular situation. These differences should be noted.

The Eco Restorers/GM Remediation Team Field Method Guidelines Manual is currently only available by electronic means on the GM Remediation Team Share Point Site.

Hard copy distribution of this manual has not been performed due to quality control concerns regarding obsolete documents/document control.

Subsequently, manual users must print off required sections for Work Plan preparation/ field/reference use. Printed sections must be discarded after use or periodically checked with the electronic version to ensure the section is current. Each page of the manual is marked with the version number and date of last revision.

Copies of site-specific Work Plans and supporting documents must be kept at the site during active field activities. Any individual tasked with conducting a specific field activity must always refer to the appropriate project document first for site-specific information. The "Native Applications Folder" of the FMG manual presents all forms in their original format.

Use of Standard Forms

At various points in Part B - Field Activity Support, and at the end of some FMG sections, a subject matter specific checklist is discussed. Forms are listed in the Table of Contents of each section and may be used for subsequent field use by accessing this source.

Applicable forms for data records or field observations are available electronically prior to the start of the work and shall be used for completion of the assigned tasks. All forms are retrievable from the GM Remediation Team Share Point Site folder with the Documents Section/Field Method Guidelines.

After the work is 100 percent complete, including follow up activities, the form should be placed in the project file.

MANUAL UPDATES/REVISIONS

Periodically, the manual will be updated consistent with suggested user feedback improvements, technology changes, and as governing codes, rules, and regulations change. As noted, this document is only available by electronic means.

Because of the changing/advancing nature of field methods, it is imperative that all field staff (including senior experienced field staff) continue to review and follow the electronic version of this manual for each work assignment, so that recent changes are not delayed in being implemented.

The practicality, accuracy, and usability of this manual will be greatly enhanced by user feedback. Any comments regarding this manual or suggestions for new guidelines covering other tasks should be submitted by email to:

cheryl.r.hiatt@gm.com
Eco Restorers, Sustainable Work Places, GM

New guideline preparation, revisions to guidelines, or requests to employ "site-specific" methods require approval from the Eco Restorers/GM Remediation Team Technical Committee (TC). These changes must be submitted to the TC using the attached Revision Request Form (FMG-RRF).

The comments received will be forwarded to the Eco Restorers/GM Remediation Team TC responsible for implementation and maintenance of the Field Method Guidelines. The TC will review the suggested changes, seek comment from the appropriate participants, and implement these changes if approved. The electronic version will be edited accordingly, with a new revision date indicated on the changed guideline.

FMG TECHNICAL COMMITTEE

The Field Method Guidelines are managed by the GM Remediation Team Technical Committee (TC) comprised of GM Eco Restorers, Sustainable Work Places personnel Cheryl Hiatt and Ed Peterson; and participating consultants [Arcadis, GHD, and Haley & Aldrich (H&A)]. The TC is responsible for the preparation and implementation of these guidelines, and future maintenance of the FMG program, including review and approval of new guidelines.

The technical preparation, review, and final approval of FMGs for use by Eco Restorers/Remediation Team members will be documented by the TC in writing and updated accordingly as changes are introduced.

PART A

GENERAL FIELD ACTIVITY POLICY

AUGUST 17, 2018
REF. NO. 17300 (2) PART A
Revision 1, August 17, 2018

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GENERAL POLICIES FOR FIELD ACTIVITIES

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

1.0 PURPOSE

The purpose of this section of the Field Method Guidelines Manual is to outline the policies that have been developed with regards to Remediation Team Consultant (RTC) personnel who conduct field activities.

2.0 SAFETY

Safety takes precedence over all other aspects of every project. No task is to be initiated until the health and safety aspects of that task are understood and appropriate precautions have been implemented. For each Facility (active or inactive), a Health and Safety Plan (HASP) will have been developed which addresses the tasks to be performed and establishes the methods and procedures to be implemented to safely conduct each task. It is your responsibility to carefully read the HASP, understand its contents, and perform the field tasks in accordance with the methods and procedures outlined. Any areas of uncertainty should be discussed with the Health and Safety Officer (HSO) for that particular task until you fully comprehend the intent of the HASP, the dangers involved, and the proper means to safely proceed. **DO NOT PROCEED UNTIL ALL OF THESE ASPECTS ARE UNDERSTOOD.**

The HASPs are developed in accordance with all OSHA regulations and the Facility requirements. Copies of the OSHA regulations are available in each RTC office. You must familiarize yourself with the sections of these regulations that are applicable to your area of service. Each RTC employee has access to the electronic version of the "Health and Safety Planning and Operating Guidelines" prepared for activities at GM Facilities.

In cases where a situation develops in the field with which you are uncertain, immediately contact the HSO to determine the proper course of action to be taken. While common sense is a very useful guide, always check uncertain situations with the HSO.

Another factor to remember during your work at any site is that you are typically there as a member of a team. When you observe work being done by others that does not appear to be consistent with the HASP, or within the bounds of good judgment, report your observations immediately to a senior site representative (i.e., Eco Restorers/GM Remediation Team Project Manager). If necessary, report directly to the other workers if no one else is on site and make sure that appropriate corrective measures are taken promptly. Remember that you are not only responsible for your own safety, but also those of your co-workers, the general public, and the environment.

Whenever some uncertainty is involved in the task being performed on site, remember that the proper level of personal protective equipment is that level which provides sufficient protection for the worst-case scenario. Never be afraid or embarrassed to upgrade to a higher level of personal protective equipment.

3.0 COMPLIANCE WITH GOVERNING CODES, RULES, AND REGULATIONS

All RTC personnel will comply with all governing codes, rules, and regulations at all times. Any questions that arise should be discussed and resolved with your Project Manager.

When you observe work being done by others that does not appear to be consistent with the governing codes, rules, or regulations or within the bounds of good judgment, report your observations immediately to a senior site representative (i.e., Eco Restorers/GM Remediation Team Project Manager). If necessary, report directly to the other workers if no one else is on site and make sure that appropriate corrective measures are taken promptly.

4.0 CONSULTANT AS WASTE GENERATOR

The Consultant IS NOT AND CANNOT BE A WASTE GENERATOR. The consultant cannot sign waste manifests, hazardous or otherwise. Therefore, you cannot sign any manifests. (In isolated cases, where Eco Restorers/GM Remediation Team and the consultant provide proper documentation and indemnification, the Consultant does have the authority to sign as an agent for Eco Restorers/GM Remediation Team. However, please note that these cases are very rare and you will be made aware of them when this applies.)

In no case should the Consultant's name appear on any drum or waste shipment. All arrangements for waste handling are to be coordinated with the Facility Resource Manager (RM) and will be Eco Restorers/GM Remediation Team's responsibility. All sample records, cuttings, and excess soils (including geologic soil record samples) **must** remain on site or in Eco Restorers/GM Remediation Team's possession.

Unless instructed by the Project Manager, every attempt should be made to avoid the purchase of chemicals by the Consultant for field use. Pre-work planning should include coordination such that all chemicals to be used by Consultant personnel are purchased by GM or the site general contractor. Sample preservatives should be supplied by the lab. After sampling activities are completed, unused preservatives should be returned to the lab. At the end of the work, unused and used chemicals must be properly disposed of by Eco Restorers/GM Remediation Team or the site general contractor.

If chemicals for use by Consultant personnel are to be used for a period of time, they should be temporarily stored by the site general contractor or Eco Restorers/GM Remediation Team. If it becomes necessary to bring chemicals back to the offices of the RTC, they must be properly stored in approved containers and areas.

5.0 TRAINING, PHYSICALS, AND RESPIRATOR FIT TESTS

All RTC personnel involved in field activities at environmental sites must participate in RTC's training and medical examination program. These requirements are described within the "Health and Safety Planning and Operating Guidelines" developed for Eco Restorers/GM Remediation Team field activities.

Mandatory training includes attendance and certification at a 40-hour OSHA hazards compliance program (except for those personnel that were grandfathered into the program). In addition, field personnel and managers must attend an approved 8-hour refresher course annually.

All RTC personnel involved in field activities at environmental sites will receive a medical examination on either an annual or biannual basis.

RTC industrial hygienists will develop and arrange medical surveillance programs in accordance with the applicable regulations. It is your responsibility to attend. Failure to attend will eliminate your eligibility for work at such sites and may result in no work being available for you. The industrial hygienists will also be responsible for maintaining the records of your training and medical history (all medical information on file is confidential). The industrial hygienists will also provide each field person with a respirator fit test; each RTC, per their involvement in the project will provide the respirator for their own personnel.

Acknowledgment of your training, medical examinations, and fit tests will be provided to you on a card which you need to keep with you as proof of participation in these programs.

In some cases, certain sites require specific entrance and exit medical examinations in addition to your annual medical. Any such medicals that you are required to take should be reported to RTC industrial hygienists so that they can maintain accurate and complete records.

Some GM Facilities also require contractor employees (such as RTC employees) to participate in substance abuse programs. To the extent that participation is required of RTC, those personnel involved at these sites will also be required to participate in, or provide proof of compliance with, GM's Substance Abuse Testing program.

6.0 REMEDIATION TEAM CONSULTANT - GM RELATIONS

It is expected that all RTC personnel to treat all GM staff courteously and with respect. It is also expected that you keep the Eco Restorers/GM Remediation Team project management staff informed of project status, problems encountered, and resolutions implemented. However, each GM employee may not be associated with the office or division of the company which is contracting and responsible for the work. The specifics of our purpose and findings must be considered confidential to our contractual contact with Eco Restorers/GM Remediation Team, not every employee of GM. Know to whom you are talking, and do not release information to anyone unless you are sure they have a right to know.

While GM needs our services, GM also has a business to run. Wherever we are working, our field work is definitely NOT the primary profit-generating activity of GM.

Accordingly, be VERY sensitive to minimizing disruption to the normal work flow at the site and to scheduling disruptive activities at the least inconvenient time for the Facility. This requires that RTC personnel review the on-site activities with GM personnel and coordinate the sequence of work with the on-site contact.

There is no doubt that over time friendships will develop between certain RTC employees and GM personnel. It is requested that RTC keep these relationships on a professional level. It is not considered appropriate to either accept gifts from GM personnel or to purchase gifts for them.

7.0 ECO RESTORERS/GM REMEDIATION TEAM CONSULTANT - CONTRACTOR RELATIONS

Whenever an RTC employee has been placed in an oversight position with a contractor, it is paramount to remember that you are providing this oversight on behalf of GM and they are entitled to the best service possible. You are expected to administer the contract fairly and at the same time also ensure that all of the rights and privileges afforded GM by the terms and conditions of the contract are taken into consideration. Any improprieties or failures on the part of the contractor are to be reported immediately to the Eco Restorers/GM Remediation Team Project Manager.

There is no doubt that over time friendships will develop between certain RTC employees and contractors. All the RTC asks is that you keep these relationships on a professional level. It is not considered appropriate to either accept gifts from contractors or to purchase gifts for them.

8.0 ECO RESTORERS/GM REMEDIATION TEAM CONSULTANT - ON-SITE REGULATORY AGENCY REPRESENTATIVE RELATIONS

RTC personnel are expected to develop a good working relationship with all personnel from the regulatory agencies. This relationship is imperative to ensure prompt resolution of field issues and to ensure that the job receives the approval of the regulatory agencies upon completion. If a field resolution cannot be reached, inform the Eco Restorers/GM Remediation Team Project Manager and further discussions will be held with the agencies' field staff supervisors.

While you are expected to be courteous and respectful of the on-site representatives, do not offer any unsolicited information regarding the project unless so instructed by the Eco Restorers/GM Remediation Team project Manager.

In the event that an OSHA inspector visits the site and requests information from you, answer all of the questions about which you are knowledgeable. For any areas of uncertainty, simply tell the OSHA inspector that you will get the answer immediately by looking it up in the HASP or contact one of RTC's industrial hygienists for assistance. All other information (e.g., Material Safety Data Sheets, Medical Records, etc.) is available at the RTC office or through one of RTC's industrial hygienists.

9.0 GM REMEDIATION TEAM CONSULTANT - PUBLIC RELATIONS

In the field, whenever you are approached by a member of the community, media, or unknown site personnel, respond courteously as follows:

"These activities are being conducted in conjunction with the program at Site X and I would suggest that you get in touch with Person Y (Remediation Team Project Manager or the GM Communications person assigned to the project) at GM for any specific information."

Do not answer any specific questions regarding the site or your activities. Acquire the name and other details of the person making the inquiry and relay this information to Person Y.

Following such an encounter, immediately notify Person Y and provide them with the details of your encounter and the tasks you were performing.

10.0 FIELD RECORDS

All activities undertaken in the field must be correctly and completely recorded in bound field books, Field Data Record Forms, or in some other RTC - approved format. All records will be kept in the RTC - approved format specified for the activities undertaken. The formats have been established to ensure completeness and to provide consistency amongst the field staff regardless of which office they are from. FMG 1.4 - Data Recording - Field Books/Digital Recording describes in detail the procedures for field book maintenance and digital records.

These field records may be called as evidence in a court of law.

In addition to the formal field records, you are expected to keep running tables that summarize the field activities so that when questioned at any time during the program you can provide a detailed status of the work completed and that which is yet to be done. These lists are also anticipated to serve as check lists to confirm that the correct number and sequence of samples, wells, boreholes, etc., have been collected or completed.

Upon completion of each project, all of the field documentation is to be brought back and suitably stored at the RTC office in which the field staff who performed the field work are located.

IT IS REQUIRED THAT ALL FIELD RECORD ENTRIES BE FACTUAL AND ACCURATE. EVERYONE RECOGNIZES THAT ERRORS AND OMISSIONS WILL BE MADE ON OCCASION. WHILE GM DOES NOT CONDONE A LEVEL OF EFFORT THAT IS INCOMPLETE OR INACCURATE, IT IS RECOGNIZED THAT IT MAY HAPPEN AND GM WILL UNDERSTAND THESE SITUATIONS. HOWEVER, ANYONE WHO IS CAUGHT FALSIFYING ANY RECORD, NO MATTER HOW SMALL, WILL BE DEALT WITH APPROPRIATELY.

11.0 SPILL REPORTING

All spills must be recorded in the field book and reported to the Eco Restorers/GM Remediation Team Project Manager as soon as is practicable. The requirements for reporting spills to the regulatory authorities are different in the United States and in Canada. These requirements are presented below.

RTC personnel should make reasonable efforts to stop and contain a spill. These efforts should not include measures which put the individual at risk of injury. If the chemical composition of the spill is unknown, Level B or Level A personal protective equipment is required. Where possible, the source of the spilled material should be isolated and ditching or berms should be used to contain spilled material. Follow up actions will depend upon the nature of the material spilled and the size of the spills. If necessary, local emergency response personnel (fire, emergency planning) should be contacted. If possible, decisions to call emergency response personnel should be made in consultation with the Eco Restorers/GM Remediation Team Project or Program Manager.

United States

The Eco Restorers/GM Remediation Team works on construction projects at which the potential for spills is present. These projects are normally conducted within the scope of an agency-approved Work Plan and an Order or similar legal document. The Work Plan and the Order usually compel the RTC and GM to report spills and incidents to the agency.

In all cases of a spill, after efforts have been made to stop and contain a spill and, if necessary, a decision has been made to call emergency response personnel, RTC site personnel must contact the Eco Restorers/GM Remediation Team Project Manager immediately.

Once the Eco Restorers/GM Remediation Team Project Manager is apprised of the situation, appropriate agency notification can be made. If the Eco Restorers/GM Remediation Team Project Manager or Program Manager is not available and no appropriate GM Facility personnel are available, the RTC personnel should report the spill within the required timelines. If necessary, the National Response Center, United States Environmental Protection (USEPA), and state agencies will be notified.

GM may also have internal notification requirements. These requirements must be confirmed to have been met by the Project Manager before outside agencies are notified.

Canada

In general, a "spill" is subjectively defined in Canada as a discharge of a substance that threatens health, life, property, or the environment. The decision as to whether a discharge is a spill that should be reported to a provincial ministry or Environment Canada must be made by the Project Manager in consultation with the GM representative.

The internal notification procedures for RTC field personnel in Canada are the same as those identified above for the United States.

12.0 PROPERTY ACCESS

Prior to commencing any field activity, RTC personnel must ensure that access to the lands under investigation has been granted from the respective landowners. Typically, this task is accomplished by the RTC Project Manager who instructs the field staff accordingly, providing the field office with copies of the access agreements/access permission. This documentation must be readily available for examination should local authorities or adjacent landowners request proof of access permission. Field personnel must confirm that this task has been completed before conducting field activities.

To assist RTC personnel in documentation and coordination of property access/utility clearance checking, a data sheet is available for general use. The Property Access/Utility Clearance Data Sheet must be used to record that access and utility clearances have been obtained. The color coded multi-format Property Access/Utility Clearance Data Sheets are available from each RTC office as a standard form.

13.0 UTILITY CLEARANCE

Field activities which penetrate the ground surface (i.e., test pits, boreholes, well installations, and new construction) must have a utility clearance performed in advance of any subsurface work. The utility clearance process is simply a logistical requirement performed to identify (as well as possible) utility presence, utility location, and special hazards that may exist when working in close proximity to these services. The utility check itself does not prevent all incidents but is one component of many activities that if all performed correctly will minimize the potential for a utility conflict. Typically, RTC field personnel are responsible for coordinating utility clearances and documenting completion of utility checks. RTC personnel cannot approve utility clearances; all utility clearance approvals must originate from GM, its authorized agent, or an outside utility group.

To underline the importance of utility clearances, a separate guideline: FMG 1.3 - Utility Clearances, has been prepared for personnel conducting subsurface activities.

Private utility locate groups are a growing industry that has organized an association of membership: National Utility Locate Contractors Association (NULCA). This group can be contacted at 715-635-6004.

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DRILLING TECHNIQUES

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 2.2
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

DRILLING TECHNIQUES

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This section will provide a brief description of common methods for conducting subsurface investigations. It should be noted that every drilling technology has its advantages and limitations.

PROCEDURES REFERENCED

- FMG 2.3 - Soil Borings
- FMG 2.4 - Bedrock Coring
- FMG 2.6 - Soil Classification
- FMG 2.7 - Rock Classification
- FMG 3.2 - Overburden and Top of Rock Wells
- FMG 3.3 - Deep Bedrock Wells
- FMG 3.5 - Piezometers
- FMG 3.6 – Well Development

PROCEDURAL GUIDELINES

It is important that the drilling method or methods used minimize disturbance of subsurface materials and not contaminate the subsurface and groundwater. The actual drilling method would be dependent upon site-specific geologic conditions and project requirements. It is important to note that the drilling equipment selected be decontaminated before and between borehole locations to prevent cross contamination (see FMG 9.0 - Equipment Decontamination).

Where possible drilling methods that minimize waste generation (soil cuttings), and wastewater generation (decontamination water), should be selected for Eco Restorer/GM Remediation Team investigation/remedial tasks.

In other settings it may be desirable to dictate drilling procedures that minimize turbidity/maximize the ability to achieve sediment-free groundwater. Generally, rotosonic techniques or rotary spun casing techniques achieve these objectives, or oversizing the borehole/sand pack may be considered, as well.

A brief description of each drilling method, listed in the order most commonly used at GM sites, is presented below.

Rotosonic Drilling

This method consists of a combination of rotation with high frequency vibration to advance a core barrel and outer casing to a desired depth. Typically, the core barrel is advanced in 10-foot intervals and then the outer casing is advanced to the core barrel depth and usually requires the injection of small quantities of water. 5-foot and 20-foot intervals are also used, depending on project requirements. Once the vibration is stopped, the core barrel is retrieved, and the sample is vibrated or hydraulically extracted into plastic sleeves or sample trays. The soil materials between the inner and outer casings are displaced into the sidewall of the geologic unit. Usually little to no soil or water is returned to the surface during drilling. The rotosonic method can usually drill easily through formations such as gravel, sand, clay, or glacial till. However, rotosonic drilling is slow in hard overburden formations (e.g., dense glacial till where displacement of soils into the sidewall are difficult), and can be very difficult in bedrock formations.

Monitoring wells shall be installed through the outer casing with minimal formation disturbance and mixing of formation materials. Rotosonic drilling generally requires less time than more traditional methods and minimizes soil mixing and soil disturbance (preferred for well locations where low turbidity is an important objective). Continuous, relatively undisturbed samples can be obtained through virtually any formation. Conventional sampling tools can be employed as attachments (i.e., hydropunch, split spoon, Shelby tube, etc.). No mud, air, water, or other circulating medium is required, although water is injected during advancement of the outer casing. The rotosonic method can drill easily through formations such as gravel, sand, clay, or glacial till. The main limitation of this method is the availability of equipment, the large area required (i.e., drill units are quite large), and costs. In addition, in some soils (e.g., silty sands, clayey sands) extra well development may be required due to displacement and compaction of soil cuttings into the borehole wall.

Hollow-Stem Auger

The hollow-stem continuous-flight auger is among the most frequently used in the drilling of monitoring wells (overburden wells) or for placement of overburden casings for bedrock wells.

The primary advantages of hollow-stem augering are that:

- Generally, no additional drilling fluids are introduced into the formation.
- It is a common drilling method and easy to find drilling companies with that capability.
- Representative geologic soil samples can be easily obtained using split-spoon samplers in conjunction with the hollow-stem augers.
- Monitoring wells can be installed through the augers eliminating the need for temporary borehole casings.

Disadvantages of hollow-stem augering are:

- Creates problems for select parameters.
- May not be possible in environments with strong upward gradients in granular environments.
- Large volumes of cuttings are typically generated.
- Decontamination is fairly time consuming/labor intensive.
- Relatively slow when compared to direct-push methods (soil sampling tasks).

Installing monitoring wells through hollow-stem augers is a relatively simple process although precautions need to be taken to ensure that the well is properly backfilled. This can be particularly problematic in cases where flowing/heaving sand is present.

Hollow-stem augers are available with inside diameters of 2.5, 3.25, 4.0, 4.25, 6.25, 8.25, 10.25, and 12.25 inches. The most commonly used are 4.25 inches for 2-inch (5 cm) monitoring wells and 6.25 inches for 4-inch (10 cm) monitoring wells. Boreholes can usually be drilled with hollow-stem augers to depths up to 100 feet (30 m) in unconsolidated clays, silts, and sands. Removing augers in flowing sand conditions while installing monitoring wells may be difficult since the augers have to be removed without being rotated. A bottom plug or pilot bit assembly should be utilized to keep out soils and/or water that have a tendency to plug the bottom of the augers during drilling. If flowing sands are encountered, potable water (analyzed once for contaminants of concern) may be poured into the augers to equalize the pressure to keep the formation materials and water from coming up into the auger once the bottom plug is removed.

<u>Direct-Push (Geoprobe™)</u>

Direct-push refers to the sampler being "pushed" into the soil material without the use of drilling to remove the soil. This method relies on the amount of the drill weight combined with rapid percussion for advancement of the tool string. Discrete soil samples are continuously obtained. Groundwater and vapor samples can also be collected utilizing this method. Subsurface investigations typically probe to depths of 30 feet or more, depths will vary based on site-specific geology. The direct-push equipment typically advances either 4-feet long or 5-feet long samplers and drill rods.

Direct-push method is widely used for underground storage tank (UST) investigations and property investigations. This method is used extensively for initial site screening activities to delineate vertical and horizontal plume presence and can significantly reduce investigative costs.

This method is more popular due to the limited cuttings that are produced during the sampling process and the rapid sampling process speed. However, due to compaction of soils into the narrow diameter soil sampler, it is common that full recovery of the sampled interval is not obtained. The soil sampler tip displaces some soil into the borehole sidewall.

Depending on the diameter of the soil sampler tubing used, pre-pack well screens and riser pipe can be installed directly through the drill rods. Alternatively, most direct-push drill rigs can advance hollow-stem augers to limited depths, with some machines able to advance large diameter augers in certain conditions.

Rotary Method

This method consists of a drill rod attached to a drill bit (soils: tricone, drag; rock: button studded, diamond studded) that rotates and cuts through the soils and rock. The cuttings produced are forced to the surface between the borehole wall and the drill rod by drilling fluids which generally consist of water, drilling mud (mixed with water), or air. The drilling fluids not only force the cuttings to the surface but also keep the drilling bit cool. Using rotary methods for well installations can be difficult as it usually requires several steps to complete the installation. First, the borehole is drilled; then temporarily cased; then the well is installed; and then the temporary casing is removed. In some cases, the borehole may remain open without installing a casing, but this will only occur in limited instances (i.e., cohesive soils).

i) Water Rotary

When using water rotary, the potable water supply should be analyzed for contaminants of concern. Water rotary is the preferred rotary method since the potable water is the only fluid introduced into the borehole during drilling. However, the use of water as a fluid is generally only successful when drilling in cohesive soils. The use of potable water (only) also reduces well development time, when compared to mud rotary.

ii) Air Rotary (typically used in rock)

When using air rotary, the air compressor must have an in-line oil filter system assembly to filter the oil mixed with the air coming from the compressor. This will help eliminate contaminant introduction into the formation. The oil filter system should be regularly inspected. Air compressors not having an in-line oil filter system are not acceptable for air rotary drilling. A cyclone velocity dissipater or similar air containment system should also be used to funnel the cuttings and produced water to one location rather than letting the cuttings blow uncontrolled out of the borehole. Air rotary may not be an acceptable method for well installation where certain contaminants are present in the formation. Alternatively, it may be necessary to provide treatment for the air being exhausted from the borehole during the installation process.

iii) Mud Rotary

Mud rotary is the least preferred rotary method because contamination can be introduced into the borehole from the constituents in the drilling mud (i.e., Ohio, Michigan). The drilling muds are generally non-toxic and do not introduce contaminants into the borehole, however, it is possible for mud to infiltrate permeable zones and can affect water quality by sorbing metals and polar organic compounds (Aller et al., 1991). Chemical composition and priority pollutants analysis may be obtained from the manufacturer. Mud rotary shall utilize only potable water and pure (no additives) bentonite drilling muds. The viscosity of the drilling mud shall be kept as low as possible in order to expedite well development. Proper well development is essential to ensure the removal of all the drilling mud and to return the formation to its previously undisturbed state. This usually requires significant surging and purging, jetting, airlifting, or a combination of these well development methods. Simply pumping is not sufficient.

Dual-Wall Reverse Circulation Air Method of Drilling

This method consists of two concentric strings of drill pipe (an outer casing and a slightly smaller inner casing). The outer drill pipe is advanced using rotary drilling with a donut-shaped bit attached to the dual casing string. The drill bit cuts an area only the width of the two casings and annulus between. Compressed air is continually forced down the annulus between the inner casing and outer casing carrying the drill cuttings and groundwater to surface. At the surface, the inner casing is connected to a cyclone hopper where the drill cuttings and groundwater fall out the bottom of the hopper, and air is dispersed out the top. The dual wall provides a fully cased borehole in which to install a monitoring well. The only soil or groundwater materials exposed at any time are those at the drill bit, providing depth-discrete soil sample cuttings in the drill returns. The potential for carrying contamination from one stratum to another is minimal. Depth-specific groundwater samples can be collected during drilling; however, since the groundwater is aerated, analysis for volatile compounds may not be valid, or additional purging with a pump may be required.

Well Points

In some limited cases, well points (sand points) are driven into place without the use of augers. This method provides no information on the geologic condition (other than the difficulty of driving which may be related to formation density). Well points are most often used simply to provide dewatering of a geologic unit prior to excavation in the area. Well points are also used in monitoring shallow hydrogeologic conditions such as in stream beds or adjacent to streams/ponds for monitoring hydraulic head and geochemical conditions. Well points are typically less than 1.25-inch diameter, which may restrict available well development or sampling methods.

REFERENCES

Numerous publications are available describing current monitoring well design and construction procedures.

Driscoll, F.G., 1986. Groundwater and Wells, 2nd Edition. Johnson Division.

EPA/625/6-90/0166 (July 1991), Handbook Ground Water Volume II: Methodology.

Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice Hall, Inc.

National Water Well Association, 1989. Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells.

Environmental Protection Agency (1986), RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

In addition, the following ASTM publications apply:

ASTM D5474	Guide for Selection of Data Elements for Ground-Water Investigations
ASTM D5787	Practice for Monitoring Well Protection
ASTM D5521	Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers
ASTM D5978	Guide for Maintenance and Rehabilitation of Ground-Water Monitoring Wells
ASTM D5299	Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes and Other Devices for Environmental Activities
ASTM D5092	Standard Practice for Design and Installation of Ground Water Monitoring Wells in an Aquifer.

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SOIL BORINGS

SOIL BORINGS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The following presents a description of the methods generally employed for the advancement of boreholes and the collection of subsurface soil samples. Boreholes are typically installed to define geologic conditions for hydrogeologic and geotechnical evaluation; to allow the installation of monitoring wells and piezometers; and to allow the collection of subsurface soil samples (generally above the water table) for chemical analysis.

Several manual methods are available for the collection of shallow subsurface soil samples (e.g., hand augers, post-hole augers, vibratory hammers). However, the most common methods used by GM to advance boreholes are rotosonic drilling techniques, hollow-stem augers (HSA), or the use of a direct-push equipment. Rotosonic drilling and direct-push techniques are preferred boring approaches at GM Facilities. FMG 2.2 - Drilling Techniques, provides insight into the advantages/disadvantages of these drilling methods.

PROCEDURES REFERENCED

- FMG 1.3 - Utility Clearance
- FMG 2.2 - Drilling Techniques
- FMG 2.6 - Soil Classification
- FMG 2.7 - Rock Classification
- FMG 6.1 - Surficial Soil Sampling
- FMG 6.15 - PFAS/POFA Sampling

PROCEDURAL GUIDELINES

The following activities must be undertaken prior to undertaking a borehole installation and subsurface soil sampling program.

i) Assemble all equipment and supplies required per the Work Plan.

ii) Obtain a site plan and any previous stratigraphic logs. Determine the appropriate number and location of boreholes to be installed and the depths of samples for chemical analysis.

iii) Contact the analytical group to arrange/determine:
- Laboratory;
- Glassware/sample jars;
- Cooler;
- Shipping details;
- Start date;
- Expected duration; and
- Arrange bids if appropriate between the GM Lab program accepted labs for best cost.

iv) Establish borehole locations in field using available permanent landmarks and conducting swing ties or by surveying methods if necessary.

v) Arrange for utility clearance of franchised utilities and site utilities.

vi) Arrange for hydrovac/air knifing services to daylight utilities/clear locations, if required by the project and clear locations with onsite personnel.

vii) Prepare FMEAs to be reviewed prior to drilling.

viii) Determine notification needs with the Project Manager. Confirm all appropriate groups have been notified of the planned sampling event like the regulatory groups, landowner, GM facility personnel, and laboratory.

ix) Determine the methods for handling and disposal of drill cuttings, wash waters, and spent decontamination fluids.

Once the prior planning and preparation activities are completed, the borehole installation and subsurface soil sampling program can proceed. The typical series of events which takes place is:

- Locating and marking of borehole locations (if not already completed).
- Equipment decontamination.
- Final visual examination of proposed drilling area for utility conflicts/final hand auger or post-hole check to verify utility absence.
- Daylighting of utilities, if required
- Advancement of borehole and collection of the soil sample.

- Field screening of soil sample.
- Description of soil sample. [Form FMG 2.6-01 - Stratigraphy Log - Overburden (Page 1/Page 2) will be used to record data.]
- Sample preparation and packaging.
- Abandonment of boreholes or installation of monitoring well.
- Surveying of borehole locations and elevations.
- Field note completion and review.
- Double check all equipment, personal protective equipment (PPE), field notebooks for possible contaminants especially if sampling for per- and polyfluoroalkyl substances (PFAS)/ perfluorooctanoic acid (PFOA) (see FMG 6.15-PFAS/POFA Sampling for special considerations if sampling for PFAS/PFOA).

i) Locating and Marking of Boreholes/Final Visual Check

The proposed borehole locations marked on the site plan are located in the field and staked. On most sites, this will likely be done several days in advance of the drill rig arriving on site. Unless boreholes are to be installed on a fixed grid, the proposed locations are usually strategically placed to assess site conditions.

Once the final location for the proposed boring has been selected and utility clearances are complete (FMG 1.3 – Utility Clearance), one last visual check of the immediate area should be performed before drilling proceeds. This last visual check should confirm the locations of any adjacent utilities (subsurface or overhead) and verification of adequate clearance. If gravity sewers or conduits exist in the area, any access manholes or chambers should be opened and the conduit/sewer alignments confirmed. Do not enter manholes unless confined space procedures are followed.

ii) Borehole Advancement

If possible, it is prudent to use a hand auger or post-hole digging equipment to a sufficient depth to verify the absence of buried utilities and pipelines. Alternatively, hydrovac/air knifing can be used to daylight the hole prior to drilling. This procedure should clear the area to the full diameter of the drilling equipment which will follow.

If it is necessary to relocate any proposed borehole due to terrain, utilities, access, refusal, etc., the Project Manager must be notified and an alternate location will be selected using previous methods.

Prior to use and between each borehole location at an environmental site, the drilling and sampling equipment must be decontaminated. All decontamination must be conducted in accordance with the project-specific plans or the methods presented in FMG 9.0 - Equipment Decontamination.

The clean augers/tooling are covered with clean plastic sheeting (check for PFAS/PFOA in sheeting materials if sampling for PFAS/PFOA, see FMG 6.15-PFAS/POFA Sampling for special considerations) to prevent contact with foreign materials. For geotechnical, geologic, or hydrogeologic studies where contaminants will not be tested, it is sufficient to clean the drilling equipment simply by removing the excess soils.

Collection of soil samples is one of the most important considerations in selecting drilling methods. Therefore, the need for reviewing drilling techniques (FMG 2.2 - Drilling Techniques) and the site objectives must first be considered. Soil Classification will be completed in accordance with FMG 2.6 - Soil Classification. Sections iii) and iv) describe borehole soil sampling procedures using direct-push tooling and HSA/split-spoon sampling (Standard Penetration Testing - SPT), respectively.

iii) <u>Subsurface Sample Collection Methods</u>

Any drilling procedure that provides a suitably clean and stable hole before insertion of the sampler and assures that the penetration test or other sampling technique is performed on essentially undisturbed soil is acceptable. The drilling method is to be selected based on the subsurface conditions. Each of the following procedures have proven to be acceptable for specific subsurface conditions:

- Conventional drilling with continuous flight hollow-stem auger (HSA) method (with inside diameter between 2.2 and 6.5 inches) using split-spoon samplers (Standard Penetration Test – STP) or Shelby tube samplers; Direct-push samplers, advanced using a percussion/vibratory hammer (Geoprobe™ or equivalent);
- Rotosonic (sonic) drilling, advanced using a 5-6" diameter, 5-10 foot long steel core barrel by an oscillator within the drill head that generates a high-frequency, resonant energy and is combined with rotational movement;
- Hand–held/driven split-spoon sampling equipment, portable hammer and split-spoon sampling equipment (final depth will be limited).

Several drilling methods are not acceptable. These include: jetting through an open tube sampler and then sampling when the desired depth is reached; use of continuous flight solid auger equipment below the groundwater table in non-cohesive soils; casing driven below the sampling depth prior to sampling; and advancing a borehole with bottom discharge bits.

The following subsections describe the specific methods for completing direct-push sampling, core barrel sampling, split-spoon sampling and Standard Penetration Testing (SPT), and Shelby tube sampling. The following section, Soil Core Chemical Sample Collection Procedure describes the soil sampling procedure for chemical analysis, once a soil core is recovered from any of the above sample collection devices.

Direct-Push/Macro-Core™ Soil Sample Method

The operation of the direct-push soil sampler (e.g., Macro-core™, Dual Tube™, or equivalent) consists of "pushing" the sampler into the subsurface and then retrieving it using a direct-push soil probing machine. The collected soil core is contained within an internal soil liner (acetate, polyethylene, or Teflon) (check soil liner material if sampling for PFAS/PFOA, see FMG 6.15-PFAS/POFA Sampling for special considerations) and removed from the sampler once returned to the ground surface. Sampler length is variable depending on equipment available (2 feet, 4 feet, 5 feet). Once the soil liner has been removed and the outer sampler decontaminated, a new liner is inserted and the sampler reassembled. The clean sampler is then driven back down the same hole to collect the next soil sample.

Once driven to the required depth, the sampler body/soil liner and soil core is removed from the borehole for inspection and sample collection. Once above grade the sampler is opened by the probe operator and the liner removed and cut open (opened with a dual blade cutting tool), to expose the soil for inspection and sampling.

The sampler body and ends are decontaminated, a new liner is inserted, and the sampler reassembled for collection of the next interval (ensure the liner is free of PFAS/PFOA if sampling for PFAS/PFOA, see FMG 6.15-PFAS/PFOA Sampling for special considerations). The clean sampler is then advanced back down the same hole to collect the next soil sample. The Macro-Core™ sampler can be used in either the open-tube or closed-point sampling mode. The open-tube is most commonly used method, typically employed in stable soil conditions when the borehole does not collapse. The closed-point system seals the cutting shoe opening until the sampler is at the next sample interval, this prevents collapsed soil from entering the sampler as it is advanced back down the hole. Once at the sample depth, the closed-point is unthreaded and released from the cutting shoe area, such that it rides on top of the soil core as it is being driven into the next interval.

Soil Core Chemical Sample Collection Procedure, presented below, describes the soil sampling procedure for chemical analysis, once a soil core is recovered from the direct-push sampler.

Sonic Core Barrel Sample Method

Once the core barrels are advanced to the required depth, the inner core barrel is pulled from the ground, and the soil sample is extruded using vibration from the drill head. Soil Core Chemical Sample Collection Procedure, presented below, describes the soil sampling procedure for chemical analysis, once a soil core is recovered from the sampler.

Split Spoon Sampling and Standard Penetration Testing (SPT) Sampling and Testing Procedure

This method is used to obtain representative samples of subsurface soil materials and to determine a measure of the in situ relative density of the subsurface soils. The test methods described below must be followed to obtain accurate SPT values.

SPT sampling is performed by using a split barrel sampler in accordance with ASTM D1586. The split barrel sampler, or split spoon, consists of an 18- or 24-inch long, 2-inch outside diameter tube, which comes apart length wise into two halves. The split spoon is typically driven in advance of an HSA string which allows collection of the disturbed but representative soil sample.

Once the borehole is advanced to the target depth and the borehole cleaned of cuttings, representative soil samples are collected in the following manner:

- The split-spoon sampler should be inspected to ensure it is properly cleaned and decontaminated (if sampling for PFAS/PFOA, ensure that the cleaner is free of PFAS/PFOA, see FMG 6.15-PFAS/PFOA Sampling for special considerations). The driving shoe (tip) should be relatively sharp and free of severe dents and distortions.
- The cleaned split-spoon sampler is attached to the drill rods and lowered into the borehole. Do not allow the sampler to drop onto the soil.
- After the sampler has been lowered to the bottom of the hole, it is given a single blow to seat it and make sure that it is in undisturbed soil. If there still appear to be excessive cuttings in the bottom of the borehole, remove the sampler from the borehole and remove the cuttings.
- Mark the drill rods in three or four successive 6-inch (0.15 m) increments, depending on sampler length, so that the advance of the sampler under the impact of the hammer can be easily observed for each 6-inch (0.15 m) increment.

The sampler is then driven continuously for either 18 or 24 inches (0.45 or 0.60 m) by use of a 140-pound (63.5 kg) hammer. The hammer may be lifted and dropped by either the cathead and rope method, or by using a trip, automatic, or semi-automatic drop system. The hammer should free-fall a distance of 30 inches (±1 inches) (760 mm, ±25 mm) per blow. Measure the drop at least daily to ensure that the drop is correct. To ensure a free-falling hammer, no more than 2 1/4 turns of the rope may be wound around the cathead (see ASTM D1586). The number of blows applied in each 6-inch (0.15 m) increment is counted until one of the following occurs:

- A total of 50 blows have been applied during any one of the 6-inch (0.15 m) increments described above;
- A total of 100 blows have been applied;
- There is no advancement of the sampler during the application of ten successive blows of the hammer (i.e., the spoon is "bouncing" on a stone or bedrock); or
- The sampler has advanced the complete 18 or 24 inches (0.45 or 0.60 m) without the limiting blow counts occurring as described above.

In some cases where the limiting number of blow counts has been exceeded, the field supervisor may direct the driller to attempt to drive the sampler more if collection of a greater sample length is essential.

On the field form, record the number of blows required to drive each 6-inch (0.15 m) increment of penetration. The first 6 inches is considered to be a seating drive. The sum of the number of blows required for the second and third 6 inches (0.15 m) of penetration is termed the "standard penetration resistance" or the "N-value".

Note: If the borehole has sloughed and there is caved material in the bottom, the split spoon may push through this under its own weight, but now the spoon is partially "pre-filled". When the spoon is driven the 18 or 24 inches representing its supposedly empty length, the spoon fills completely before the end of the drive interval. Two problems arise:

1. *The top part of the sample is not representative of the in-place soil at that depth; and*
2. *The SPT value will be artificially higher toward the bottom of the drive interval since the spoon was packed full. These conditions should be noted on the field log.*

The sampler is then removed from the borehole and unthreaded from the drill rods. The open shoe (cutting end) and head of the sampler are partially unthreaded by the drill crew and the sampler is transferred to the geologist/engineer work surface.

Note: A table made out of two sawhorses and a piece of plywood is appropriate, or a drum, both covered with plastic sheeting.

The open shoe and head are removed by hand, and the sampler is tapped so that the tube separates.

Note: Handle each split spoon with clean disposable gloves if environmental issues are being investigated.

Measure and record the length of sample recovered making sure to discount any sloughed material that is present on top of the sample core. Note that surficial or shallow soils may be lodged in the auger borehole, thus split spoon samples from depth may contain sloughed material including topsoil/grass or fill materials previously encountered.

Caution must be used when conducting SPT sampling below the groundwater table, particularly in sand or silt soils. These soils tend to heave or "blow back" up the borehole due to the difference in hydraulic pressures between the inside of the HSA and the undisturbed soil, and the syringe-like effect of pulling the center plug from the augers for sampling. To equalize the hydraulic pressure, the inside of the HSA must be filled with water (preferred) or drilling mud. The drilling fluid level within the boring or HSAs needs to be maintained at or above the in situ groundwater level at all times during drilling, removal of drill rods, and sampling. Since heave or blow back is not always obvious to the driller, it is essential that the water level in the borehole always be maintained at or above the groundwater level.

Heaving conditions and the use of water or mud should be noted on the field logs.

Soil Core Chemical Sample Collection Procedure, presented below, describes the soil sampling procedure for chemical analysis, once a soil core is recovered from a split-spoon sampler.

SPT sampling below the water table in sands and silt occasionally results in low SPT values being obtained due to the heaving effect disturbing the soil especially if the water level in the hole has not been maintained at the in-situ water level. Suspect low N values should be noted on the field logs. If it is critical to have accurate N values below the water table, other methods can be employed, such as conducting a dynamic cone penetration test. This quick and easy test involves attaching a cone shaped tip to the end of the drill rods, and driving the tip into the ground similar to the SPT method, except that the borehole is not pre-augered. Cones may be driven 20 to 40 feet through a formation without augering. Blow counts are recorded for each foot (0.3 m) of advancement.

A variation of split barrel sampling involves the use of a longer barrel (continuous sampler) in conjunction with HSAs. The sampling barrel is installed inside the auger with a swivel attachment to limit rotation of the barrel. After completion of a 5-foot auger penetration, the auger is left in place and the continuous sampler barrel retrieved from the borehole. The sampler should be handled and the sample retrieved in the same way as described above for SPT sampling.

Thin-Walled Samplers (Shelby Tubes)

Thin-walled samplers are used to collect relatively undisturbed samples (as compared to split-spoon samples) of soft to stiff clayey soils. Shelby tubes are commonly used. The Shelby Tube has an outside diameter of 2 or 3 inches and is 3 feet long. These undisturbed samples are used for certain laboratory tests of structural properties (consolidation, hydraulic conductivity, shear strength) or other tests that might be influenced by sample disturbance. Procedures for conducting thin-walled tube sampling are provided in ASTM D1587, and are briefly described below.

- The soil deposit being sampled must be cohesive in nature, and relatively free of sand, gravel, and cobble materials, as contact with these materials will damage/collapse the sampler.
- Clean out the borehole to the sampling elevation using whatever method is preferred that will ensure the material to be sampled is not disturbed. If groundwater is encountered, maintain the liquid level in the borehole at or above groundwater level during the sampling operation.
- Bottom discharge bits are not permitted. Side discharge bits may be used, with caution. Jetting through an open-tube sampler to clean out the borehole to sampling elevation is not permitted. Remove loose material from the center of a casing or HSA as carefully as possible to avoid disturbance of the material to be sampled.
- Place the sample tube so that its bottom rests on the bottom of the hole. Advance the sampler into the formation without rotation by a continuous and relatively rapid motion; usually hydraulic pressure is applied to the top of the drill rods.

- Determine the length of advance by the resistance and condition of the formation, but the length shall never exceed 5 to 10 diameters of the tube in sands and 10 to 15 diameters of the tube in clays.
- In no case should the length of advance be greater than the sample-tube length minus an allowance for the sampler head and a minimum of 3 inches for cuttings.
- The tube may be rotated to shear the bottom of the sample 2 to 3 minutes after pressing in, and prior to retrieval to ensure the sample does not slide out of the tube. Lift the weight of the rods off of the tube prior to rotating.
- Withdraw the sampler from the formation as carefully as possible in order to minimize disturbance of the sample.

On occasion it may be required that extraction of the sample from the tube be conducted in the field for chemical sample collection. The following procedure should be followed.

- A sample extruder, which consists of a clamp arrangement to hold the tube and a hydraulic ram to push the sample through the tube, is usually mounted on the side of the rig. To prevent cross-contamination, be certain that the extruder is field cleaned between each sample.
- The sample is then extruded into a carrying tray; these are often made from a piece of 4-inch or 6-inch diameter PVC pipe cut lengthwise. Be certain that the carrying tray is field cleaned between each sample. The sample is carried to the work station to describe the sample, trim the potentially cross-contaminated exterior, and select the area for sample collection (see Section 2.4 - Soil Core Chemical Sample Collection Procedure). Form FMG 2.3 -01 - Soil Sample Selection Details shows the method for obtaining a soil sample from a Shelby tube soil core.
- The Shelby tube may then be thoroughly field cleaned and decontaminated for reuse. Since they are thin-walled, the tubes are easily damaged, crimped, or otherwise distorted during handling or pushing. The Shelby tube should be inspected before use and any which are significantly damaged should be rejected.

Soil Core Chemical Sample Collection Procedure, presented below, describes the soil sampling procedure for chemical analysis, once a soil core is recovered from a Shelby tube sampler.

iv) Soil Core Chemical Sample Collection Procedure

The following describes the collection of soil samples for chemical analysis from a split-spoon soil core, Shelby tube soil core, direct-push sample core, or sonic core barrel. Form FMG 2.3-01 - Soil Sample Selection Details shows the soil sample selection details. Sample preparation and selection is as follows:

- Record soil core recovery and soil stratigraphy data.
- Discard upper and lower ends of sample core (± 3 inches).

- If clayey soils are present use a pre-cleaned stainless steel knife to cut the remaining core longitudinally, alternatively if sandy soils are present, use a clean stainless-steel spoon to scrape away the soil surface.
- Screen the exposed soil surface with a photoionization detector (PID) to monitor for the presence of volatile organics.
- With a sample knife or spoon, remove soil from the center portion of the core and place in the sample jar (when only one aliquot is required), or when more than one aliquot is required place soils in a pre-cleaned stainless steel bowl for homogenization.
- Do not sample large stones and natural vegetative debris.
- Homogenize the soil and place directly into the sample jars. Do not homogenize soil for VOC analyses.
- Place collected samples on ice or cooler packs in laboratory-supplied shipping coolers.
- Package and transport the sample in accordance with FMG 6.10 - Sample Handling and Shipping.

When only one sample container is required, the collected soil will be placed directly into the clean, pre-labeled sample jar. When more than one sample container requires filling or samples will be split for duplicate analyses; the soils will first be homogenized in a pre-cleaned stainless steel bowl; and then placed into the respective sample containers. It is important that soil samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample interval. When round bowls are used for sample mixing, mixing is achieved by stirring the material in a circular motion and occasionally turning the material over. Soil samples collected for volatile organic compounds (VOCs) analyses shall not be mixed.

Exception is noted for the collection of VOCs which require special sample collection methods and is usually collected first to minimize VOC loss. VOCs are collected directly into a sample vial (triplicate volume typically required) without headspace, or collected in triplicate using an EnCore Sampler™, or equivalent sampler, (triplicate samples collected per manufacturer's instructions). Samples for VOCs are typically collected first, without homogenization or extra handling to limit the loss of volatile constituents.

The VOC sample collection methodology will be identified in the Work Plan, which will dictate the sample method. The methodology for VOC sampling varies from area to area, so careful review of this issue in advance of the field efforts is required.

If PFAS/PFOA is being analyzed, specialized collection procedures, containers and equipment should be utilized (see 6.15-PFAS/POFA Sampling).

v) Borehole Completion

At the completion of the soil boring, once the soil/groundwater samples have been collected, the borehole annulus is then abandoned. Borehole abandonment options are identified in FMG 2.5 -

Borehole Abandonment/Sealing. Each boring will be surveyed to establish vertical/horizontal information; field ties (i.e., swing ties) will also be collected to document the boring location. Once completed, a stratigraphic log will be prepared for reporting purposes.

EQUIPMENT/MATERIALS

- Drilling equipment.
- Form 2.6-01 - Stratigraphy Log - Overburden (Page 1/Page 2).
- Tape measure.
- Cutting Instrument.
- Plastic sheeting (free from PFAS/PFOA if sampling for PFAS/PFOA).

REFERENCES

ASTM D420-93 - Guide to Site Characterization for Engineering, Design, and Construction Purposes.

ASTM D1452-80 - Practice for Soil Investigation and Sampling by Auger Borings.

ASTM D1586-84 - Test Method for Penetration Test and Split-Barrel Sampling of Soils.

ASTM D1587-94 - Practice for Thin-Walled Tube Geotechnical Sampling of Soils.

ASTM D2488-93 - Practice for Description and Identification of Soils (Visual-Manual Procedure).

EPA OSWER-9950.1, 1986. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document.

National Water Well Association, Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. 1989.

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BEDROCK CORING

BEDROCK CORING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The following procedures describes the methodology for bedrock coring.

PROCEDURES REFERENCED

- FMG 2.7 - Rock Classification

PROCEDURAL GUIDELINES

- Prior to initiating coring activities, ensure that the overburden portion of the hole is isolated from the bedrock portion of the hole using an overburden casing grouted in place.
- Coring must be performed utilizing an approved diamond coring method and size, and performed with wire line coring techniques.
- Potable water or air can be utilized as circulating medium.
- If required, all rock cuttings produced will be properly contained and disposed of in accordance with the Work Plan requirements.
- All coring activities shall be performed following procedures outlined in ASTM D2113.
- Upon completion of the coring activities the core hole shall be flushed with fresh water to remove all residual rock cuttings from the bottom of the corehole and measured to confirm final depth.
- All bedrock core runs should be completed without interruption so penetration rates can be determined.

EQUIPMENT/MATERIALS

- Drilling equipment
- Appropriate coring equipment
- Form FMG 2.7-01 - Bedrock Stratigraphic Log
- Tape measure
- Hand lens
- Camera
- Work Plan
- Health and Safety Plan

REFERENCES

American Society for Testing and Materials (1991) Standard D2113-8307 "Standard Practice for Diamond Core Drilling for Site Investigations" Annual Book of ASTM Standards, Section 4, Volume 04.08.

American Society for Testing and Material (1991) Standard D5434-93 "Standard Guide for Field Logging of Subsurface Exploration of Soil and Rock" Annual Book of ASTM Standards, Section 4, Volume 04.09.

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BOREHOLE ABANDONMENT/SEALING

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 2.5
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

BOREHOLE ABANDONMENT/SEALING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The following procedure describes common techniques for the abandonment/sealing of overburden boreholes. Borehole completion may have been performed by a rotosonic drilling technique, direct push sampling device, hollow-stem augering/split-spoon sampling, solid-stem augering, or other soil sample collection techniques. The method of borehole abandonment selected for a program will be dependent on a number of factors such as: depth to groundwater, presence of contamination [and degree of contamination i.e., light or dense non-aqueous phase liquids (NAPL)], confining layer presence and/or physical setting (i.e., open field/vacant land, vs. facility setting). The Work Plan guiding these activities (soil boring/boring closure) will dictate which method of borehole abandonment/sealing is required. The borehole abandonment/sealing techniques reviewed in the following consist of:

- Soil cutting backfill;
- Bentonite chip backfill;
- Cement/bentonite grout backfill using tremie techniques; or
- Bentonite slurry using tremie techniques.

Boreholes need to be abandoned and sealed properly to prevent surface water entry to the groundwater regime, to eliminate any physical hazard, and to prevent/protect groundwater movement from one aquifer to another.

PROCEDURES REFERENCED

- FMG 2.3 - Soil Borings
- FMG 3.1 – Well Construction Materials

PROCEDURAL GUIDELINES

Soil Cutting Backfill

Typically employed when working above groundwater table and at shallow depths (maximum depth 2 feet).

- The final depth of borehole will be measured and recorded.
- Cuttings are dropped into borehole after sample equipment is removed.
- Drill rod and/or probe rodding is used to compact/compress cuttings to allow return of all cuttings back into borehole.
- Mound final surface of cuttings above ground surface to allow settlement and promote surface water runoff away from boring. Final restoration will be completed in accordance with needs of the GM Facilities representative and/or the GM Project Manager.
- Borehole abandonment will be documented in field records/notes.

Bentonite Chip Backfill

Typically employed when working above or just into the groundwater table.

- Excess cuttings have been drummed for disposal or excess cuttings have been spread at ground surface.
- The depth of the borehole will be measured and recorded.
- Bentonite chips (bentonite gravel) will be dropped into borehole as hollow-stem augers are removed, or after the boring equipment has been removed from the borehole (solid-stem auger, probing tools, split-spoon samplers).
- Sufficient water will be needed to hydrate bentonite chips as they are placed.
- The bentonite chip backfill will be extended to within 1 foot of ground surface, the final borehole space will be backfilled with native soil and mounded slightly to allow settlement and promote surface water runoff away from the boring. Alternatively, the borehole cuttings may be mixed with bentonite to complete the abandonment/sealing task. Final restoration will be completed in accordance with needs of the GM Facilities representative and/or the GM Project Manager.
- Borehole abandonment will be documented in field records/notes.

Cement/Bentonite Grout Backfill

Typically employed when working below the groundwater table, or in an area where a confining layer exists and the potential for groundwater/NAPL movement along a preferential pathway (i.e., former borehole) must be eliminated. Cement/bentonite grout sets up hard, like a soft concrete. If future site development is planned or excessive surface water may be present, neat bentonite grout may be preferred.

- The final depth of borehole will be measured and recorded.
- The volume of grout required will be calculated from the above measurements.
- A grout mix of one bag (94 pounds) of Portland cement and 3 pounds of bentonite with approximately 7.5 gallons of clean water will be prepared.
- Using a tremie tube placed at the base of the borehole the grout will be pumped until observed at the required elevation. The tremie tube will be raised as the grout level rises (positive displacement technique).
- The bentonite/grout backfill will be extended to within 1 foot of ground surface, the final borehole space will be backfilled with native soil and mounded slightly to allow settlement and promote surface water runoff away from boring. Final restoration will be completed in accordance with the GM Facility representative and/or the GM Project Manager.
- Borehole abandonment will be documented, noting depth of borehole, volume of grout used and mix ratio.
- Groundwater displaced from the borehole may or may not require containment depending on borehole setting and/or water quality.

Note: At the completion of borehole abandonment/sealing activities (regardless of methodology employed) it is necessary to check for surface settlement a few days after work completion to determine if the borehole area requires "topping off".

Final Restoration

The area around the borehole and the borehole surface shall be restored as directed by the GM Facility representative (e.g., asphalt, concrete, vegetation). Time for borehole settlement may be permitted, then final restoration performed; or alternatively final restoration may be required immediately in active interior work areas.

Cleanup

The area around the borehole shall be completely cleaned up of any investigation related materials (litter, etc.).

EQUIPMENT/MATERIALS

- Grout pump/mixing equipment.
- Form FMG 2.6-01 - Stratigraphic Log (Overburden) (Page 1/Page 2).

REFERENCES

ASTM D5299 "Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes and Other Devices for Environmental Activities.

United States Environmental Protection Agency (1992) "Guide to Management of Investigation-Derived Wastes", Quick Reference Fact Sheet.

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SOIL CLASSIFICATION

LIST OF FORMS
(Following Text)

SOIL CLASSIFICATION

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The stratigraphic log is a factual description of the soil at the borehole location and is relied upon to interpret the soil characteristics, and their influence and significance in the subsurface environment. The accuracy of the stratigraphic log is to be verified by the person responsible for interpreting subsurface conditions. An accurate description of the soil stratigraphy is essential for a reasonable understanding of the subsurface conditions. Confirmation of the field description by examination of representative soil samples by the project geologist, hydrogeologist, or geotechnical engineer (whenever practicable) is recommended.

The ability to describe and classify soil correctly is a skill that is learned from a person with experience and by systematic training and comparison of laboratory results to field descriptions.

It is GM EcoRestorers/Remediation Team's Policy to log soils according to the Unified Soil Classification System (USCS) described in the following.

PROCEDURES REFERENCED

- FMG 2.1 - Test Pits
- FMG 2.3 - Soil Borings

PROCEDURAL GUIDELINES

Several methods for classifying and describing soils or unconsolidated sediments are in relatively widespread use. The Unified Soil Classification System (USCS) is the most common. With the USCS, a soil is first classified according to whether it is predominantly coarse-grained or fine-grained.

The description of fill soil is similar to that of natural undisturbed soil except that it is identified as fill and not classified by USCS group, relative density, or consistency. Those logging soils must attempt to distinguish between soils that have been placed (i.e., fill) and not naturally present; or soils that have been naturally present but disturbed (i.e., disturbed native).

It is necessary to identify and group soil samples consistently to determine the subsurface pattern or changes and non-conformities in soil stratigraphy in the field at the time of drilling. The stratigraphy in each borehole during drilling is to be compared to the stratigraphy found at the previously completed boreholes to ensure that pattern or changes in soil stratigraphy are noted and that consistent terminology is used.

Visual examination, physical observations and manual tests (adapted from ASTM D2488, visual-manual procedures) are used to classify and group soil samples in the field and are summarized in this subsection. ASTM D2488 should be reviewed for detailed explanations of the procedures. Visual-manual procedures used for soil identification and classification include:

- Visual determination of grain size, soil gradation, and percentage fines.
- Dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) tests for identification of inorganic fine-grained soil (e.g., CL, CH, ML, or MH).
- Soil compressive strength and consistency estimates based on thumb indent and pocket penetrometer (preferred) methods.

The three main soil divisions are: coarse-grained soil (e.g., sand and gravel), fine-grained soil (e.g., silt and clay), and soil with high natural organic matter content (e.g., peat and marl).

<u>Coarse-grained Soil</u>

The USCS group symbols for coarse-grained soil are primarily based on grain or particle size, grain size distribution (gradation), and percent fines (silt and clay content).

Coarse-grained soils are then further subdivided according to the predominance of sand and gravel. Coarse-grained soil is made up of more than 50 percent, by weight, sand size, or larger (75 μm diameter, No. 200 sieve size or larger). It is noted that there are other definitions for coarse-grained or coarse textured soil and for sand size in other soil classification systems, such as soil having greater than 70 percent particles equal to or greater than 50 μm diameter.

Descriptions for grain size distribution of soil include; poorly graded (i.e., soil having a uniform grain size or missing grain size fractions (gap graded), SP and GP) and well graded (i.e., poorly sorted; having wide range of particle sizes with substantial intermediate sizes, SW and GW).

Coarse-grained soils are further classified based on the percentage of silt and clay it contains (fines content). Coarse-grained soils containing greater than 12 percent fines is commonly described as dirty. This description arises from the soil particles that adhere when the soil is rubbed between the hands or adhere to the sides of the jar after shaking or rolling the soil in the jar. The jar shake test which results in segregation of the sand and gravel particles is also used as a visual aid in determining gravel and sand percentages.

Examples of the group symbol, name, and adjectives used to describe the primary, secondary, and minor components of soil are; GW - Sandy Gravel (e.g., 70 percent gravel and 30 percent sand) or Sandy Gravel trace silt (less than 10 percent silt), and SP - Sand, uniform.

Relative density is an important parameter in establishing the engineering properties and behavior of coarse-grained soil. Relative density of non-cohesive (granular) soil is determined from standard penetration test (SPT) blow counts (N values) (after ASTM Method D1586).

The SPT gives a reliable indication of relative density in sand and fine gravel. N values in coarse-grained soil are influenced by a number of factors that can result in overestimates of relative density (e.g., in coarse gravel and dilatent silty fine sand) and can be conservative and underestimate the relative density (e.g., sand below the groundwater table and uniform coarse sand). These effects will be assessed by the project geotechnical engineer, if required, and need not be taken into account by field personnel.

Other dynamic methods, such as modified SPT and cone penetration tests, are used on occasion to supplement or replace the SPT method for certain site-specific conditions. The details of all modifications to the SPT or substitute methods should be recorded as they are required to interpret test results and correlate to relative density.

<u>Fine-grained Soil</u>

A soil is fine-grained if it is made up of half or more of clay and silt [i.e., fines greater than 50 percent by weight passing the 75 μm (No. 200) sieve size]. A description of visual-manual field methods and criteria (after ASTM D2488) that are used to further characterize and group fine-grained soil (e.g., CL, CH, ML, or MH) including dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) follows. Fine-grained soils are subdivided on a basis of the liquid limit and the degree of plasticity.

The accurate identification of silts and clays can be aided by the use of some single field tests. Clay is sticky, will smear readily, and can be rolled into a thin thread even when the moisture content is low. When it is dry, clay forms hard lumps. Silt on the other hand, has a low dry strength, can be rolled into threads only at high moisture content, and a wet silt sample will puddle when it is tapped.

<u>Criteria for Describing Dry Strength</u>

Description	***Criteria***
None	The dry specimen crumbles into powder with mere pressure of handling.
Low	The dry specimen crumbles into powder with some finger pressure.

Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure.
High	The dry specimen crumbles into powder with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and a hard surface.

<u>Criteria for Describing Dilatancy</u>

Description	***Criteria***
None	No visible change in small wetted specimen when rapidly shaken in palm of hand.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing or stretching.

<u>Criteria for Describing Toughness</u>

Description	***Criteria***
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

<u>Criteria for Describing Plasticity</u>

Description	***Criteria***
Nonplastic	A 1/8-inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be re-rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be re-rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Examples of group symbol identification based on visual-manual procedures and criteria for describing fine-grained soil are:

Group Symbol	***Dry Strength Plasticity***	***Dilatency***	***Toughness***
ML	None to low Slight	Slow to rapid	Low or thread cannot be formed
CL	Medium to high Low	None to slow	Medium
MH	Low to medium Low	None to slow	Low to medium
CH	High to very high High	None	High

A requirement for positive classification by USCS group symbols (as described in Test Method ASTM D2487) is laboratory determination of particle size characteristics, liquid limit and plasticity index. The need for this type of testing will be determined by the project geologist, hydrogeologist, or geotechnical engineer.

Examples of name terminology that accompanies the group symbols are ML - Sandy Silt (e.g., 30 percent sand) and CL - Lean Clay with sand (e.g., 15 to 29 percent sand).

The correlation between N value and consistency for clays is rather unreliable. It is preferable to determine consistency using more appropriate static test methods, particularly for very soft to stiff clay soil. N value estimates of consistency are more reasonable for hard clay.

Unconfined compressive strength (Su) may be estimated in the field from the pocket penetrometer test method. To obtain a pocket penetrometer estimate of consistency and compressive strength, the soil core is cut perpendicular to the core length, the length of core (minimum 4 inches) is held in the hand and a moderate confining pressure is applied to the core (not sufficient to deform the core); the penetrometer piston tip is slowly inserted into the perpendicular face of the core until the penetrometer indents into the soil core to the mark indicated on the tip of the penetrometer piston; the penetrometer estimate of soil compressive strength (Su) is the direct reading of the value mark on the graduated shaft (in tons per square foot or other unit of pressure as indicated) indicated by the shaft ring marker, or in some models, by the graduated piston reading at the shaft body. To obtain an average estimate, this procedure is completed several times on both ends and mid cross-section of the core. For Shelby tube (or thin wall sampler) samples the pocket penetrometer tip is applied to the exposed bottom of the sample at several locations.

Estimates of compressive strength for clay soil of very soft to stiff consistency are better established by in situ shear vane tests or other static test methods.

The description of consistency (or strength) is an important element in determining the engineering properties and strength characteristics of fine-grained cohesive soil. Consistency terms (e.g., soft, hard) are based on the unconfined compressive strength (Su) and shear strength or cohesion (cu) of the soil.

The ease and pattern of soil vapor and groundwater movement in the subsurface is influenced by the natural structure of the soil. Soil structure, for the most part, depends on the depositional environment and, to a lesser extent, climate.

Visual Appearance/Other Features

Those logging soils should also note the presence, depth and components of fill soils (if evident) and note the distinction between disturbed native soils (i.e., excavation likely performed) vs. undisturbed native soils.

Other features such as color, root presence/structure, and soil fractures should also be recorded. Soil fractures should be described noting fracture orientation (i.e., horizontal/vertical), length/aperture and appearance of soil infilling, oxidation and/or weathering (if present).

Field Sample Screening

Upon the collection of soil samples, the soil is screened with a photoionization detector (PID) for the presence of organic vapor. This is accomplished by running the PID across the soil sample. Record the highest reading and sustained readings.

Note: The PID measurement must be done upwind of the excavating equipment or any running engines so that exhaust fumes will not affect the measurements.

Another method of field screening is head space measurements. This consists of placing a portion of the soil sample in a sealable glass jar, placing aluminum foil over the jar top, and tightening the lid. Alternatively, plastic sealable bags maybe utilized for field screen in lieu of glass containers. The jar should only be partially filled. Shake the jar and set aside for at least 30 minutes. After the sample has equilibrated, the lid of the jar can be opened; the foil is punctured with the PID probe and the air (headspace) above the soil sample is monitored. Record this headspace reading on the field form or in the field book. The selection of samples for chemical analysis may be specified in the Work Plan or be dependent in part on the PID responses.

Note: Perform all headspace readings in an area that is not subject to wind. Also, in the winter, it is necessary to allow the samples to equilibrate in a warm area (e.g., site trailer, van, etc.). This requirement is dictated by the Work Plan.

All head space measurements must be completed under similar conditions to allow comparability of results.

NAPL Detection

During soil examination and logging, the sampler shall carefully check for the presence of light or dense non-aqueous phase liquid (NAPL). NAPL may be present in gross amounts or present in small/minute quantities. The adjectives and corresponding quantities used when describing NAPL within a soil matrix are as follows:

Visual Description	***Fraction of Soil Pore Volume Containing NAPL***
Saturated	>0.5
Some	0.5 to 0.25
Trace	<0.25

A complete description of NAPL, must describe the following:

- Color.
- Quantity.
- Density (compared to water i.e., light/floats or heavy/sinks).
- Odor (if observed).
- Viscosity (i.e., mobile/flowable, non-mobile/highly viscous-tar like).

The presence of an "iridescent sheen" by itself does not constitute "NAPL presence", but may be an indicator that NAPL is close to the area.

NAPL presence within a soil matrix may be confirmed by placing a small soil sample within water, shaking, and observing for NAPL separation (i.e., light or dense), from the soil matrix.

Trace amounts of NAPL are identified/confirmed by a close visual examination of the soil matrix, [i.e., separate soil by hand (wearing disposable gloves)] and perform a careful inspection of the soil separation planes/soil grains for NAPL presence.

Often during the sample examination with a knife, an iridescent sheen will be noted on the soil surface (i.e., clay/silts) if the knife has passed through an area of NAPL.

There are several more sophisticated tests available to confirm/identify NAPL presence, these are:

- UV fluorescent analysis.
- Hydrophobic dyes.
- Centrifugation.
- Chemical analysis.

Typically consultants will utilize organic vapor detection results, visual examination, soil/water shake testing, and chemical analysis, to confirm NAPL presence. The more complex techniques described may be incorporated on sites where clear colorless NAPL is present and its field identification is critical to the program.

Note: When describing the presence of vegetative matter in the soil sample, do not use the term "organic" as this often leads to confusion with regards to the presence of organic chemicals (i.e., NAPL).

EQUIPMENT/MATERIALS

- Pocket knife or small spatula.
- Small handheld lens.
- Form FMG 2.6-01 - Stratigraphic Log - Overburden (Page 1/Page 2).
- Tape measure.

REFERENCES

American Society for Testing and Materials (1991), Standard D1452-80, "Practice for Soil Investigation and Sampling by Auger Borings", "Annual Book of ASTM Standard", Section 4, Volume 04.08.

ASTM Standards on Environmental Sampling (1995), Standard D2488-93, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)"

ASTM Standards on Environmental Sampling (1995), Standard D4700-91, "Guide for Soil Sampling from the Vadose Zone".

ASTM Standards on Environmental Sampling (1995), Standard D1586-92, "Test Method for Penetration Test and Split-Barrel Sampling of Soils".

ASTM Standard D2487, "Classification of Soils for Engineering Purposes (Unified Soil Classification System)".

Geotechnical Gauge, Manufactured by W.F. McCollough, Beltsville, MD.

Sand Grading Chart, by Geological Specialty Company, Northport, Alabama.

Form FMG 3.4 - 01

BEDROCK MONITORING WELL INSTALLATION REPORT

Well No.

Boring No.

PROJECT	______		
LOCATION	______	**PROJECT MANAGER**	______
CLIENT	______	**FIELD REP.**	______
CONTRACTOR	______	**DATE INSTALLED**	______
DRILLER	______	**WATER LEVEL**	______

Ground Elev. ______ ft **Location** ______

Top of Casing Elev. ______

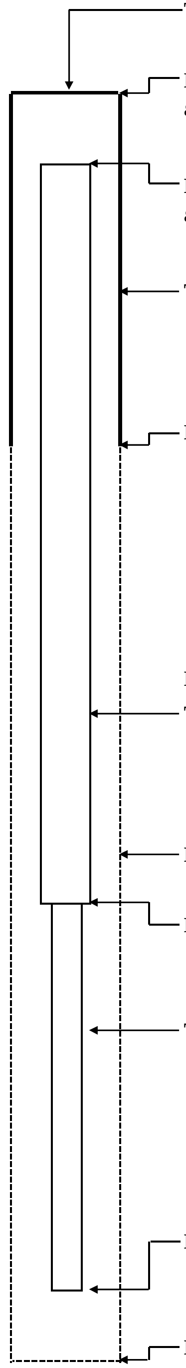
☐ **Guard Pipe**

☐ **Roadway Box**

SOIL/ROCK CONDITIONS	**BOREHOLE BACKFILL**

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock ______

Height/Depth of top of guard pipe/roadway box above/below ground surface ______ **ft**

Height/Depth of top of riser pipe above/below ground surface ______ **ft**

Type of protective casing: ______

Length ______ **ft**

Inside Diameter ______ **in**

Depth of bottom of guard pipe/roadway box ______ **ft**

Type of Seals	**Top of Seal (ft)**	**Thickness (ft)**
______	______	______
______	______	______
______	______	______
______	______	______

Depth to the top of bedrock ______ **ft**

Type of casing pipe: ______

Inside diameter of casing pipe ______ **in**

Type of backfill around riser ______

Diameter of borehole ______ **in**

Depth to top of open core interval ______ **ft**

Type of open core interval ______

Diameter of open core interval ______ **in**

Depth of bottom of open core interval ______ **ft**

Depth of bottom of test borehole ______ **ft**

(Not to Scale)

* - Elevation Datum = ______

COMMENTS: ______

Project name		**Drilling contractor**		**Hole designation**	
Project number		**Driller**		**Date/Time started**	
GM Site		**Surface elevation**		**Date/Time completed**	
Location		**Weather (A.M.)**		**Drilling method**	
		(P.M.)		**Supervisor**	

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, supplementary descriptors.			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis

Notes and Comments	Depth of borehole caving ____________________ Depth of first groundwater encounter ____________________ Topsoil thickness ____________________ Water level in open borehole on completion ____________________ After ____________________ Hours ____________________ Notes:

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SOIL FIELD SCREENING FOR ORGANIC VAPORS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The following FMG describes two field methods for determining if soils exhibit evidence of manmade chemical vapor presence. These methods are typically performed using a photoionization detector (PID) for measurement of organic vapor presence, but may also be performed using other instruments to screen for site-specific compounds (i.e. mercury using a Lumex mercury vapor analyzer, or similar). The field data collected using these methods is a "qualitative" indicator only, providing an approximation of the potential for chemical presence.

In some circumstances, soil screening following these procedures may be performed to select discrete soil samples for conventional laboratory analysis, or performed to provide an indicator of chemical presence for determining well locations or further investigation.

PROCEDURES REFERENCED

- FMG 2.3 - Soil Borings
- FMG 2.6 - Soil Classification
- FMG 6.1 - Surficial Soil Sampling
- FMG 8.0 - Field Instruments - Use/Calibration

PROCEDURAL GUIDELINES

Prior to field screening activities, the PID instrument must be calibrated in accordance with the manufacturer's recommendations and GM requirements (see FMG 8.0 - Field Instruments - Use/Calibration).

Soil Sampler Screening

This field screening technique is used when performing soil screening on split-spoon samples, or discrete soil samples by direct-push or rotosonic (sonic) drilling techniques (see FMG 2.3 - Soil Borings).

- Open split-spoon sampler or discrete sampler liner to expose length of collected soil for monitoring;
- Screen surface of exposed soil with PID tip from top of soil column to base of soil column; and;
  - Note: For coarse grained soils (i.e. sand, granules, etc.), small indents should be made in the core at each screening point to insert PID tip into to obtain accurate field screening results. For fine grain soils (i.e. clay, silt, etc.), the center of the core should be exposed and screened to obtain accurate screening results.
- Record the highest reading detected on the field log or in the field book.

Note: Organic vapor monitoring must be performed upwind and away from the drill unit or any running motors, such that exhaust fumes do not cause a "false positive" reading.

Headspace Monitoring

Headspace monitoring is performed on a portion of soil collected from a test pit, split-spoon/ discrete soil sampler, or from a surface soil sample.

- Place soil sample into a clean sample container (i.e., sealable glass jar) until container is approximately half full;
- Cover container top with aluminum foil;
- Tighten lid over aluminum foil onto container top;
- Shake container;
- Set container aside for a minimum of 30 minutes;
- After 30 minutes remove lid and puncture foil with PID tip; and
- Record "headspace" reading on field log or in field book.

Note: If cold conditions exist, equilibrate headspace samples in a warm area (±70℉/±20℃) before monitoring is completed.

EQUIPMENT/MATERIALS

- PID instrument with appropriate calibration gas.
- Sealable clean glass jars/tinfoil.

- Sampling equipment (knives, measuring tape, log forms/field book).
- Work Plan.
- Health and Safety Plan.

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WELL CONSTRUCTION MATERIALS

WELL CONSTRUCTION MATERIALS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

In environmental subsurface investigations, the information used to evaluate subsurface conditions often relies heavily on the installation of quality groundwater monitoring wells. The application and use of the proper well construction materials to the specific well installation is crucial to obtaining representative and reliable groundwater samples.

The two general types of wells are groundwater monitoring wells and pumping (also referred to as recovery, extraction, or withdrawal) wells. The specific use of a groundwater well dictates the types of materials used to construct it.

This FMG outlines the general types and use of well construction materials and considerations involved in selecting appropriate materials for specific well installation applications. Installation of these materials are described in detail in the specific well installation FMGs listed below.

PROCEDURES REFERENCED

- FMG 3.2 - Overburden and Top of Rock Wells
- FMG 3.3 - Deep Bedrock Wells
- FMG 3.4 - Pump Wells
- FMG 3.5 - Piezometers

EQUIPMENT DESCRIPTIONS

Well Screen

Well screen is the portion of the well pipe that contains appropriately sized openings and allows groundwater to enter the well. The screen materials used in groundwater monitoring wells are crucial to ensuring the installation of an efficient, productive, and durable groundwater well.

The diameter of the well screen is generally dependent upon the application of the well. For monitoring wells used in groundwater level measurements and groundwater sampling, screen diameter will generally be 2.0-inch inner diameter (ID) flush-threaded screen segments (piezometers are typically 1.0-inch ID but may be 2-inch also). These screen segments are typically available in 10-foot lengths. Four-inch diameter or larger well screens are usually reserved for recovery or production well applications where larger diameters permit greater groundwater withdrawal rates. Larger diameter wells also allow a well to serve additional functions such as housing oil recovery systems.

Screen material will be either thermoplastic Schedule 40 polyvinyl chloride (PVC) (ASTM D1785, ASTM D2665, ASTM F480) or Schedule 5 Type 316 stainless steel, depending primarily on the depth of the well and the groundwater quality (degree and nature of contamination). Shallower depths and generally low levels of contaminants in groundwater allow for PVC applications, whereas greater depths and severely degraded groundwater quality, or the presence of free-phase oils or solvents, may necessitate stainless steel due to its greater strength and resistance to chemical degradation. It should be noted that PVC and stainless steel are appropriate for the vast majority of environmental applications and are generally accepted by regulatory agencies. Well materials other than PVC or stainless steel should be used only in certain instances, to be determined and approved by the Project Manager on a case-by-case basis.

Certain applications such as investigation of inorganic (metals) concentrations in groundwater, or the presence of low pH (acidic) conditions, may preclude the use of stainless steel wells. Stainless steel, which contains molybdenum in addition to its iron content, may leach out metal compounds which could lead to misleading groundwater analysis results.

PVC may likewise leach out or degrade specific thermoplastic elements of its composition which may compromise the well integrity or groundwater analyses. PVC generally performs well in acidic groundwater conditions; however, it may degrade in the presence of certain organic compounds such as ketones, aldehydes, or chlorinated compounds in high concentrations. Certain additives to the PVC may also affect groundwater quality.

Well screen slot sizes and well screen type will also be consistent for groundwater monitoring wells. Screen slot size is typically 0.010 inches; 0.020-inch slot size may be more appropriate for coarser formation materials or where the well may serve as a recovery well for free-phase oils. For monitoring applications, slot type should be either factory machine-slotted or continuous-wrap slotted. Perforated, bridge-slotted or louver-slotted well screens are generally not acceptable for most environmental applications and should be avoided.

Screen slot sizes may vary from these two sizes when used in production or recovery (pumping) well applications where the need to maximize groundwater withdrawal is essential. In such cases, screen slot sizes can be manufactured to exact specifications for a particular well based on particle size analysis results and formation transmissivity or permeability.

Well Riser Pipes and Casings

Well riser pipe is a solid extension of the well screen that extends from the screen up to the surface. The riser pipe protects the well screen, prevents outside groundwater from entering the well, and allows groundwater pumped from down in the open interval to be routed up through the well to the surface.

Well riser pipe should be of the same material and size as the well screen described above. In instances to be determined and approved by the Project Manager on a case-by-case basis only, differing materials may be approved for use in the same well (e.g., stainless steel well screen connected to PVC riser). Well risers should extend to the surface and should either be cut at grade in flush-mount completions or as an approximately 3-foot stickup to be covered with a steel protective casing.

Well riser pipe sections shall be flush-threaded and fitted with neoprene, rubber, or other appropriately constructed, durable o-rings to properly seal the threaded pipe joints. Glues or cements are not to be used in well construction.

In installations of bedrock monitoring wells, which have an open rock monitoring interval and a permanent well casing that extends from bedrock to the surface, the permanent casing (or casings in telescoping wells) shall be made of carbon steel or low-carbon steel (greater than 0.8 percent carbon and less than 0.8 percent carbon, respectively). The well casing should be a minimum of 4 inches in diameter (at least 4 inches diameter for the innermost casing).

On sites wells where dense, non-aqueous phase liquid (DNAPL) is present or may be a concern, in screened wells it is advisable to install a collection sump on the base of the well below the well screen to collect infiltrated DNAPL for possible measurement and/or sampling. Sumps should be installed as a 1- to 5-foot section of solid riser material with a sealed bottom placed below the well screen.

Sand Packs

The filter pack, or sand pack, installed in a well replaces formation material immediately around a well with a more permeable material (sand). The sand pack separates the well screen from the formation, increases the hydraulic diameter of the well, and prevents fines (silt or clay) from entering or clogging the well screen.

Sand pack of an appropriate size shall be utilized based on the well screen slot size being used. Sand pack size should be chosen so that the majority of the sand (sand pack has inherent variation in its particle grain size distribution) is larger than the screen slot size while sized small enough to prevent deleterious amounts of formation fines from entering the well through the sand pack. Screen slot sizes of 0.010-inch and 0.020-inch typically use a sand pack such as Morie or U.S. Silica No. 1, No. 0, No. 00N, or equivalent.

Sand pack shall be washed silica sand with a silica content of at least 95 percent. Sands should meet one or more of the following requirements: NSF 61, AWWA B-100, ANSI, or equivalent standards for uniformity and chemical inertness. In cases to be determined and approved by the Project Manager on a case-by-case basis only, differing sand pack materials may be approved for use in a well. Sand packs used for production and recovery wells with larger screen slot sizes will use larger particle sized sand packs of the same type and quality. The slot size and sand pack size for recovery wells should be chosen based on results of formation grain size distribution analysis.

Seals

Bentonite and grout seals are installed above the sand pack to isolate the monitoring interval and prevent groundwater from infiltrating into the well screen from other water-bearing zones. Seals also prevent migration of backfill or formation materials downward into the sand pack.

Bentonite is the generic name for a group of a naturally occurring clay minerals (montmorillonites) that come in a variety of forms: pellets, chips, granulated, or powdered. This material is commercially available as "Wyoming Bentonite". When hydrated it swells to many times its original volume and forms an ultra-low permeability clay seal.

Bentonite chips or pellets are generally used to create a seal immediately above the sand pack. The chips/pellets are dropped inside the augers or well casing by hand down through the water column onto the top of the sand pack. Care must be taken to prevent "bridging" of the bentonite particles in the casing above the target zone. Measurements of the depth to the top of the seal must be obtained during installation of the seal to ensure its proper position and thickness. In the absence of significant water in a casing or borehole, potable water must be added to hydrate the bentonite. The bentonite seal will be allowed to set for a minimum of one-half hour, in order to hydrate properly, before additional seals (grout) are applied. Once the bentonite has set for one-half hour the grout seal may be placed, as described below.

In saline groundwater environments, such as where ocean water may infiltrate the monitoring interval, a zeolite-based seal material may be used, as saline conditions may hamper the performance of bentonite pellets.

Portland cement grout (grout) forms a concrete-like seal that can be more manageable than bentonite (e.g., able to be pumped through a water pump). Grout is generally placed on top of the hydrated bentonite seal to form a solid cement seal around the well riser up to the surface. In certain circumstances, only under approval of the GM Project Manager, soil cuttings may be used to backfill the borehole in lieu of grout.

The grout mixture will consist of one 94-pound bag of Portland cement and 3 to 5 pounds of powdered bentonite added per sack of cement. Two pounds of calcium chloride may also be added (under certain conditions, e.g., very cold days) to accelerate the setting time of the grout, as well as to increase the dry strength of the grout. The grout will be thoroughly mixed with 6.5 gallons of potable water per sack of cement. Grout is generally placed using either the tremie or Halliburton grouting methods. These are described in the specific well installation FMGs.

Protective Casings and Surface Seals

Once the well screen, riser, and all seals have been placed to ground surface, the well riser must be protected. This includes protection from vehicles, damage, surface water infiltration, and weather. This is typically accomplished using either a flush-mount roadbox or a stickup casing.

Flush-mount roadboxes are circular steel casing segments with a heavy-duty steel lid with locking bolts. These units are widely available and come in a number of diameters and lengths, depending on the well diameter. A stickup protective casing is generally a length of carbon or stainless-steel pipe with a locking top.

For a typical 2-inch monitoring well, the roadbox should be at least 6 inches in diameter; a stickup casing should be at least 4 inches in diameter. A roadbox should be at least 12 inches in length (they are typically 16 to 18 inches long) and is installed flush with the ground surface. A stickup casing should be at least 5 to 6 feet long such that approximately 2.5 to 3 feet is below ground surface and 2.5 to 3 feet is protruding above grade. In wells where a permanent steel casing is installed (serves as the well riser pipe) and brought to the ground surface, it may be used as the protective casing provided it is equipped with a semi-permanent, metal, locking cap or cover that can be affixed to the steel casing.

Flush-mount installations should have at least the last 18 inches of the open borehole filled with coarse sand, placed up to ground surface to allow drainage of surface water infiltration down through and out of the roadbox. This also prevents infiltrating surface water from accumulating up over the top of the well riser and draining down into the well. This sand drain is not necessary in the locking cap stickup casings.

Both roadbox and stickup casings must be secured in the ground with concrete, which also serves as a surface seal.

In areas of high vehicle traffic activity, protective steel bollards should be installed. This is typically a vertically oriented, concrete-filled, steel pipe (minimum 4 inches diameter) cemented at least 3 feet into the ground, acting as a "guard rail" for the well casing and preventing it from being damaged by vehicles. Three bollards should be placed around a well to provide adequate protection.

EQUIPMENT/MATERIALS

- Drilling equipment.
- Well screen and riser materials.
- Sand pack.
- Bentonite pellets/chips.
- Powdered bentonite.
- Portland cement.

REFERENCES

ASTM D1785-99, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

ASTM D2665-00, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM F480-00, Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), Schedule 40 and Schedule 80.

ASTM A53/A53M-01, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless for Ordinary Uses.

Campbell, M.D., and Lehr, J.H., Water Well Technology, McGraw Hill, 1973.

Cold Weather Concreting, ACI Committee 306, Materials Journal, Volume 85, Issue 4, July 1, 1988.

Driscoll, Fletcher G., Groundwater and Wells, Johnson Filtration Systems, Inc., 1986.

Freeze, R. Allen, and Cherry, John A., Groundwater, Prentice-Hall, 1979.

USEPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response, 1986.

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LIST OF FORMS
(Following Text)

DEEP BEDROCK WELLS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure is for the installation of deep groundwater monitoring wells in bedrock zones which lie below the top of bedrock groundwater flow zone.

PROCEDURES REFERENCED

- FMG 2.0 - Subsurface Investigations
- FMG 3.0 - Monitoring Wells, Pump Wells, and Piezometers
- FMG 5.0 - Aquifer Characterization
- FMG 9.0 - Equipment Decontamination
- FMG 10.0 - Waste Characterization

PROCEDURAL GUIDELINES

- Overburden drilling will be performed down to the top of bedrock surface in accordance with the procedures outlined in FMG 3.2 - Overburden and Top of Rock Well Installation. Once at the top of bedrock surface, the augers will be advanced a minimum of 1 foot into bedrock, if possible, depending on the bedrock competency.
- If the augers cannot be advanced the minimum 1 foot into bedrock, the augers will be removed and a temporary steel casing will be placed to the bottom of the borehole to seal off the overburden. The seal shall be augmented by either pounding or spinning the casing just into the top of bedrock.
- Once the augers or casing are in place, either bedrock coring or 7 7/8-inch rotary drilling using standard techniques will be performed to advance the corehole to the depth of the top

of the desired open monitoring interval. If cored, the core boring will be reamed to a nominal 8-inch diameter with a rotary bit. Bedrock coring will be performed in accordance with procedures outlined in ASTM D2113 and FMG 2.4 - Bedrock Coring.

- Bedrock logging and classification will be performed in accordance with FMG 2.7 - Rock Classification.
- After the corehole has been drilled to the final depth and before the well has been constructed geophysical logging may be utilized to record and analyze measurements in coreholes to provide highly accurate information about subsurface properties. Down-hole methods also provide a means of correlating geological formations from one borehole to another. A variety of geologic information can be obtained from borehole geophysical surveys. Acoustic and Optical Televiewer logging can be used to determine the depths and precise orientations of bedrock fractures and can replace oriented coring for some projects. Some of the objectives of geophysical well logging are: identification of lithology and stratigraphic correlation, identifying water production zones and formation voids, measuring porosity, permeability, bulk density, elastic properties, acterizing fractures and secondary porosity, determining angle of fractures, and verifying well construction. Geophysical logging of a borehole may consist of: optical televiewer (OTV), acoustic televiewer (ATV), acoustic caliper, fluid temperature, fluid resistivity, natural gamma ray, spontaneous potential, single point resistance (SPR), heat pulse vertical flow measurements etc. Geophysical logs will be conducted in accordance to FMG – 4.1 EM Survey, FMG - 4.2 Gamma Ray Logging and FMG - 4.3 Downhole Caliper Logging.
- Once at the top of the desired monitoring interval a 4-inch diameter well casing equipped with centralizers will be installed. The well construction material should be selected based on constituents being analyzed. The casing will be grouted in place to within 6 inches of the base of the borehole using either the Halliburton single-plug grouting method or by tremie grouting, as described below. Grout will be mixed according to the specifications presented in FMG 3.1 - Well Construction Materials.

Halliburton Method

- Approximately 1.5 times the total calculated annular space volume of grout will be mixed. The grout will be placed inside the casing and a drillable plug (made of inert material which shall not result in the introduction of contaminants to the well [ensure no per- and polyfluoroalkyl substances (PFAS)/perfluorooctanoic acid (PFOA)]) will be placed on top of the grout. The plug must fit tight enough to prevent the mixing of the grout with the water above the plug. Potable water will be injected under pressure into the casing, forcing the plug to the bottom of the casing and grout into the annular space. A valve on the freshwater line will be closed to maintain pressure on the plug and the grout will be allowed to set for at least 12 hours. The temporary casing or auger assembly will be gradually withdrawn during the grouting process. The Halliburton method may also employ the use of drilling rods, in lieu of pressurized water, to force the plug down through the casing and maintain pressure on the plug.

Tremie Grouting Method

- A temporary tremie pipe will be installed to the depth of the bottom of the 4-inch casing in the annular space between the 4-inch casing and the 8-inch borehole wall. Grout will be pumped through the pipe until undiluted grout return is noted at the ground surface in the annular space between the 4-inch casing and the temporary casing or augers. The temporary casing or auger assembly will then be gradually withdrawn: the tremie pipe will be disconnected from the grout pump without removing it from the bottom of the borehole, temporary casing sections or auger flights will be withdrawn one at a time, the tremie pipe will be reconnected, and additional grout will be pumped until grout return is again observed at the ground surface inside and outside the temporary casing or augers. This procedure will be repeated, thereby maintaining a full head of grout in the casing, until the temporary casing or auger string has been completely withdrawn. Additional grout will then be pumped through the tremie pipe if necessary to achieve and maintain undiluted grout at ground surface outside the 4-inch casing. The tremie pipe will then be withdrawn from the borehole.
- The grout will be allowed to set for a minimum of 12 hours prior to resuming drilling operations.
- Drill excess grout out of the casing first with a tri-cone roller-bit of a diameter just slightly less than the inner diameter of the casing.
- At most locations, after the casing grout has set, an NQ or NX-core boring will be advanced approximately 10 feet (or alternate length to serve as the desired monitoring interval) below the 4-inch casing seat. The cored interval will serve as the monitoring interval for most locations, or the corehole may be reamed to a nominal 4-inch diameter.
- In some instances, depending on factors such as degree of rock competency (i.e., low-competency rock), groundwater quality, etc., a well screen may be appropriate for the monitoring interval. In such cases, a 2-inch-diameter stainless-steel or PVC well screen, machine-slotted or continuous wrapped, with 0.020-inch slot screen size, and equal in length to the cored interval may be installed within the open bedrock interval. A riser pipe of similar material will be attached to complete the well screen to the surface. In such cases the annular space between the well screen and corehole will be filled with a sandpack of appropriate grain size distribution to match the screen slot size. Seals of bentonite (minimum 2 feet thick) and grout may be installed above the sandpack to fill the annular space between the 2-inch riser and 4-inch casing, although these are not required since the screen is for stability purposes only and the monitoring interval has already been isolated.
- On sites where dense non-aqueous phase liquid (DNAPL) is present or may be a concern, do not drill through. If it is necessary to drill through, stop and seal off the zone before drilling further.
- Well screen "centralizers" may also be used in deeper wells to ensure that the well screen remains centered in the borehole at depth and facilitating an even distribution of the sand pack around the screen. These are generally a steel bracket or clamping device affixed (prior to installation) at one or more locations along the lower portion of the well screen and riser pipe. Centralizers are recommended but may be omitted if approved by the GM Project

Manager. Care must be taken to ensure that bridging of sand or bentonite does not occur at the centralizer locations.

- The well casing will be secured with a vented lockable cap. If the well is located in a high traffic area, the casing will be cut below grade and packed in coarse sand for drainage. The casing will be protected by a 9-inch flush-mounted roadway box set in a concrete seal. Alternatively, in low traffic areas, the well casing may be cut above grade and completed with a locking steel protective casing with approximately 3 feet of stickup, set in a concrete surface seal. Protective steel bollards will be installed, where necessary, to protect the well casing. Refer to FMG 3.1 - Well Construction Materials for additional information regarding protective casings.
- For deep bedrock monitoring well installation, where multiple zones of permeable rock may exist, steel casings and rotary drilling bits of larger size than indicated in this FMG may be used to create "telescoping" wells in which the sizes of the casings and boreholes become progressively smaller with increased depth. The deeper the well installation, the larger the diameter required for the near-surface (initial) drilling. Each permanent steel casing shall be grouted in place, using the methods described herein. The casing must be sealed in between each well.
- Bedrock coring and deep bedrock well installations may also be performed in conjunction with packer pressure testing (FMG 5.4 - Packer Pressure Testing) in order to define more permeable bedrock zones or to target specific hydrogeologic zones.
- All equipment will be decontaminated in accordance with FMG 9.0 - Equipment Decontamination, and all drilling-related wastes shall be handled and disposed in accordance with FMG 10.0 - Waste Characterization.
- Well installation will be followed by development. The procedure for well development is described in FMG 3.7 - Well Development. Water level monitoring will be performed in accordance with FMG 5.1 - Water Level Measurements.
- If required, in situ hydraulic conductivity testing shall be done in accordance with FMG 5.2 - In Situ Hydraulic Conductivity (Slug Test) Procedure.

EQUIPMENT/MATERIALS

- Well construction materials.
- Water level probe.
- Form FMG 3.3-01 - Bedrock Well Installation.
- Weighted tape measure.

REFERENCES

ASTM D1452-80, “Practice for Soil Investigation and Sampling by Auger Borings", Annual Book of ASTM Standard, Section 4, Volume 04.08.

ASTM D2113-83 (87), "Diamond Core Drilling for Site Investigations", Annual Book of ASTM Standards, Section 4, Volume 04.08.

American Society for Testing and Materials (1991), Standard D5092, "Practices for Design and Installation of Ground Water Monitoring Wells in Aquifers", Annual Book of ASTM Standard, Section 4, Volume 04.08.

New York State Department of Environmental Conservation (1988), Draft Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Division of Mineral Resources.

Environmental Protection Agency (1986), RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

Environmental Protection Agency (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001.

Environmental Protection Agency (1988), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, EPA/540/G-89/004.

Environmental Protection Agency (2016), General In-Hole Procedures, https://archive.epa.gov/esd/archive-geophysics/web/html/general_in-hole_procedures.html

Campbell, M.D., and Lehr, J.H., Water Well Technology, McGraw Hill, 1973.

Driscoll, Fletcher G., Groundwater and Wells, Johnson Filtration Systems, Inc., 1986.

Freeze, R. Allen, and Cherry, John A., Groundwater, Prentice-Hall, 1979.

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PIEZOMETER

PIEZOMETERS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The term piezometer generally refers to a small-diameter observation well ordinarily installed for the primary purpose of obtaining hydraulic head (i.e., water level measurement) data. The hydraulic information obtained from multiple piezometers allows evaluation of horizontal and vertical components of groundwater flow (flow direction and gradients). Piezometers can be installed as individual, stand-alone wells, arranged in a lateral array to monitor one hydrogeologic unit, zone, or formation. They can also be installed as clusters or nests in one location.

Piezometers are typically installed only in overburden soils due to ease of installation and potential low cost. These installations are not typically used for groundwater sampling applications or other functions, which are usually accomplished with larger-diameter monitoring wells.

PROCEDURES REFERENCED

- FMG 3.1 - Well Construction Materials
- FMG 3.2 - Overburden and Top of Rock Wells
- FMG 5.1 - Water Level Measurements

PROCEDURAL GUIDELINES

Application

Piezometers utilize the same general installation protocols as for overburden monitoring wells (see FMG 3.2 - Overburden Wells). In most instances piezometers are installed using direct-push methods (e.g., Geoprobe®), which are rapid and inexpensive subsurface exploration technologies, but piezometers can also be installed with standard drilling rig methods.

In direct-push applications a single piezometer is placed in a single direct-push borehole, typically 2 to 3 inches in diameter.

If information on the vertical component of groundwater flow is required, data from multiple hydrostratigraphic zones must be obtained. This can be accomplished using closely located clusters of piezometers installed at different vertical depths. Care must be taken to install a proper seal above the screened interval to prevent communication with hydrostratigraphic units above the target interval.

Alternatively, a "nest" of piezometers can be co-located in the same borehole. Standard (rotary) drilling rig installations are generally required for such installations, as larger-diameter boreholes are needed to accept multiple casings. The installation process is basically a repetition of overburden well installation procedures on a vertical, "one-atop-the-other" basis, with proper seals in between target intervals.

Materials

Piezometers are usually smaller diameter than monitoring wells, typically 1.0 inch or 1 1/4 inch inner diameter (ID). Well screen and riser should be Schedule 40 polyvinyl chloride (PVC). Well screen should be 0.010-inch factory-slotted (piezometers are not typically continuous wrap due to cost limitations) and screen segments should be a maximum 5 feet long. As with overburden wells, the well screen and riser should be O-ring-sealed, flush-threaded, PVC. No glues or solvents should be used to assemble the well casing.

Installation

Piezometer installations, due to their potential low cost, most often accompany direct-push explorations. In small-diameter applications such as direct-push technology, a single piezometer is usually placed within a single direct-push borehole. The piezometer installation is carried out similarly to that for overburden wells (FMG 3.2 - Overburden and Top of Rock Wells), upon completion of the borehole to depth:

- Install the direct-push borehole, typically about 2 to 3 inches in diameter.

- Install screen and riser sections as discussed above, to the target depth.
- Place sand pack material of Morie or U.S. Silica No. 1, No. 0, or No. 00N, or equivalent, to 1 to 2 feet above the top of the screen section.
- Place granulated bentonite to form a 1- to 2-foot thick seal above the sand pack (chips or pelletized bentonite can be used but may not fit down the annulus between the piezometer and the borehole). Hydrate the bentonite if sufficient groundwater is not present in the borehole.
- Place clean backfill soil, additional bentonite, or grout if desired, to create final seal around the riser to ground surface. If soil is used to backfill, install a surface seal of bentonite or grout.

Installation of nested piezometers should adhere to the following procedures:

- Completion of 6-inch to 10-inch (4 1/4-inch to 6 1/4-inch ID hollow-stem augers or casing) borehole to depth for two or three piezometers. The actual borehole diameter should be based on the number of piezometers to be installed in the borehole, anticipated soil materials, etc. The inside diameter of the temporary casing or auger must allow sufficient space to install sand pack and seal materials without bridging.
- Use well screens of 5 feet length or less.
- Install the deepest piezometer to the base of the borehole, or to the target depth. (Note: if the bottom depth of the exploration and the bottom depth of the deepest piezometer vary by more than 1 foot this interval will be plugged using either grout or bentonite seal.)
- Place sand pack around the deepest piezometer screen to 1 to 2 feet above the top of the screen.
- Install a minimum 1-foot thick bentonite seal on top of the sand pack (hydrate if necessary based on water level measurements obtained).
- If the next piezometer is to be installed immediately above the first, place 6 inches of sand on top of the bentonite seal before placing the next screen.
- Install the next-deepest piezometer to the desired depth.
- Place similar seals around the second piezometer.
- Continue the above procedures for each multi-level piezometer installed.
- Piezometer installation and seal placement should be performed as the augers or casing is withdrawn from the borehole. Do not install piezometers in an uncased hole, as this presents the possibility of caving and mixture of formation material with sandpack and seal materials, which will compromise the quality of the installation and therefore the data obtained.
- Label each individual piezometer casings appropriately to prevent confusion regarding depth intervals measured.

Concrete surface seals and protective casing installations are also recommended but may be considered optional, depending on factors such as piezometer location, cost considerations, degree of permanence, etc. However, a form of protection should be in place as there is a cost associated with the piezometer(s) as well. If installed it is recommended that concrete surface completions be placed to a depth of at least 18 inches below ground surface.

EQUIPMENT/MATERIALS

- Direct-push or standard drilling rig apparatus and equipment.
- Well screen and riser materials.
- Well sand pack and seal materials.
- Surface seal and protective casing materials, if necessary.

REFERENCES

Driscoll, Fletcher G., Groundwater and Wells, Johnson Filtration Systems, Inc., 1986.

Freeze, R. Allen, and Cherry, John A., Groundwater, Prentice-Hall, 1979.

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LIST OF FORMS
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ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 3.6
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 0	REVISION DATE:

WELL DEVELOPMENT

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure is for the development of groundwater monitoring wells that have been installed in overburden, top of bedrock, or deep bedrock formations. Before a newly constructed well can be used for water quality sampling, measuring water levels, or aquifer testing, it must be developed. Well development refers to the procedure used to clear the well and formation around the screen of fine-grained materials (sands, silts, and clays) produced during drilling or naturally occurring in the formation. Sampling should not be done for 1-2 weeks after well development to allow the well to return to normal groundwater conditions.

Well development is completed to remove fine grained materials from the well but in such a manner as to not introduce fines from the formation into the sand pack. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

PROCEDURES REFERENCED

- FMG 3.2 - Overburden and Top of Rock Wells
- FMG 3.3 – Deep Bedrock Wells
- FMG 6.15 – PFAS/PFOA Sampling
- FMG 10.0 - Waste Characterization

PROCEDURAL GUIDELINES

The well development procedures presented below are the recommended standards. However, due to variations in conditions, changes in these standards may be necessary in order to facilitate successful monitoring well development.

Well development can be accomplished by using in-place pumps or by using portable equipment; either peristaltic, bladder, or other appropriate pumps depending on well depth. In the case of developing wells installed utilizing the mud rotary methods (least preferred method) it would be beneficial to surge the well prior to and during development to help break down the filter cake that may have built up on the well screen.

- Don appropriate safety equipment.
- All equipment used for development purposes entering each monitoring well will be cleaned using a soapy wash [laboratory grade, confirm no presence of per- and polyfluroalkyl substances (PFAS) or perfluorooctanoic acid (PFOA) if sampling for PFAS/PFOA (see FMG 6.15 – PFAS/PFOA Sampling for further details)], tap water rinse, isopropyl alcohol rinse (or other rinse agent that is appropriate for site-specific conditions), and distilled/deionized water rinse.
- Uncap well and allow water level to stabilize. Attach appropriate pump and lower tubing into well.
- Turn on pump. If well runs dry, shut off pump and allow to recover.
- Collect the groundwater sample in a glass jar to determine relative turbidity, and measure and record the temperature, pH, turbidity, and specific electrical conductance.
- The above steps will be repeated until groundwater is relatively silt-free; no further change is noted; the temperature, pH, turbidity, and specific conductance readings have stabilized to within 10 percent.
- The time period between development and groundwater sampling will be dependent upon the project objectives, and the chemicals of concern (COCs). When sampling for COCs sensitive to turbidity presence (i.e., semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals), an extended time period between the development activity and the sampling event will be observed. On GM sites, sampling will be conducted in accordance with the following:

Primary COC	***Time Period Between Development and Sampling***
General Chemistry	1 week
Volatile organic compounds (VOCs)	1 week
SVOCs, PCBs, Metals	2 weeks

Waste Disposal

- All waste generated will be disposed in accordance to the methods and procedures contained in FMG 10.0 - Waste Characterization through the onsite Resource Manager, if the site is active.
- All water generated during cleaning and development procedures will be collected and contained in accordance to the site-specific disposal requirements.
- Personal protective equipment, such as gloves, disposable clothing, and other disposable equipment, resulting from personnel cleaning procedures and from soil sampling and handling activities, will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums or a covered roll-off box for appropriate disposal.

EQUIPMENT/MATERIALS

- Appropriate health and safety equipment.
- Knife.
- Power source (e.g., generator, battery).
- Field book.
- Form FMG 3.6-01 - Well Development and Stabilization Form.
- Well keys.
- Graduated pails.
- Surge block
- Form FMG 3.6-01 - Well Development and Stabilization Form.
- Well keys.
- Graduated pails.
- Pump and tubing.
- Cleaning supplies (including non-phosphate soap, buckets, brushes, laboratory-supplied distilled/deionized water, tap water, isopropyl alcohol or other site-specific rinse agent (e.g., nitric acid solution), aluminum foil, plastic sheeting, etc.).
- Water level meter.
- pH/temperature/conductivity meter.
- Turbidity meter.
- Clear glass jars (e.g., drillers' jars).

REFERENCES

Environmental Protection Agency (1986), RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

Environmental Protection Agency (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001.

Environmental Protection Agency (1988), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, EPA/540/G-89/004.

WELL DEVELOPMENT AND STABILIZATION FORM

PROJECT NAME: ______________________ **PROJECT NO.:** __________

DATE OF WELL DEVELOPMENT: ______________________

DEVELOPMENT CREW MEMBERS: ______________________

PURGING METHOD: ______________________

SAMPLE NO.: ______________________

SAMPLE TIME: ______________________

WELL INFORMATION

WELL NUMBER: ______________________

WELL TYPE (diameter/material) ______________________

MEASURING POINT ELEVATION: ______________________

STATIC WATER DEPTH: ______________________ **ELEVATION:** __________

BOTTOM DEPTH: ______________________ **ELEVATION:** __________

WATER COLUMN LENGTH: ______________________

SCREENED INTERVAL: ______________________

WELL VOLUME: ______________________

Note: For 2-inch diameter well: 1 foot = 0.14 gallons (Imp) or 0.16 gallons (US)
1 meter = 2 liters

	UNITS	*1*	*2*	*3*	*4*	*5*	*TOTAL/ AVERAGE*
VOLUME PURGED (volume/total volume):							
FIELD pH:							
FIELD TEMPERATURE:							
FIELD CONDUCTIVITY:							
CLARITY/TURBIDITY VALUES:							
COLOR:							
ODOR:							
COMMENTS:							

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WELL DECOMMISSIONING

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 3.7
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

WELL DECOMMISSIONING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure is for the decommissioning/abandonment of groundwater monitoring wells that have been installed in overburden, top of bedrock, or deep bedrock formations. Well decommissioning refers to the procedure used to properly abandon or remove the monitoring well from the formation while taking the proper precautions to help eliminate cross-contamination.

The proper methods for properly abandoning monitoring wells are either by leaving the well materials in place and pressure grouting with a cement/bentonite slurry directly into the well or by over-drilling with augers, removing the well material, and backfilling with a cement-bentonite slurry. Individual state regulations must be reviewed and followed prior to and during well abandonment procedures.

PROCEDURES REFERENCED

- FMG 3.2 - Overburden and Top of Rock Wells
- FMG 3.3 - Deep Bedrock Wells
- FMG 9.0 - Equipment Decontamination
- FMG 10.0 - Waste Characterization

PROCEDURAL GUIDELINES

Pressure Grouting

- The borehole log from the monitoring well needs to be obtained to determine the well construction in order to prepare the proper materials and calculate the quantity of cement/ bentonite slurry that will be required.
- The cement pad and the well protector around the monitoring pad needs to be removed and the immediate area around the monitoring well dug out. The riser pipe is to be cut off approximately 1 to 2 feet below ground surface.
- A tremie pipe will be placed into the well completely to the bottom. A cement/bentonite slurry will then be pressure grouted in to the monitoring well backfilling completely to the surface. The grout will be prepared in the ratio of one bag (94 pounds) of Type I or Type II Portland cement to 3 to 5 pounds of bentonite powder mixed with approximately 7 gallons of potable water. The grout will be allowed to sit for approximately 1 hour to allow any settlement of the cement/bentonite slurry and then augment if needed.

Overdrilling

- Based on the diameter of the monitoring well, this information can be obtained from the well completion diagram, the proper sized augers need to be specified.
- The cement pad and the well protector around the monitoring pad needs to be removed and the immediate area around the monitoring well dug out. The riser pipe is to be cut off approximately 1 to 1 feet below ground surface.
- The augers are then placed over the riser pipe of the monitoring well and then drilling commences. The drilling continues until the final depth to which the monitoring well was installed is reached. The well materials are then removed (pulled) from the augers.
- A cement/bentonite grout will be placed from the bottom of the borehole to the top of the augers. As each flight of augers is removed from the ground, the cement/bentonite grout will continue to be placed in the augers, to the top. This will continue until all the augers have been removed from the borehole. The grout will be prepared in the ratio of one bag (94 pounds) of Type I or Type II Portland cement to 3 to 5 pounds of bentonite powder mixed with approximately 7 gallons of potable water.
- The area final restoration will be completed in accordance with the directions of the GM Facility representative (e.g., asphalt, concrete, vegetation). In active work areas final restoration maybe necessary immediately; or time to allow settlement of the abandoned well area may be permitted prior to final restoration being performed.
- Documentation/Notification requirements include modification of the well log to reflect closure and if necessary notification to the appropriate regulatory agency.

Waste Disposal

- All waste generated will be disposed of in accordance with the methods and procedures contained in FMG 10.0 - Waste Characterization.
- All material generated during well decommissioning procedures will be collected and contained on site in roll-off boxes or 55-gallon drums for future analysis and appropriate disposal.
- Personal protective equipment, such as gloves, disposable clothing, and other disposable equipment, resulting from personnel cleaning procedures and from well closure activities, will be placed in plastic bags. These bags will be handled in accordance with the Work Plan.

EQUIPMENT/MATERIALS

- Drilling equipment.
- Well supplies.
- Subsurface boring log.
- Tape measure.

REFERENCES

Michigan Department of Public Health, Ground Water Quality Control Section – Division of Water Supply (1988), Michigan Water Well Grouting Manual, MDPH GW-3-302.

ASTM D5229 "Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes and other Devices for Environmental Activities".

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SUB-SLAB SOIL GAS SAMPLING POINT INSTALLATION USING VAPOR PIN™ APPROACH

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 3.10
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

SUB-SLAB SOIL GAS SAMPLING POINT INSTALLATION USING VAPOR PIN™ APPROACH

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This document describes the procedures for installing permanent sub-slab sampling probes using the Vapor Pin™ approach. These sample probes can then be used for the collection of sub-slab soil gas samples, for vacuum readings, or other uses. When not in use, the probes can be sealed in place without having to abandon the point.

The following sections list the necessary equipment and detailed instructions for installing sub-slab sampling points using the Vapor Pin™ approach.

PROCEDURES REFERENCED

- FMG 1.3 –Utility Clearance
- FMG 6.10 - Sample Handling and Shipping
- FMG 7.1 – Particulate Monitoring
- FMG 9.0 – Equipment Decontamination
- FMG 10.0 – Waste Characterization

DRILLING PROCEDURES

The following cautions and field tips should be reviewed and considered prior to installing or collecting a sub-slab soil gas sample.

- Utility clearing will be completed in accordance with FMG 1.3 - Utility Clearance.

- Drilling/boring equipment will be decontaminated prior to the installation of the soil vapor point and between successive installations in accordance with FMG 9.0 – Equipment Decontamination.
- No oils or grease will be used on equipment introduced into the borehole.
- Field personnel should not use sharpie markers during installation or note taking.
- Derived waste generated from boring activities will be characterized and disposed of in accordance with FMG 10.0 – Waste Characterization.
- Use of Vapor Pins™ and drill bit length will be based on the thickness of the slab encountered. Every effort will be made to establish the thickness of the slab during the preliminary investigation activities, such as interviews with site personnel, review of construction drawings, building walk through and utility clearance process. If slab is determined to be too thin for Vapor Pins™ – install a standard port using the FMG 3.9 – Installation Procedure for Soil Vapor Monitoring Points.
- Field personnel will properly seal the sub-slab soil gas sampling point at the slab surface to prevent leaks of atmosphere into the sub-slab soil gas sampling point during purging and sampling. Permanent ports will be fit snug into the predrilled hole by ensuring that the silicone sleeve is fitted properly around the Vapor Pin™ before installation and expands sufficiently inside the hole during installation. A protective cap will be installed on the end of the barb fitting. If this is not done properly, the integrity of the sample port may be compromised.
- If possible, have equipment shipped two to three days before the scheduled start of the installation event so that all materials can be checked. Order replacements if needed or have spares shipped if timing is important.

VAPOR PIN™ INSTALLATION

Permanent sub-slab soil gas sampling points are installed using a hammer drill and manual placement of the Vapor Pin™ probe. After a dry fit, the vapor probe is inserted into the hole and installed using a dead blow hammer to tap the installation/extraction tool over the Vapor Pin™ to protect the barb fitting. The vapor probe is equipped with a rubber protective cap that is used to close the sampling port when not in use. A figure presenting a properly installed Vapor Pin™ is below:

Figure 1: Cross-section of properly installed Vapor Pin™ (Cox-Colvin Vapor Pin™ Installation SOP [2016])

The Vapor Pin™ and tubing will be purged prior to collecting the soil gas sample. Detailed installation methods are as follows:

- Complete a utility clearance in accordance with FMG 1.3 - Utility Clearance prior to drilling activities.
- Remove, only to the extent necessary, any covering on top of the slab (e.g., carpet) if present.
- Lay down plastic sheeting to keep the work area clean. Check to make sure shop vacuum is working properly and fine concrete particles will not pass through filter.
- Advance the 1½-inch drill bit approximately 1.75 inches into the slab (Please note that if the stainless-steel flush mount is being used, advance the 2-inch drill bit approximately 1/8 inch into the slab first before using the 1½-inch drill bit). This hole is drilled deep enough to permit the top of the Vapor Pin™ to be set flush with the slab when the Vapor Pin™ is inserted into the 5/8-inch hole drilled under Step 7, below. Careful not to advance too far into the slab. This will cause the threaded portion of the Vapor Pin™ to be set too deeply to engage with stainless-steel cover. Clean up cuttings with shop vacuum, bottle brush, and dust pan.
- Drill a 5/8-inch-diameter hole into the concrete slab using the hammer drill. Do not fully penetrate the slab at this time. Stop drilling approximately 1-inch short of penetrating the slab.

- Use the shop vacuum, bottle brush and dust broom to clean up the work area and material that may have fallen into and around the drill hole. Refer to FMG 7.1 – Particulate Monitoring to assess risks associated with concrete dust generation during drilling activities. Concrete dust should be wetted with distilled water prior to cleaning to minimize dust hazards.
- Advance the 5/8-inch drill bit the remaining thickness of the slab and approximately 3 inches into the sub-slab material to create an open cavity. Record any observations from the drill cuttings, if possible, regarding approximate soil type(s), presence of soil moisture/water, and presence or absence of a plastic sub-slab sheet. Record PID readings.
- Use the bottle brush, dust broom and dust pan to clean material around and within the hole. Do not use the shop vacuum to clean up the drill hole after the full thickness of the slab has been penetrated. Concrete dust should be wetted with distilled water prior to cleaning to minimize dust hazards.
- Using a Vapor Pin™ without the silicone sleeve fitted, test fit the components so that the proper depth of the 1½-inch hole provides enough space for the Vapor Pin™. Adjust so that the Vapor Pin™ will lie flush with the slab surface and does not create a tripping hazard.
- Re-drill the 5/8-inch hole to ensure it remains clear. This can also be accomplished using a piece of steel rod, sample tubing or a piece of heavy wire (e.g., coat hanger).
- Assemble the Vapor Pin™ for installation by fitting the silicone sleeve over the lower end of the pin.
- Place the lower end of Vapor Pin™ assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the Vapor Pin™ to protect the barb fitting and tap the Vapor Pin™ into place using a dead blow hammer. Make sure the installation/extraction tool is aligned with the Vapor Pin™ to avoid damaging the barb fitting. Place the rubber protective cap over the Vapor Pin™ barb so that it covers the first barb. Do not push the cap down so that it is flush as this will make it very difficult to remove when preparing to sample.
- For flush mount installations, cover the Vapor Pin™ with a flush mount cover, using either the plastic cover or by threading the stainless-steel secure cover onto the Vapor Pin™. Replace the surface covering (e.g., carpet) if warranted. Sample collection location should be returned to pre-sampling conditions to the extent feasible given the presence of a permanent probe.
- Although not required immediately following installation, a helium tracer test may be completed (see FMG 6.11 - Sub-Slab or Soil Vapor Monitoring Point Sampling Procedure) upon installation of the Vapor Pin™ to verify that the sampling point is sealed. It should be noted that this test is required prior to sampling.
- All permanent sub-slab soil gas sampling points should be allowed to equilibrate for a minimum of 24 hours before proceeding to sample collection to ensure that the most representative sub slab soil gas sample is collected.

WASTE MANAGEMENT

The waste materials generated by these activities should be minimal. Personal protective equipment, such as gloves, disposable clothing, and other disposable equipment will be disposed of in accordance with FMG 10.0 – Waste Characterization.

EQUIPMENT/MATERIALS

The following equipment and materials are used for the completion of a soil vapor monitoring point:

1. Appropriate personal protective equipment (PPE) as required by the site- specific Health and Safety Plan.
2. Site Plan, Field Sampling Plan, and/or Work Plan, with proposed soil vapor monitoring point locations.
3. Electric hammer drill (big – e.g., Bosch, Hilti, etc.) equipped with commercially available shroud or cowling with dust collection system (Note: dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism per the OSHA Standard).
4. 5/8-inch and 1 ½-inch concrete drill bits for impact drill (drill bit length contingent on slab thickness)
5. 2-inch concrete coring drill bit (for stainless steel flush mount cover installation)
6. Contractor Cox Colvin Vapor Pin™ Kit that includes:
   a. decontaminated Stainless Steel Vapor Pin™ with barbed fitting (0.5-inch outside diameter at end, 0.8125-inch diameter at middle, 3.5-inch in length)
   b. Vapor Pin™ sleeves
   c. Vapor Pin™ rubber protective caps
   d. Secure, steel flush mount covers or plastic flush mount cover
   e. Spanner screwdriver
   f. Stainless steel drilling guide
   g. Installation/Extraction tool
   h. Bottle brush
   i. Vapor Pin™ SOP
7. Photoionization detector (PID) with appropriate eV lamp for site related contaminants of concern (COCs)
8. Dead blow hammer
9. Pliers
10. Shop vacuum with clean HEPA filter

11. Paper towels
12. Dust Broom and Pan
13. Spray Bottle with Distilled Water
14. Nitrile gloves
15. Work gloves
16. Knee pads
17. Ground fault circuit interrupter (GFCI)
18. Extension cords capable of amperage required for hammer drill
19. Plastic sheeting
20. Field notebook

REFERENCE

Cox-Colvin & Associates, Inc. 2016. Standard Operating Procedure Installation and Extraction of the Vapor Pin™. http://vaporpin.coxcolvin.com/wp-content/uploads/2016/09/Vapor-Pin-SOP-09-2016-Web.pdf

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GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

WATER LEVEL MEASUREMENTS

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure describes measurement of water levels in groundwater monitoring and extraction wells, piezometers and boreholes. This procedure does not cover automated measurement of water levels with a transducer/datalogger and does not cover measurement of phase-separated liquids.

Water levels in monitoring wells will be measured prior to each sampling event and at other times as indicated in the project Work Plan. Water levels will be acquired in a manner that provide accurate data that can be used to calculate vertical and horizontal hydraulic gradients and other hydrogeologic parameters. Accuracy in obtaining the measurements is critical to insure the useability of the data.

PROCEDURES REFERENCED

- FMG 6.5 - Non-Aqueous Phase Liquid (NAPL)
- FMG 8.0 - Field Instruments – Use/Calibration
- FMG 9.0 - Equipment Decontamination

PROCEDURAL GUIDELINES

In order to provide reliable data, water levels must be collected over as short a period of time as practical. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements must be noted. Tidal fluctuations, navigation controls on rivers, rainfall events, and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level collection period, it is imperative that the time of data collection at each station be accurately recorded.

In conjunction with groundwater level measurements, surface water (e.g., ponds, lakes, rivers, and lagoons) often are monitored as well. This information is very helpful (and can be critical) in understanding the hydrogeologic setting of the site and most importantly how contaminants may move beneath the site.

The depth to groundwater will be measured with an electronic depth-indicating probe. Prior to obtaining a measurement, a fixed reference point on the well casing shall be established for each well to be measured. Unless otherwise established, the reference point is typically established and marked on the north side of the well casing. Avoid using protective casings or flush-mounted road boxes for reference, due to the greater potential for damage or settlement.

If provided for in the project Work Plan, the elevation of the reference point shall be obtained by accepted surveying methods, to the nearest 0.01 foot.

The water level probe will be lowered into the well until the meter indicates (via indicator light or tone) the water is reached. The probe will be raised above water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest 0.01 foot on Form FMG 5.1-01 - Groundwater Level Monitoring Report or other designated data recording location if specified in the project Work Plan.

Upon completion, the probe will be raised to the surface and together with the amount of cable that entered the well casing, will be decontaminated in accordance with methods described in FMG 9.0 - Equipment Decontamination.

EQUIPMENT/MATERIALS

- Battery-operated, non-stretch electronic water level probe with permanent markings at 0.01-foot increments (traceable to national measurement standards), such as the Solinst Model 101 or equivalent.
- The calibrated cable on the depth indicator will be checked against a surveyor's steel tape once per quarter year. A new cable will be installed if the cable has changed by more than 0.01 percent (0.01 foot for a 100-foot cable). See also FMG 8.0 - Field Instruments – Use/Calibration.

REFERENCES

ASTM D4750 - Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).

ASTM D6000 - Guide for Presentation of Water-Level Information from Ground-Water Sites.

Form FMG 5.1-01

GROUNDWATER LEVEL MONITORING REPORT

WELL NUMBER

Page of

PROJECT ____________________ PROJECT MANAGER ____________

LOCATION ____________________ FIELD REP. ____________

ELEVATION REFERENCED TO: ____________________ DATE ____________

Date	Time	Elapsed Time (days)	Depth of Water from ( ) in ft	Elevation of Water	Remarks	Read By

FMG MODIFICATIONS MUST BE ACCOMPANIED BY A REVISION REQUEST FORM APPROVED BY THE PROJECT MANAGER

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SURFICIAL SOIL SAMPLING

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 6.1
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
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SURFICIAL SOIL SAMPLING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

The following procedure describes typical surficial soil sample collection methods for submission of samples to a laboratory for chemical analysis. See FMG 2.3 - Soil Borings for subsurface sampling procedures. See FMG 2.1 - Test Pits for test pit soil sampling procedures.

Soil sampling procedures may vary from project to project due to different parameters of concern, different guidance provided by the state/province where the site is located, or the specific objectives for the project. Therefore, it is essential that the sampling team members carefully review the Work Plan requirements and the rationale behind the program. The primary goal of soil sampling is to collect representative samples for examination and chemical analysis (if required). **Any questions regarding whether a sample should be collected or additional samples or different depths should be collected should be directed to the Client while in the field to limit need for remobilization.**

Grab Versus Composite Samples

A grab sample is collected to identify and quantify compounds at a specific location or interval. The sample shall be comprised of no more than the minimum amount of soil necessary to make up the volume of sample dictated by the required sample analyses. Composite samples are a mixture of a given number of sub-samples and are collected to characterize the average chemical composition in a given surface area or vertical horizon.

PROCEDURES REFERENCED

- FMG 2.1 - Test Pits
- FMG 2.2 - Drilling Techniques

- FMG 2.3 - Soil Borings
- FMG 2.6 - Soil Classification
- FMG 6.14 – Incremental Soil Sampling
- FMG 6.15 – PFAS/PFOA Sampling
- FMG 6.10 - Sample Handling and Shipping
- FMG 9.0 - Equipment Decontamination

PROCEDURAL GUIDELINES

1. Sample Strategy -Random, Biased, and Grid-Based Sampling

Random Sampling: Random sampling involves selecting locations for sampling in advance using a randomizing method. Therefore, all locations have an equal chance of being sampled for any sample location. Unless there is a strong indication of contaminant presence, such as staining, then soil sample locations may be randomly selected from several areas within the site.

Biased Sampling: Biased sampling involves preferentially selecting locations for sampling based the parameters of interest. If any areas show evidence of contamination, such as staining or vegetative stress, biased samples are normally collected from each area to characterize the contamination present in each area. Biased sampling may reduce sampling variability and the number of samples required. Background and control samples are also biased, since they are collected in locations typical of non-site-impacted conditions.

Grid-Based Sampling: Grid-based sampling involves collecting samples in a regular (grid) pattern. When soil sampling investigations involve large areas, a grid-based soil sampling program can be used. There is no single grid size that is appropriate for all sites. Common grid sizes are developed on 50-foot and 100-foot centers. It is acceptable to integrate several different grid sizes in a single investigation.

See FMG 6.14-Incremental Soil Sampling for further details on collecting samples under the Incremental Sampling Methodology (ISM).

For surficial soil sampling programs, it is also important to consider the presence of structures and drainage pathways that might affect contaminant migration. It is sometimes desirable to select sampling locations in low lying areas which can retain some surface water flow since these areas could provide samples which are representative of historic site conditions (worst-case scenario if surface water flow was a concern).

2. Sample Interval

Surficial soils are generally considered to be soil between ground surface and 6 to 12 inches below ground surface. However, for risk assessment purposes, regulatory authorities often consider soil from ground surface to 2 feet below ground surface to be surficial soil. The exact interval to be considered as surficial soil is often a matter of discussion with the regulatory authorities that review the Work Plan. The sample interval is important to the manner in which the data are ultimately interpreted. Another important factor is the type of soil. If there are different types of soil present at the site, this may have a bearing on the sample interval. For example, it may be important to separately sample a layer of material with high organic carbon content which overlies a layer of fine grained soil.

3. Sampling Procedure

Soil sampling techniques are dependent upon the sample interval of interest, the type of soil material to be sampled, and the requirements for handling the sample after retrieval. The most common method for collection of surficial soil samples involves the use of a stainless-steel trowel or hand auger. Soil samples may also be collected with spoons and push tubes. The sampling equipment is cleaned between sample locations. A typical surficial soil sampling protocol is outlined below:

- Surficial soil samples will be collected using a pre-cleaned stainless steel trowel or other appropriate tool. Each sample will consist of soil from the surface to the depth specified within the Work Plan.
- A new pair of disposable gloves will be used at each sample location. If sampling for per- and polyfluoroalkyl substances (PFAS)/perfluorooctanoic acid (PFOA), special considerations apply, see FMG 6.15-PFAS/PFOA Sampling for further details.

  - Any surficial debris (i.e., grass cover, gravel) should be removed from the area where the sample is to be collected using a separate pre-cleaned device. Gravel presents difficulties for the laboratory in terms of sample preparation and is typically not representative of contaminant concentrations in nearby soil.
  - A pre-cleaned sampling tool will be used to remove the sample from the layer of exposed soil.
  - When only one sample container is required, the collected soil will be placed directly into the clean, pre-labeled sample jar. When more than one sample container requires filling or samples will be split for duplicate analyses; the soils will first be homogenized in a pre-cleaned stainless steel bowl; and then placed into the respective sample containers. It is important that soil samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample interval. When round bowls are used for sample mixing, mixing is achieved by stirring the material in a circular motion

and occasionally turning the material over. Soil samples collected for volatile organic compounds analyses shall not be mixed.

- Samples will be placed on ice or cooler packs in laboratory supplied shipping coolers after collection.

Exception is noted for the collection of volatile organic compounds (VOCs) which require special sample collection methods. VOCs are collected directly into a sample vial (triplicate volume typically required) or collected using an EnCore Sampler™, or equivalent sampler (triplicate samples collected in accordance with manufacturer's instructions). Some VOC analyses require preservation of the sample immediately upon collection (i.e. methanol). Samples for VOCs are typically collected first, without homogenization or extra handling to limit the loss of volatile constituents. Please note that PFAS/PFOA samples will require special handing and containers, see FMG 6.15-PFAS/PFOA Sampling for further details.

The VOC sample collection methodology will be identified in the Work Plan, which will dictate the sample method. The methodology for VOC sampling varies from area to area, so careful review of this issue in advance of the field efforts is required.

EQUIPMENT/MATERIALS

- Drilling equipment and soil sampling tools
- Decontamination fluids and rinse water
- Subsurface boring log
- Tape measure
- Water level probe

REFERENCES

ASTM D1452-80 - Practice for Soil Investigation and Sampling by Auger Borings.

ASTM D1586-84 - Test Method for Penetration Test and Split-Barrel Sampling of Soils.

ASTM D1587-94 - Practice for Thin Walled Tube Geotechnical Sampling of Soils.

ASTM D2488-93 - Practice for Description and Identification of Soils (Visual-Manual Procedure).

ASTM D4700-91 - Guide for Soil Sampling from the Vadose Zone.

Environmental Protection Agency (1986), RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

Environmental Protection Agency (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001.

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GROUNDWATER SAMPLING

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GROUNDWATER SAMPLING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure is for the collection of groundwater samples for laboratory analysis.

The objective of most groundwater quality monitoring programs is to obtain samples that are representative of existing groundwater conditions, or samples that retain the physical and chemical properties of the groundwater within an aquifer.

One of the most important aspects of groundwater sampling is acquiring samples that are free of suspended silt, sediment, or other fine-grained particulates. Fine-grained particulates may be comprised of naturally occurring inorganic constituents or adsorbed anthropogenic chemicals and may bias the aqueous phase concentration.

Constituents that may adsorb to fine-grained materials suspended in the groundwater include: polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), and Non-Aqueous Phase Liquids (LNAPL). Monitoring programs where these constituents are suspected or known to be prevalent must employ sampling methods that minimize the entrainment of fine-grained particulates.

The sampling method of "preference" for GM sites where fine-grained particulates may be an issue is the "low stress/low flow/very low flow" sampling techniques described within this FMG. Experience has shown that the "low stress/low flow" technique typically achieves representative groundwater samples with minimal fine-grained particulates. In addition to the "low stress/low flow/very low flow" technique, a "typical sample method" has been presented for the collection of constituents less sensitive to particulates presence (i.e., VOCs), or "direct-push sample methods" generally employed as a "pre-screening tool" to evaluate the presence or absence of VOC. Direct-push sample procedures will result in groundwater samples with particulates present. The goal would be to have flow at rates which mimic the natural flow in the aquifer itself.

Lastly, in "extreme" cases "ultra-low flow" techniques have been employed at select sites where "low stress/low flow" methods were used, yet particulate-sensitive constituents continue to bias the analytical results. Ultra-low flow techniques are conducted at purging rates below 100 mL per minute and should only be utilized after careful review and a procedural variance has been approved.

PROCEDURES REFERENCED

- FMG 1.4 - Data Recording - Field Books/Digital Recording
- FMG 5.1 - Water Level Measurements
- FMG 6.15 - PFAS/PFOA Sampling
- FMG 8.0 - Field Instruments - Use/Calibration
- FMG 9.0 - Equipment Decontamination

PROCEDURAL GUIDELINES

The following describes four techniques for groundwater sampling: "Low Stress/Low Flow Methods", "Typical Sample Methods", “Passive Diffusion Bag Sample Methods”, and "Direct-Push Methods".

"Low Stress/Low Flow Methods" will be employed to collect representative groundwater samples, and minimize the impact of particulates such as sediment/colloids. Parameters typically affected by particulates present in the sample include PCBs, SVOCs, and inorganic constituents (metals).

The "Typical Sample Methods" will be employed where groundwater samples are collected for the analysis of parameters less sensitive to the presence of particulates such as VOCs and general chemistry.

The “Passive Diffusion Bag (PDB) Sample Methods” are typically employed for the collection of VOCs.

The "Direct-Push Methods" are typically employed for pre-screening areas for chemical presence to aid in determining well placement, or the need for further study.

Note: If non-aqueous phase liquids (NAPL) (light or dense) are detected in a monitoring well, groundwater sample collection will not be conducted, and the Project Manager and Client must be contacted to determine a course of action.
If deemed necessary to sample groundwater from below a LNAPL layer, a suggested sampling procedure has been presented at the end of this Procedural Guidelines section. However, that analysis will always be suspect and results must always be qualified.

Preparatory Requirements

- Verify well identification and location using borehole log details and location layout figures. Note the condition of the well and inform the Project Manager of any required repair work.
- Prior to opening the well cap, measure the breathing space above the well casing with a PID to establish baseline levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the Health and Safety Plan, field personnel should adjust their PPE accordingly.
- Prior to commencing the groundwater purging/sampling tasks, water level and total well depth measurements must be obtained to determine the volume of water in the well. Refer to FMG 5.1 - Water Level Measurements for details. In some settings, it may be necessary to allow time for the water level to equilibrate. This condition exists if a water tight seal exists at the well cap and the water level has fluctuated above the top of screen; creating a vacuum or pressurized area within the well casing. Three (3) water level checks will verify static water level conditions or changing conditions.
- Calculate the water volume in the well. Typically overburden well volumes consider only the quantity of water standing in the well screen and riser; bedrock well volumes are calculated on the quantity of water within the open corehole and within the overburden casing.

Well Purging and Stabilization Monitoring (Low Stress/Low Flow Method)

Note: The low stress/low flow method described below is the preferred procedure for most GM Sites. Bladder pumps/submersible variable rate pumps or peristaltic pumps are typically employed.

- Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified by the project requirements. The pump or tubing should be placed in the well as early as possible before sampling is initiated (this is to minimize well disturbance). In some programs, it may be necessary to install the pumping equipment/tubing approximately 24 hours prior to purging. Peristaltic tubing placement should include a tubing "clamp" at the well head, to minimize vibration transfer into the water column. The pump or tubing intake must be at the mid-point of the well screen to prevent disturbance and resuspension of any sediment in the screen base. Bedrock well sampling may require pump/tubing placement at the depth of specific fracture zone areas or other areas identified within the project-specific Work Plan.
- Before starting the pump, measure the water level again with the pump in the well leaving the water level measuring device in the well when completed.
- Purge the well at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level should be monitored approximately every 5 minutes, or as appropriate. A steady flow rate should be maintained that results in drawdown of 0.3 feet or less. The rate of pumping should not exceed the natural flow rate conditions of the well being sampled. Note: Care should be taken to maintain pump suction and to avoid entrainment of air into the tubing. Equipment should be free from per- and polyfluoroalkyl substances (PFAS)/perfluorooctanoic acid (PFOA) if PFAS/PFOA may be present, is being sampled for or may be sampled for in the future. See FMG 6.15-PFAS/PFOA Sampling for special considerations.

- Record adjustments made to the pumping rates and water levels immediately after each adjustment.
- Calibrate field instrument and document calibration activity. Calibration shall be performed in accordance with manufacturer's recommendations and FMG 8.0 - Field Instruments - Use/Calibration.
- During the purging of the well, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction (redox) potential (ORP), dissolved oxygen (DO), and turbidity) approximately every 5 minutes. Stabilization is achieved when three (3) consecutive readings for each parameter are within the following limits:
  - pH ±0.1 pH units of the average value of the three readings;
  - temperature ±3 percent of the average value of the three readings;
  - conductivity ±0.005 milliSiemen per centimeter (mS/cm) of the average value of the three readings for conductivity <1 mS/cm and ±0.01 mS/cm of the average value of the three readings for conductivity >1 mS/cm;
  - ORP ±10 millivolts (mV) of the average value of the three readings;
  - DO ±10 percent of the average value of the three readings; and
  - turbidity ±10 percent of the average value of the three readings, or a final value of less than 5 nephelometric turbidity units (NTU).
- Should stabilization not be achieved for all field parameters, purging is continued until a maximum of 8 well screen volumes have been purged from the well. Since low-flow purging (LFP) likely will not draw groundwater from a significant distance above or below the pump intake, the screen volume is based upon a 5-foot (1.4 m) screen length. After purging 8 well screen volumes, purging is continued if the purge water remains visually turbid and appears to be clearing, or if stabilization parameters are varying slightly outside of the stabilization criteria listed above and appear to be approaching stabilization.
- If low-turbidity samples are critical to the project goals, purging will be extended until turbidity has been reduced to 5 NTU or less.
- The pump should not be removed from the well between purging and sampling.
- Once stabilization has been achieved, direct the discharge of the pump tubing to the appropriate sample containers as specified in the sampling order presented below.
(see Sampling Techniques)

Well Purging and Stabilization Monitoring (Typical Method)

- The use of bailers for well purging is not recommended due to the surging of the groundwater within the well casing and the potential to increase suspended solids. Submersible bladder pumps are preferred but peristaltic pumps can be used for shallow small (>2.0-inch interior diameter) wells. The pump intake/tubing is typically placed at the mid-point of the screen within overburden wells. Bedrock well sampling may require pump/tubing placement in specific fracture zone areas or other areas identified within the project-specific Work Plan.

- Purge the well until three (3) consecutive well volume measurements of temperature and specific conductivity are approximately plus or minus 10 % and if the pH values are within 1 pH unit of the last three (3) value averages, and the groundwater turbidity values are less than the project-specific Work Plan requirements. If stabilization has not occurred after five (5) well volumes have been removed, continue purging and monitoring until eight (8) well volumes have been removed. Purging rates should not exceed the natural flow rate of groundwater into the well if using very low flow sampling. Elevated purging rates may result in excessive drawdown of the water column, introducing sediment/particulates into the sample and allow oxidation of sediments prior to sample collection.
- Groundwater turbidity may be evaluated by a visual examination or use of a nephelometer. Work Plan-specific goals may exist for turbidity values which may require extending the purging or require an alternate purging method.
- Purging and stabilization activities using a bailer should be performed at the top of the water column, within the riser piping/above the well screen. This will minimize the potential for sediment disturbance/suspension in the screen area and move water from the formation into the well screen/riser area in an effort to remove stagnant groundwater within the well. Bottom-loading bailers are generally employed. The lowering and removal actions are performed slowly to minimize well disturbance. Once stabilization has been attained, the sample aliquots are collected directly from the bailer.
- In the event the well goes dry (poor yielding formations), allow sufficient groundwater recharge to occur and perform sample collection.

Passive Diffusion Bag (PDB) Sampling Technique

Passive diffusion bag sampling techniques are used when sampling for VOCs (excluding certain ketones, ethers and alcohols). PDBs are simple to deploy, eliminate the collection and disposal of purged groundwater, and significantly reduce the cost of sampling. Verify the regulatory agency identifies PDB sampling as an accepted form of sampling for VOCs prior to utilizing the sampling technique.

Passive diffusion bags are made of low density polyethylene which acts as a semi-permeable membrane. The PDBs are either unfilled or prefilled by the manufacturer, are cylindrical in shape and come in a variety of sizes. Prefilled PDBs are filled with ASTM Type II certified, laboratory grade, analyte free, deionized water. Passive diffusion bag sampling methods are as follows:

- Hang the PDB sampler from the provided stainless-steel cable, connect the PDB to the top stainless-steel clip of the line then secure the bottom using a zip-tie.
- Lower the PDB into the monitoring well at the well screen interval. The hanging assembly is labeled and pre-sized for correct sampling depth. The stop cap will keep the bag at the desired depth.
- Wait a minimum of 14 days, or until equilibrium has been achieved between the water in the sampler and the surrounding groundwater prior to retrieving the PDB.
- Wind up the cable, release the PDB from the steel clip and cut the zip-tie.

- Cut a notch at the top of the PDB with decontaminated scissors and gently pour the water into the sample bottles.
- Dispose of PDB appropriately.

Direct-Push Sampling Technique

Generally, the direct-push sampling methods are employed for "pre-screening" groundwater quality (typically VOCs) in selected areas. This method is generally used to evaluate the need for permanent monitoring wells or determine the need for further study. The sampling technique is a direct-push protected-screen sampling technique as described in ASTM D6001 (Standard Guide for Direct Push Water Sampling for Geoenvironmental Investigations). The direct-push sampling technique is summarized as follows:

- Advance borehole to the target depth below the groundwater table.
- Remove the drill rod, assemble the direct–push sample tool and attach it to the drill rod.
- Lower the sample device to the bottom of the borehole using the drill rod.
- Advance the sample device approximately 3 feet into the bottom of the borehole by hydraulically pushing the drill rod.
- Withdraw the drill rods approximately 1 to 2 feet to retract the screen sleeve and to expose the sampler screen to the formation.
- Alternatively, a number of direct-push tools exist that do not require an advance borehole and can be driven directly to the target depth and retracted for sample collection.
- Allow at least 15 minutes from exposing the sampler screen to sample collection to allow silt in the sampler to settle. In tight formations, a longer wait time may be required to allow sufficient groundwater to enter the screen. In some clays, the sample device may not collect sufficient water volume to obtain a sample.
- Lower a small bailer into the sampler, discard initial bail (to acclimate bailer), and collect a water sample. A few bailer volumes may be required to obtain a sufficient volume of water sample. Alternatively, a "Waterra" check ball affixed to tubing maybe employed to collect a groundwater sample, or a peristaltic pump.
- Remove and clean the sampler device after completion of sample collection. Decontaminate sampler for next sample event.

This sampling technique is prone to sediment presence due to the lack of a well screen and sand pack and the limited purging performed before sample collection. A project variance will be required if non-VOC constituents are collected for analysis and results should be qualified on tables as to collection method.

Sampling Techniques

- If an alternate pump is utilized (i.e., Typical Method), the first pump discharge volumes (or bailer volumes) should be discarded to allow the equipment a period of acclimation to the groundwater.
- Samples are typically collected directly from the pump with the groundwater sample discharged into the appropriate sample container. Avoid handling the interior of the bottle or bottle cap and don new gloves for each well sampled to avoid cross-contamination of the sample.
- Order of sample collection:
  - VOCs;
  - SVOCs and PCBs;
  - Total organic carbon (TOC);
  - Total organic halogens (TOX);
  - Extractable organics;
  - Total metals;
  - Dissolved metals;
  - Phenols;
  - Cyanide;
  - Sulfate and chloride;
  - Nitrate and ammonia; and
  - Radionuclides.
- For low stress/low flow sampling, samples should be collected at a flow rate between 100 and 250 mL/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 feet.
- For VOC sample containers, the pumping rate should not exceed 100 mL/min. Samples should be transferred directly to the final container 40 mL glass vials completely full and topped with a Teflon cap (if not sampling for PFAS/PFOA). (NOTE: DO NOT OVERFILL AND DISPLACE SAMPLE PRESERVATIVE) Once capped the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present the sample vial will be discarded, and re-collected until free of air.
- Field filtration will be performed if required by the project-specific Work Plan. Sediment presence can interfere or bias sample results; false positive findings have been observed when turbid samples are analyzed. Field filtration can eliminate this concern; generally applicable to inorganic/PCB analysis. In-line disposable filter cartridges are generally the easiest and quickest method for field filtration.
- Sample labels/sample identification. All samples must be labeled in accordance to GHD's Laboratory Program including:
  - A unique sample number;
  - Date and time;

- Parameters to be analyzed;
- Project Reference ID; and
- Sampler's initials.

- Labels should be secured to the bottle(s) and should be written in indelible inks or preprinted.
- Field laboratory analysis can be conducted in the field using kits (i.e. HACH Kits or similar). Field analysis can also include alkalinity, chloride, total hardness, iron, etc. The manufacturer's instructions must be followed to ensure the correct result is obtained. Data determined from the field analysis will be recorded on the appropriate field forms (see FMG 6.9 - Field Quality Control Samples appropriate forms).

Groundwater Sampling Techniques Below LNAPL Layers

Sampling and analysis of groundwater below a LNAPL layer is not performed at GM Sites. The rationale for avoiding groundwater analysis below a LNAPL layer is as follows:

- The potential for sample "cross-contamination" with a trace amount of NAPL is very probable; analytical data will be biased "high" based upon this concern and the method and conditions should be noted on any results collected using this technique.
- Analytical data generated from this scenario does not represent "dissolved" constituent presence in groundwater. Dissolved constituents are "best" determined in downgradient locations.

In some instances, it may be required to perform groundwater sampling below a LNAPL layer, possibly at the request of a regulatory group. This should not be done without the prior approval of the Client. If absolutely necessary, this type of sampling may be accomplished in accordance with the following procedure:

- Determine the LNAPL depth and thickness using an interface probe or clear bottom loading bailer.
- Determine the sampling depth, selecting a sample point as far away as possible from the LNAPL interface.
- Using a "capped" outer tube or piping (i.e., 1-inch diameter polyethylene), insert the outer tube to the selected sample interval. The cap should be a slip-on cap affixed to the outer tube using a short "leash" (i.e., stainless steel wire or equivalent). This allows cap recovery once the sampling is complete.
- Insert the sample line (3/8-inch diameter tubing) into the outer tube and "push out" the end cap for sample line entry into the sampling interval.
- Perform purging and sampling using a peristaltic pump.
- Monitor the groundwater level and/or the NAPL level to ensure the LNAPL layer is not drawn to sampling depth. If LNAPL drawdown occurs evaluate the need to proceed further and consider terminating sampling activity.

- This sample should not be referred to on any analysis as a groundwater sample. It should always be referred to as a groundwater/NAPL mixture (GW/NAPL designation).

Sampling Techniques for Per- and Polyfluoroalkyl Substances (PFAS)/Perfluorooctanoic acid (PFOA) by LC/MS/MS

Sampling for PFAS/PFOA is becoming more common. When sampling for PFAS/PFOA, caution must be taken to avoid cross contamination and false positives. Prior to sampling PFAS/PFOA, contact the project laboratory to define a PFAS/PFOA target list. It is recommended to collect additional field/equipment blanks prior to and during sampling to check for residual PFAS/PFOA on sampling equipment due to the potential for cross-contamination issues and the need for very low reporting limits. PFAS/PFOA sampling methods are as follows:

- Using new nitrile gloves, sample for PFAS/PFOA first prior to collecting samples for any other parameter.
- Do not place the bottle cap on any other surface when collecting the sample.
- Avoid all contact with the inside of the sample bottle or its cap.
- After the sample has been collected and capped, place the sample bottle(s) in an individual sealed plastic bag (Ziploc) separate from all other sample parameter bottles.
- Make sure all equipment and sampling containers do not contain potential PFAS containing materials, such as Teflon. Samplers should ensure to the extent possible that PPE and any lotions/etc. do not contain PFAS/PFOA.

Due to the very low reporting levels of PFAS/PFOA, care must be taken during sample collection. The following table summarizes the do's and don'ts of sampling for PFAS/PFOA:

Do Not Use Items	**Do Use Items**
Field Equipment Items	
No Teflon containing materials including Teflon lined bottle caps and bailers	High-density polyethylene (HDPE) and Low-density polyethylene (LDPE)
	Acetate liners for soil samples
No Teflon tubing	Silicon tubing
No waterproof field books	Loose paper (non-waterproof)
No plastic clipboards, binders, or spiral hardcover notebooks	Aluminum field clipboards or with Masonite
No Post-It Notes	Ball-point pens
No chemical (blue) ice packs	Regular ice
Field Clothing and PPE Items	
No new clothing or water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex	Well-laundered clothing, defined as clothing that has been washed 6 or more times after purchase, made of synthetic or natural fibers (preferable cotton)
No clothing laundered using fabric softener	No fabric softener

Do Not Use Items	Do Use Items
No boots containing Gore-Tex	Boots made with polyurethane and polyvinyl chloride (PVC)
No Tyvek	Cotton Clothing
No cosmetics, moisturizers, hand cream, or other related products on the morning of sampling.	Sunscreens – All Organic Natural Sunscreen, that are "free" or "natural" Check the label
	Insect repellents- various natural products, DEET, but check the label prior to use
Sample Container Items	
No LDPE or glass containers	HDPE or polypropylene
No Teflon -lined caps	Lined or unlined HDPE or polypropylene caps
Rain Gear Items	
No waterproof or resistant rain gear	Tent that is only touched or moved prior to & following sampling activities
Equipment Decontamination Items	
No Decon 90	Alconox and/or Liquinox
No water from an on-site well	Potable water from municipal drinking water supply
Food Items	
No food and drink, with exceptions noted on the right	Bottled water and hydration drinks (Gatorade and Powerade) to be brought and consumed only in the staging area

EQUIPMENT/MATERIALS

- pH meter, conductivity meter, nephlometer, ORP meter, DO meter, temperature gauge.
- Field filtration units (if required).
- Purging/sampling equipment:
  - Peristaltic pump (not suitable for VOCs[1]/SVOCs, or drawing water from depths greater than 25 feet[2]);
  - Suction pumps (not suitable for LFP, VOCs/SVOCs, or depths greater than 25 feet);
  - Submersible pumps (suitable for VOCs/SVOCs only at low flow rates);
  - Air lift pumps (not suitable for VOCs/SVOCs);
  - Bladder pumps (suitable for LFR and VOCs/SVOCs);
  - Inertia pumps (gaining acceptability for VOCs/SVOCs, generally not suited for GM programs); and
  - Bailers.
- Water level probe.
- Sampling materials (containers, log book/forms, coolers, chain-of-custody).
- Project Work Plan.

- Health and Safety Plan.

Note[1]: Peristaltic pump use for VOC collection is acceptable on select EPA/RCRA sites; this technique has gained acceptance in select areas. Where it is permissible to collect VOCs using a peristaltic pump, collection must be performed at a low flow rate (Michigan allows VOC sampling with the peristaltic pump). *Acceptability of the collection of VOCs using the peristaltic pump should be evaluated before the sampling program commences, commonly performed during the project Work Plan development and approval process.* *Note[2]: Exception is noted in locations that the suction line can be placed at the desired sample depth (i.e., 100 feet), and the natural recharge maintains a water level within 25 feet of the ground surface.*

Field Notes

Field notes must document field activities and measurements collected during the sampling activities. FMG 1.4 - Data Recording - Field Books/Digital Recording describes the data/recording procedure for field activities. The log book/field file should document the following for each well sampled:

- Identification of well.
- PID readings before and after well opening (if required).
- Well depth.
- Static water level depth and measurement technique.
- Sounded well depth.
- Presence of immiscible layers and detection/collection method.
- Well yield – high or low.
- Purge volume, pumping rate, and final disposition.
- Time well purged.
- Measured field parameters and meter calibration records.
- Purge/sampling device used.
- Well sampling sequence.
- Sample appearance.
- Sample odors.
- Sample volume.
- Types of sample containers and sample identification.
- Preservative(s) used.
- Parameters requested for analysis.

- Field analysis data and method(s).
- Sample distribution and transporter.
- Analytical laboratory.
- Chain-of-custody number for shipment to laboratory.
- Field observations on sampling event.
- Name(s) of sampling personnel.
- Climatic conditions including air temperature.
- Problems encountered, and any deviations made from the established sampling protocol.

A standard log form for documentation and reporting groundwater purging and sampling events are presented on Form FMG 6.4-01 - Well Purging Field Information, Form FMG 6.4-02 - Sample Collection Data Sheet, and Form FMG 6.4-03 - Monitoring Well Record for Low-Flow Purging.

Groundwater/Decontamination Fluid Disposal

The project Work Plan will identify the required disposal procedures for groundwater and decontamination fluids. Groundwater disposal methods will vary on a case-by-case basis but may range from:

- Off-site treatment at private treatment/disposal facilities or public owned treatment facilities.
- On-site treatment at Facility-operated facilities.
- Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime (if State allows).
- Direct discharge to impervious pavement surfaces, allowing evaporation to occur.

Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers. Often small volumes of solvents used during the day can be allowed to evaporate if left in an open pail. In the event evaporation is not possible or practical, off-site disposal arrangements must be made with the Facility Resources Manager and the Client.

REFERENCES

ALS, Passive Diffusion Bags (PDBs), http://www.alsglobal.com/us

ASTM D5474 - Guide for Selection of Data Elements for Groundwater Investigations.

ASTM D4696 - Guide for Pore-Liquid Sampling from the Vadose Zone.

ASTM D5979 - Guide for Conceptualization and Characterization of Groundwater Systems.

ASTM D5903 - Guide for Planning and Preparing for a Groundwater Sampling Event.

ASTM D4448 - Standard Guide for Sampling Groundwater Wells.

ASTM D6001 - Standard Guide for Direct Push Water Sampling for Geo-Environmental Investigations.

SGS Sampling, Shipping & Handling or Per and Polyfluorinated Alkyl Substances (PFAS) By LC/MS/MS Fact Sheet – 2017.

USEPA Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S -95/504).

USEPA RCRA Groundwater Monitoring: Draft Technical Guidance (EPA/530-R-93-001).

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NON-AQUEOUS PHASE LIQUID (NAPL)

NON-AQUEOUS PHASE LIQUID (NAPL)

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure is for monitoring the presence of dense and light non-aqueous phase liquids (DNAPL and LNAPL), and collection of NAPL samples for laboratory analysis in monitoring, observation, and extraction wells.

It should be noted that groundwater sampling and analysis should not be performed in locations where NAPL has been identified.

PROCEDURES REFERENCED

- FMG 5.1 - Water Level Measurements
- FMG 9.0 - Equipment Decontamination

PROCEDURAL GUIDELINES

- Conduct well identification, inspection, and opening in accordance with FMG 5.1 - Water Level Measurements.
- NAPL level measurements are best conducted using a dual phase interface probe. The interface probe uses an optical liquid sensor, in conjunction with an electric circuit to detect the top of a phase-separated liquid and the interface between the phase layer and water (water level). The procedure for use of this probe is:
- For LNAPL:
  - Lower the probe tip into the center of the well until discontinuous beeping is heard (this indicates the top of the LNAPL has been detected). Grasp the calibrated tape at the reference point and note reading. Confirm the reading by slowly raising and lowering the probe to the level of the phase layer.

- Once the top of the phase layer is confirmed, slowly lower the probe until a continuous sound is heard. This indicates that the water level has been encountered. Grasp the tape at the reference point and note the reading. Confirm this water level measurement.
- Decontaminate the submerged end of the tape and probe prior to the next use in accordance with the Work Plan requirements.

- For DNAPL:
  - Lower the probe tip in the center of the well to the bottom of the well, a discontinuous beeping will be heard if DNAPL is present. Grasp the calibrated tape at the reference point and note reading.
  - Once the bottom of the well is confirmed, slowly raise the probe until a continuous sound is heard. This indicates that the water level has been encountered and represents the top of the DNAPL layer. Grasp the tape at the reference point and note the reading. Confirm this water level measurement.
  - Decontaminate the submerged end of the tape and probe prior to the next use and collect a decontamination blank following each cleaning.
- Alternative NAPL measurement methods exist in the event an interface probe is unavailable or not functioning properly. These methods tend to be less accurate than the interface probe but may be used to establish an estimated NAPL measurement.
  - **Clear Bailer –** A clear bottom-loading bailer may be used to estimate NAPL thickness if floating or denser than water. If NAPL presence is suspected, the bailer is carefully lowered to the location of suspected NAPL presence (top of water column/base of water column), and slowly removed and examined for NAPL. If present, the column of NAPL within the clear bailer can be measured to estimate the NAPL thickness within the groundwater column.
  - **Weighted Cord –** Primarily used for DNAPL measurements, a weighted "cotton" string or cord may be lowered to the base of the well and inspected upon retrieval. Typically, the lower DNAPL layer will "coat" the string indicating the approximate thickness of this layer.

<u>Well NAPL Sampling</u>

- Prior to sampling, the level of NAPL in the well should be measured as identified above.
- Various sampling devices can be employed to acquire fluid samples from the top and bottom of the well, including the following:
  - Bottom-loading bailer;
  - Double check value bailer (produces most reliable results);
  - Peristaltic pump for shallow wells (<25 feet in depth); or
  - Inertia pump for deeper wells (up to 300 feet in depth).
- Transfer NAPL to sample containers for shipment to laboratory. NAPL can be sampled to evaluate the physical properties of the fluid or to evaluate chemical composition.

- Decontaminate equipment prior to next use.

Note: Groundwater sampling shall not be performed in locations where NAPL is present.

EQUIPMENT/MATERIAL

- Interface probe.
- Bottom-loading bailer.
- Double check valve bailer.
- Peristaltic pump.
- Inertia pump.
- Work Plan.
- Health and Safety Plan.

REFERENCES

Cohen, Robert M., Mercer, James W. (GeoTrans, Inc.), Robert S. Kerr Environmental Research Laboratory "DNAPL Site Evaluation" Office Research and Development. U.S. Environmental Protection Agency

Cohen, R.M., Brayda, A.P., Shaw, S.T., and Spaulding, C.P.; Fall 1992 "Evaluation of Visual Methods to Detect NAPL in Soil and Water", Groundwater Monitoring Review, Volume 12 No. 4, pp. 132-141.

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SAMPLE HANDLING AND SHIPPING

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

Sample management is the continuous care given to each sample from the point of collection to receipt at the analytical laboratory. Good sample management ensures that samples are properly recorded, properly labeled, not lost, broken, or exposed to conditions which may affect the sample's integrity and that the integrity of the sample can be defended even in court proceedings by the sampling team and the documentation.

All sample submissions must be accompanied with a chain-of-custody (COC) document to record sample collection and submission. When possible, sampling should be batched to prevent completing validation for a small set of samples.

The following sections provide the minimum standards for sample management.

PROCEDURAL GUIDELINES

Field Handling

Prior to entering the field area where sampling is to be conducted, especially at sites with defined exclusion zones, the sampler should ensure that all materials necessary to complete the sampling are on hand.

If samples must be maintained at a specified temperature after collection, proper coolers and ice/cool-packs must be brought out to the field. Consideration should be given to keeping reserve cooling media on hand if sampling events will be of long duration. Conversely, when sampling in extremely cold weather, proper protection of water samples, trip blanks, and field blanks must be considered.

Personnel performing groundwater sampling tasks must check the sample preparation and preservation requirements to ensure compliance with the Work Plan Quality Assurance Project Plan (QAPP). Typical sample preparation may involve pH adjustment (i.e., preservation), sample filtration and preservation, or simply cooling to 4°C. Sample preparation requirements vary from site to site and vary depending upon the analytical method for which the samples will be analyzed.

The sampling personnel must also confirm before the sample event, the amount of bottle filling required for the respective sample containers. Groundwater samples analyzed for volatile organic compounds (VOCs) must not have any headspace within the sample collection vial; whereas when collecting select analytes (i.e., metals) a headspace must be provided to allow addition of the required preservative.

Sample Labeling

Samples must be properly labeled as soon as practical after collection. Note that markers that generate VOCs (i.e. Sharpie® markers) should not be used to write on labels as they can create false positive VOC results in the sample.

Note that the data shown on the sample label is the minimum data required. The sample label data requirements are listed below for clarity.

i) Project name.
ii) Sample number.
iii) Sampler's initials.
iv) Date of sample collection.
v) Time of sample collection.
vi) Analysis required.
vii) Preservatives.

The Work Plan Quality Assurance/Quality Control (QA/QC) specification should be reviewed to determine any additional requirements.

Quite often the analytical laboratory supplying the containers will provide blank sample labels. If these are adequate and convenient they can be used.

Under certain field conditions it is impractical to complete and attach sample labels to the container at the point of sample collection. However, to ensure that samples are not confused, a clear notation should be made on the container with a permanent, non-VOC marker indicating the last three digits of the sample number. If the containers are too soiled or small for marking, the container can be put into a zip-lock bag which can then be labeled.

No one sample number format is adequate for every type of sampling activity. Prior to the start of every project or sub-sampling event within the project, Project Managers and field personnel should devise a sample number format. Sample number formats should be as simple and short as possible. Simple number formats will reduce transcription errors by both Consultants and lab personnel. The sample number format should be comprehensive enough to allow for easy location of detailed sample data within the Site log books. Sample format must also be consistent with any future data management activities. GM is migrating to digital recording to minimize transcription errors and reduce management costs.

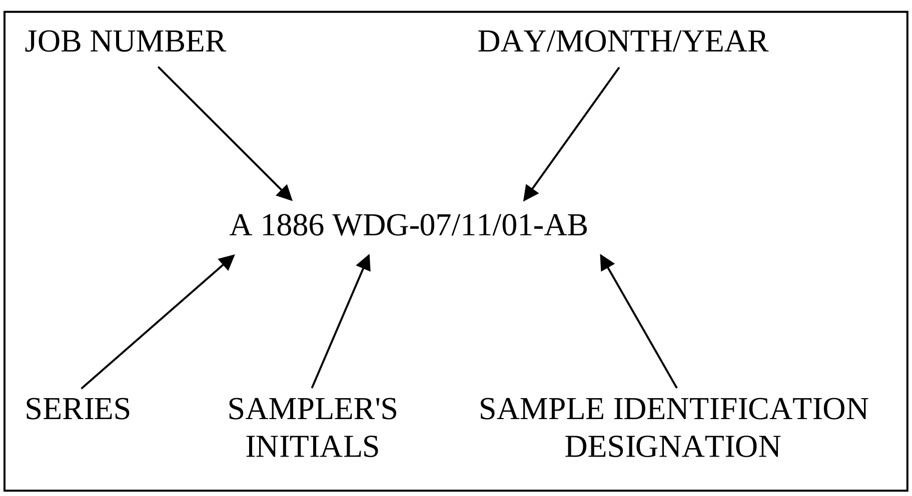
Sample Labels/Sample Identification

All samples must be labeled with:

- A unique sample number (never to be re-used, nor likely to be).
- Date and time.
- Parameters to be analyzed.
- Job number.
- Sampler's initials.

Labels should be secured to the sample container (bottle, Summa® canister, etc.) and should be written in indelible, non-VOC inks. It is also desirable to place wide clear tape over the label before packing in a cooler for label protection during transportation.

The unique sample identification number may follow the format recommended below, or a specific sample protocol for labeling may be specified in the project Work Plan.



This format has been selected to maximize the information content of the sample number. Minor modifications are certainly reasonable.

i) Series is a letter, which designates a group of samples. This might include sample round, or might designate sample type (e.g., sediment, soil, volatile analysis, Round 2 Lower Aquifer wells), or sample source. For example, "A" might mean samples of influent to some treatment system, "B" might mean samples of effluent. Letters should be used, not numbers. Series is optional.

ii) Job number together with the series number will allow easier tracking of samples.

iii) Sampler's initials will allow identification of the sampler, and so allow all project personnel to contact the correct person for information regarding that sample and its collection. The use of three initials is requested. Special arrangements will need to be made if two individuals have the same initials.

iv) Sample date will allow monitoring of actual holding time of samples and should ensure that all sample numbers are unique, even if sample location designation is used in a system, as opposed to assigned at random.

v) Sample identification designation will identify the sample and can be any numerical or letter designation.

The decision of how to assign sample numbers should be made at the beginning of a job or phase and should be consistent throughout the job.

<u>Packaging</u>

When possible, sample container preparation and packing for shipment should be completed in a well organized and clean area, free of any potential cross-contaminants.

Sample containers should be prepared for shipment as follows:

i) Containers should be wiped clean of all debris/water using paper towels (paper towels must be disposed of with other contaminated materials).

ii) Clear, wide packing tape should be placed over the sample label for protection.

While there is no one "best" way to pack samples for shipment, the following packing guidelines should be followed.

i) Plan time to pack your samples (and make delivery to shipper if applicable). Proper packing and manifesting takes time. A day's worth of sampling can be easily wasted due to a few minutes of neglect when packing the samples.

ii) Always opt for more coolers and more padding rather than crowd samples. The cost associated with the packing and shipment of additional coolers is usually always small in comparison with the cost of having to re-sample due to breakage during shipment. Make sure though to minimize the number of COCs and batch samples where possible to reduce the laboratory cost and validation costs that are incurred with each set of samples.

iii) Do not bulk pack. Each sample must be individually padded.

iv) Large glass containers (1 L and up) require much more space between containers.

v) Ice is not a packing material due to the reduction in volume when it melts.

The following is a list of standard guidelines which must be followed when packing samples for shipment.

i) When using ice for a cooling media, always double bag the ice in zip-lock bags.

ii) Double-check to ensure trip and temperature blanks have been included for all shipments containing VOCs, or where otherwise specified in the QAPP.

iii) Enclose the COC form in a zip-lock bag and place copies in each cooler.

iv) Ensure custody seals (two, minimum) are placed on each cooler. Coolers with hinged lids should have both seals placed on the opening edge of the lid. Coolers with "free" lids should have seals placed on opposite diagonal corners of the lid. Place clear tape over custody seals.

v) Ensure that all "Hazardous Material" stickers/markings have been removed from coolers being used which previously contained such materials.

vi) Ensure all proper containers/shipping labels required for the sample shipment are used/adhered to the sample packaging

Note: Never store sterile sample containers in enclosures containing equipment which use any form of fuel or volatile petroleum-based product. An alternate means of secure storage must be planned for.

When conducting sampling in freezing conditions at sites without a heated storage area (free of potential cross contaminants), trip blanks and temperature blanks not being used in a QA/QC role should be isolated from coolers immediately after receipt. Trip and temperature blanks should be double-bagged and kept from freezing.

Chain-of-Custody

COC forms will be completed for all samples collected. The form documents the transfer of sample containers. GM is in the process of migrating to digital COCs.

The COC record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The COC document will be signed and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a COC form. The COC form will consist of four copies which will be distributed as follows: The shipper will maintain a copy while the other three copies will be enclosed in a waterproof envelop within the cooler with the samples. The cooler will then be sealed properly for shipment. If one COC is used and there are multiple coolers, copies of the COC should be placed in all coolers. The number of coolers must be written on the COC. Make sure the laboratory knows when there are multiple coolers it is still one batch. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to the Field QA/QC Officer upon receipt of the samples by the laboratory. One copy will be returned with the data deliverables package.

COC records are legal documents and may be evidence in court. They must be completed and handled accordingly.

The following list provides guidance for the completion and handling of all COCs.

i) COCs used should be Consultant standard forms or those supplied by the analytical laboratory. Do not use any COC forms from other labs, even if the heading is blocked out.

ii) COCs must be completed in black ball-point ink only.

iii) COCs must be completed neatly using printed text.

iv) If a simple mistake is made, line out the error with a single line and initial and date next to it.

v) Each separate sample entry must be sequentially numbered.

vi) The use of "Ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, place a continuous vertical arrow between the first entry and the next different entry.

vii) When more than one COC form is used for a single shipment, each form must be consecutively numbered using the "Page ___ of ___" format. Try to batch as much as possible.

viii) If necessary, place additional instructions directly onto the COC. Do not enclose separate loose instructions.

ix) Include a contact name and phone number on the COC in case there is a problem with the shipment.

x) Before using an acronym on a COC, define clearly the full interpretation of your designation [i.e., Polychlorinated Biphenyls (PCBs)].

<u>Shipment</u>

In all but a few cases, the QA/QC plan for the field work will require shipment of samples by overnight carrier. When possible, samples may be held to ship a batch of samples together by overnight carrier. Samples must be kept at proper temperatures and received at the laboratory with adequate holding times remaining. Issues can be avoided by planning in advance and discussing with the laboratory when holding samples in the field.

Prior to the start of the field sampling, the carrier should be contacted to determine if pickup can be made at the field site location. If pickup at the field site can be made, the "no-later-than" time for having the shipment ready must be determined.

If no pickup is available at the site, the nearest pickup or drop-off location should be determined. Again, the "no-later-than" time for each location should be determined.

Sufficient time must be allowed not only for packaging but also for delivery of samples if this becomes necessary. Driving at high rates of speed in order to make the drop time is unacceptable.

Sample shipments must not be left at unsecured or questionable drop locations (i.e., if the cooler will not fit in a remote drop box do not leave the cooler unattended next to the drop box).

Some overnight carriers do not in fact provide "overnight" shipment to/from some locations. Do not assume; call the carrier in advance before the start of the field work. If overnight shipment is provided, make sure that the correct overnight delivery timeframe is selected. If the samples are collected and to be shipped on a Friday, ensure that the lab will have someone working that Saturday to accept the shipment. All transfers of sample control should be documented on the COC.

Copies of all shipment manifests must be maintained in the field file.

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 6.11
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

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LIST OF FORMS
(Following Text)

ECO RESTORERS	FIELD METHOD GUIDELINE NO.: FMG 6.11
SUSTAINABLE WORKPLACES	EFFECTIVE DATE: AUGUST 17, 2018
GENERAL MOTORS LLC	
REVISION NO.: 1	REVISION DATE:

SUB SLAB SOIL VAPOR OR SOIL VAPOR MONITORING POINT SAMPLING PROCEDURE

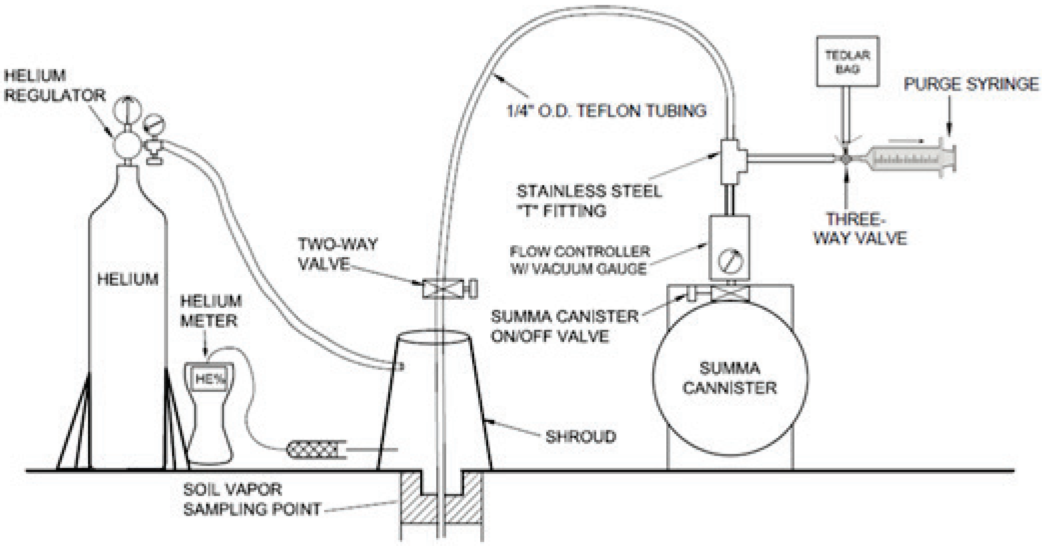
It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This document includes procedures for sampling sub slab monitoring points or soil vapor monitoring points (herein referred to as "soil vapor") and performing soil vapor integrity testing. These methods can be used for both exterior soil vapor samples and interior sub-slab soil vapor samples collected from both permanent or temporary sample point installations. The soil vapor sampling procedures include the use of SUMMA®-Type Canisters for analysis using USEPA Method TO-15 in situations where achieving low laboratory analytical method detection limits (DLs) is appropriate (e.g., sampling soil vapor for vapor intrusion assessments). The procedures also include the use of Tedlar® bags for analysis using USEPA SW-846 Method 8260 in situations where elevated chemical concentrations in soil vapor are expected and achieving low DLs or reliable quantitation to support risk assessments is not necessary (e.g., sampling soil vapor above free product to evaluate explosivity).

Sample Train Assembly

A schematic of the suggested sample train set up is included below:



1. Assemble the sample train by removing the cap from the SUMMA® canister and connecting the flow controller with in-line particulate filter and vacuum gauge. The flow controller attaches directly to the canister and dictates the sample duration. This piece will come preset from the laboratory.
2. Attach the canister and flow controller assembly to a stainless-steel T-fitting using a short length of 1/4-inch OD Teflon tubing. This T-fitting adds a leg to the sample train that will be used to purge "dead" air from the sample train in order to collect a more representative sample.
3. Connect the purge syringe with three-way valve to one of the free ends of the T-fitting using a length of Teflon sample tubing, Swagelok compression fittings, and silicon tubing.
4. Attach the Swagelok two-way valve to the remaining free end of the T-fitting using a short length of ¼-inch OD Teflon tubing. The two-way valve will be immediately adjacent to the sample point in the train assembly. This valve is used to isolate the sample train from the sample point prior to sampling in order to test the sample train's integrity.
5. When collecting duplicate or other quality assurance/quality control (QA/QC) samples as required by applicable regulations and guidance, couple two SUMMA® canisters using stainless steel Swagelok duplicate sample T-fitting supplied by the laboratory. Attach flow controller with in-line particulate filter and vacuum gauge to duplicate sample T-fitting provided by the laboratory.
6. Attach the terminal end of the two-way Swagelok valve to the sampling point as appropriate. This may be done using the options below:
   a. Use a section of silicon tube to connect the Teflon sample tubing to the barbed fitting of a Vapor Pin™ port.
   b. Use Swagelok compression fittings to connect Teflon tubing to sampling point. Teflon tape should never be used on Swagelok compression fitting connections.

c. Wrap the Teflon tubing with Teflon tape to seal around the slab then use volatile organic compound (VOC) free clay to further seal around the slab if using temporary points.

PROCEDURES REFERENCED

- FMG 3.9 – Installation Procedure for Soil Vapor Monitoring Points
- FMG 6.10 - Sample Handling and Shipping
- FMG 9.0 – Equipment Decontamination
- FMG 10.0 – Waste Characterization

LEAK TESTING

In accordance with both state and federal guidelines (see References below) for sampling soil vapor, it is necessary to perform leak testing on the sampling point to ensure that ambient air is not being drawn through the surface seal of the sampling point (also known as short-circuiting) during sample collection. Using helium as an indicator gas, the following steps should be followed to successfully complete leak testing:

- Obtain a surface shroud with three sealed penetrations and a pressure gauge. The surface shroud should have an outside diameter large enough to cover the sampling point flush mount opening when it is placed on top of the sampling point. It should be noted that there is no standard for the type or configuration of the surface shroud. Any container that can accommodate the components mentioned above, has the capability of being sealed at all openings, and does not introduce contamination or other adverse effects to the sampling point or sample quality is an acceptable surface shroud. A container with the smallest possible volume is recommended to reduce the amount of helium that is needed.
- The sample tubing from the sampling point that is securely connected to the associated subsurface vapor screen implant or sub slab monitoring point (i.e. Vapor Pin™) is extended using flexible tubing through a sealed penetration in the surface shroud (first hole in shroud) and connected to the sampling train (Figure 1) that yields the purge pump or syringe.

<u>Step 1 – Vacuum Test</u>

- The personal sampling pump or syringe will be used to conduct the vacuum test. When using SUMMA® canisters, the vacuum test will consist of opening the valve to the personal sampling pump or syringe while leaving closed the valves to the SUMMA® canister and the sampling point. When using Tedlar® bags with a vacuum box, the vacuum test will consist of connecting the personal sampling pump to the evacuation port of the vacuum box. The vacuum box is then sealed, but absent the Tedlar® bag, with the valves to the vacuum box sampling and evacuation ports open and leaving closed the valve to the sampling point. The pump or syringe will then be operated to ensure that it draws no air from the sampling assembly (i.e., creates a negative pressure, or vacuum, within the sampling assembly), thus establishing that all assembly connections are air-tight. If using a pump, the sampling pump low-flow detect switch will likely activate within 10 to 15 seconds, turning the pump off. A negative pressure, or vacuum, should be established within the sampling assembly as measured on the connected SUMMA® canister vacuum gauge, and should be sustained at the recorded vacuum for at least 1 minute.

- If the pump or syringe is capable of drawing flow, or if the vacuum is not sustained for a least 1 minute, all fittings and tubing will be checked for tightness (or replaced), and the vacuum test will be repeated.
- The reading from the vacuum gauge pressure will be recorded in a field logbook to demonstrate that the pump or syringe is able to create a vacuum within the sampling assembly (it will also be noted whether the low-flow detect switch on the pump was activated), and that the vacuum is sustained for a least 1 minute.

<u>Step 2 – Leak Test</u>

- Using lab supplied helium gas, ¼-inch diameter flexible tubing is connected to the helium gas source and inserted into the shroud through a sealed penetration (second hole in shroud) allowing the injection of helium gas within the void of the surface shroud. Pressurization of the shroud should be avoided so helium is not forced into the annulus of the borehole. A pre-calibrated hand-held helium detector (Dielectric MGD-2002, Mark Model 9522, or equivalent) is then inserted into the shroud through a sealed penetration (third hole in shroud) to determine the source concentration of helium inside the shroud.
- Once the tubing is situated and sealed at the penetrations, the surface shroud must have an air tight seal against the sampling point surface pad or flush mount opening. As noted with the surface shroud itself, the sealing agent can be anything that maintains an airtight seal and does not introduce contamination or other adverse effects to the sampling point or sample (e.g., modeling clay).
- Once a stable helium concentration is maintained beneath the shroud, the personal sampling pump or syringe can be opened to the sampling point sample tubing and used to purge the appropriate volume of air out of the sampling point in accordance with the purge calculation illustrated in FMG 3.9– Installation Procedure for Soil Vapor Monitoring Points. A sample of the purged air should be collected in a Tedlar® bag near the end of the purging. The Tedlar® bag sample is then connected to the hand-held helium detector to test for the presence of helium in the purged air. The surface seal is verified if helium is either:
    - Not detected in the purged air; or
    - Detected in the purged air at a concentration not greater than 10 percent of the helium source concentration beneath the shroud.

While maintaining the stable helium concentration, the valve to the portable purge pump or syringe is turned off and the sample collection leg of the sampling train is opened to the sampling point.

The sample collection apparatus typically consists of 6-liter, 1-liter or smaller SUMMA®-Type canisters equipped with low volume (100-200 ml/min) flow controllers. SUMMA®-Type canisters are commonly utilized for soil vapor sampling when it is necessary to achieve low Detection Limits. The preference is for smaller volume samples (and, thus smaller canisters) unless larger canisters are specified by applicable guidance or the project specific Sampling and Analysis Plan. The sample collection apparatus can also consist of Tedlar® bags that are filled using a vacuum box. The use of Tedlar® bags is appropriate when achieving low Detection Limits or reliable quantitation to support risk assessment is not necessary. Sample collection procedures using both SUMMA®-Type canisters and Tedlar® bags are discussed in detail below.

(Note: If the leak test fails, the sampling point should be evaluated and repaired, and/or abandoned and re-installed.)

SAMPLE COLLECTION

Soil vapor sampling should not be performed during or within 48 hours of a significant rainfall event. Soil vapor samples are collected using either certified SUMMA®-Type Canisters with dedicated time integrated flow controllers, or Tedlar® bags in conjunction with a vacuum box. The applicable regulatory guidance and project specific Sampling and Analysis Plan will dictate whether SUMMA® canisters or Tedlar® bags are appropriate for sample collection. For SUMMA® canisters, the size of the canister and the flow rate requirements will be specified in the project specific Sampling and Analysis Plan. The details of sample collection immediately following the purging and leak testing described above using either SUMMA® canisters or Tedlar® bags are presented below.

<u>SUMMA® Canisters</u>

Prior to opening the SUMMA® canister to the dedicated sample train for any sampling point, the identification number from both the SUMMA® canister and flow controller and the initial vacuum reading must be recorded in the field book, on the sampling log, and analytical Chain of Custody (COC). If the initial vacuum is less than -25 inches of mercury (e.g., -20 in. Hg), the canister should not be used for sample collection.

During the installation of a sub grade soil vapor sampling point (i.e. installed into soil and finished with flushmount cover), the dedicated sampling train (stainless steel, Teflon, Nylaflow® or similar) should be equipped with the appropriate steel Swagelok® fittings and ferrules necessary to connect to the specified flow controller/SUMMA® canister. For sub-slab monitoring points (i.e. installed into building slab), connect the sampling train during sampling instead of installation as the there is no flushmount cover to house the sampling train between events. Connect the sampling train to the flow controllers using Swagelok compression fittings so that the ferrule seals to the tubing, as noted above in the sampling train assembly section. Turn the SUMMA® canister valve to the "open" position, and immediately record the sample start time in a field book or on a sampling log form, and on the COC form. For field duplicate sample collection, the procedure described above is followed except for the addition of another flow controller/SUMMA® canister connected to a

"T" apparatus designed specifically for duplicate sampling that is provided by the analytical laboratory.

Termination of sample collection is achieved by turning the SUMMA® canister valve to the "close" position. The sample time and vacuum gauge on the flow controller must be monitored to ensure that the vacuum is not completely released. In high permeability soils, the canister should fill sufficiently within the designated sampling period (period set by the flow controller). In low permeability soils, it may be necessary to allow the canister to collect the sample for a longer period to ensure a sufficient volume is collected. The final vacuum should be 5 in. Hg or less, but greater than zero; 3 in. Hg is a sufficient target vacuum to reach before termination of sample collection. If the SUMMA® canister is allowed to equilibrate to atmospheric pressure (i.e., the vacuum is completely released) sample quality may be compromised. In the event that the vacuum gauge on the flow controller is not accurate (damaged in shipping, etc.), field personnel will need to use their best judgment on when to terminate the sample based on knowledge of soil type, the sample duration, and the vacuum gauge. Excessive vacuum remaining in a canister may result in elevated reporting limits.

After the SUMMA® canister valve is closed, the valve to the personal sampling pump or syringe should be opened and used to draw an air sample into a Tedlar® bag. The helium concentration within the Tedlar® bag air sample should be measured using the pre-calibrated hand-held helium detector. The surface seal is verified if helium not detected or detected in the sample at a concentration not greater than 10 percent of the helium source concentration beneath the shroud. The absence of helium, or presence of helium no greater than 10 percent of the helium source concentration beneath the shroud, in the air sample verifies that the integrity of the surface seal was maintained during sample collection.

Once the sampling on the point is completed, the SUMMA® canister should be disconnected from the sampling tubing, and the valve to the sampling point should be closed. If sampling a subgrade soil vapor monitoring point, an appropriate cap should be placed on the end of the tubing leading to the sampling point to keep out moisture and debris. If sampling a sub slab monitoring point, the sampling train should be totally removed from the point, and the cap should be placed back onto the point. At both locations, an appropriate flushmount cover should be placed on the point following sampling to eliminate safety hazards (vehicular and/or pedestrian traffic).

Although a flow regulator has a given flow rate and time associated with sampling, sample times are dependent on soil properties. Cohesive soils (silts and clays) with relatively less interconnected air voids within the soil matrix will not allow the vacuum to pull the soil vapor as readily as a granular soil type (clean sand and gravel). Further, soil moisture can affect the sample time as well. The sampler should monitor the sample tubing and apparatus during collection, to ensure that water incursion (from soil moisture) does not occur. Should water incursion occur the sample integrity is compromised and may result in the permanent fouling of the SUMMA® canister. A wide range of sample times should be expected. Ensuring that the final vacuum is between 3 and 5 in. Hg is more important than the amount of time it takes to collect the sample unless simultaneous sampling is a requirement of the Sampling and Analysis Plan. In certain situations, such as extremely tight soils, if an appropriate 1-liter sample cannot be obtained within 60 minutes, the location may be described as not yielding soil vapor and sampling should be abandoned.

Tedlar® Bags and Vacuum Box

During the installation of the sampling point, the dedicated sampling train (stainless steel, Teflon, Nylaflow® or similar) should be equipped with the appropriate steel Swagelok® fittings and ferrules necessary to connect to the sampling point of the vacuum box. Connect the sampling point sample train to the sampling point of the vacuum box so that the ferrule seals to the tubing. Connect a fresh unused Tedlar® bag to the sampling port on the inside of the vacuum box, and then seal the vacuum box. Connect the personal sampling pump to the evacuation port of the vacuum box. Immediately record the Tedlar® bag serial number and the sample start time in a field book or on a sampling log form, and on the Chain of Custody form. Open the valves on the vacuum box to both the sampling and evacuation ports. Turn on the personal sampling pump to evacuate the air sealed inside vacuum box to create a vacuum inside the box. The vacuum causes the Tedlar® bag to expand, which draws a soil vapor from the sampling point into the bag. Sample collection is complete when the bag is filled. Care should be taken not to over-fill the bag or it will rupture. When the bag approaches being full, the vacuum within the box can be reduced by closing down the valve on the evacuation port. Once the bag is filled, the valves to the sampling and evacuation ports can be closed, pump turned off, and the vacuum box can be opened. The valve to the Tedlar® bag can be closed, and the bag can be disconnected from the sampling port on the vacuum box. The Tedlar® bag should be 'conditioned' by filling it and emptying it three times prior to a final filling to obtain the sample to be analyzed by the lab. The conditioning step will help ensure that any surface active areas within the bag are well exposed to the soil vapor sample and do not adsorb significant VOCs that could bias the final sample. Analysis of the Tedlar® bag sample should be arranged to occur with 36 hours of sample collection to avoid potential VOC losses during storage. For field duplicate sample collection, the procedure described above is followed except for the addition of a second vacuum box/Tedlar® bag connected to a "T" apparatus designed specifically for duplicate sampling that is provided by the analytical laboratory.

Immediately following sampling, the vacuum box leg of the sampling train should be closed off from the rest of the sampling train and the valve to the personal sampling pump or syringe should be opened and used to draw an air sample into a Tedlar® bag. The helium concentration within the Tedlar® bag air sample should be measured using the pre-calibrated hand-held helium detector. The surface seal is verified if helium not detected or detected in the sample at a concentration not greater than 10 percent of the helium source concentration beneath the shroud. The absence of helium, or presence of helium no greater than 10 percent of the helium source concentration beneath the shroud, in the air sample verifies that the integrity of the surface seal was maintained during sample collection.

WASTE MANAGEMENT

The waste materials generated by these activities should be minimal. Personal protective equipment, such as gloves, disposable clothing, and other disposable equipment will be disposed of in accordance with FMG-10.0 – Waste Characterization.

EQUIPMENT/MATERIALS

The following equipment and materials are used for the sampling of a soil vapor monitoring point:

1. Appropriate personal protective equipment (PPE) as required by the site specific Health and Safety Plan;
2. Site Plan, Field Sampling Plan, and/or Work Plan, with specific sampling objectives and analytical methods;
3. Sample media, typically consisting of SUMMA®-Type Canisters with pre-calibrated laboratory supplied time integrated flow controllers, pressure gauges, and associated stainless steel Swagelok fittings, ferrules, and "T" apparatus for duplicate sampling. The canisters should be certified clean by the laboratory in accordance with USEPA Method TO-15. If elevated chemical concentrations are expected and it is not necessary to achieve low DLs or reliable quantitation to support risk assessment, sample collection may be conducted using Tedlar® bags in conjunction with a vacuum box. The vacuum box allows collection of a soil vapor sample directly from the sampling line into a Tedlar® bag without first passing the sample through a pump. This eliminates the potential for cross-contamination from the interior pump components (e.g., rubber diaphragm, filters, gauges, etc.) and the need to disassemble and/or decontaminate the pump after each sample is collected. Two vacuum boxes will be required in instances where field duplicate soil vapor samples are to be collected from a single sampling location;
4. Extra ¼-inch Swagelok front and back compression sleeves;
5. Decontaminated stainless steel Swagelock or comparable "T" fitting and ball or needle valve for isolation of purge leg of sample train;
6. Portable vacuum pump and/or 60-mL syringe equipped with a three-way leur lock valve;
7. Appropriately-sized open-end wrench (typically 9/16-inch and 1/2");
8. Tedlar® bag to collect purge air for venting outside a structure if working inside;
9. Portable weather meter, if appropriate;
10. Helium detector.
11. Helium leak testing materials: laboratory grade helium gas and regulator, surface testing shroud, Tedlar® bags, sealing agent (i.e. modeling clay), additional nylon tubing for splicing if necessary (typically ¼-inch I.D.).
12. Nylon, Teflon, or stainless-steel tubing.

REFERENCES

United States Environmental Protection Agency (USEPA), Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), OSWER-530-D-02-0004, November 2002.

Indiana Department of Environmental Management (IDEM), Draft Vapor Intrusion Pilot Program Guidance, April 26, 2006.

American Petroleum Institute (API), Collecting and Interpreting Soil Gas Samples from the Vadose Zone: A Practical Strategy for Assessing the Subsurface-Vapor-to-Indoor Air Migration Pathway at Petroleum Hydrocarbon Sites. American Petroleum Institute, Publication Number 4741, November 2005.

California Environmental Protection Agency, Advisory – Active Soil Gas Investigations. Department of Toxic Substances Control and California Regional Water Quality Control Board, Los Angeles Region. January 28, 2003.

New York State Department of Health (NYSDOH), Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Center for Environmental Health, Bureau of Environmental Exposure Investigation. October 2006.

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LIST OF FORMS
(Following Text)

FIELD INSTRUMENTS – USE/CALIBRATION

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

A significant number of field activities involve usage of electronic instruments to monitor for environmental screening and health and safety purposes. It is imperative the instruments are used and maintained properly to optimize their performance and minimize the potential for inaccuracies in the data obtained, and to insure worker's health and safety is not compromised. The equipment should also be evaluated for potential per- and polyfluroalkyl substances (PFAS)/perfluorooctanoic acid (PFOA) presence if there is a potential for cross contaminating analytical samples.

This FMG provides guidance on the usage, maintenance and calibration of electronic field equipment, whether for equipment owned by the Consultant or Contractor, or equipment obtained from a rental agency.

PROCEDURES REFERENCED

- FMG 1.4 - Data Recording – Field Books/Digital Recording

PROCEDURAL GUIDELINES

- All monitoring equipment will be in proper working order and operated for the purpose for which it was intended, in accordance manufacturer's recommendations before bringing it to the field or using it in the field.
- Field personnel will be responsible for ensuring the equipment is maintained and calibrated in the field to extent practical or returned for office or manufacturer maintenance or calibration if warranted. Calibration is discussed in greater detail below.

- A copy of the Operating Instructions, Maintenance and Service Manual for the equipment being used during a task will be kept with the equipment on-site until the task has been completed and the equipment is no longer on-site.
- Instruments will be operated only by personnel trained in the proper usage and calibration. In the event certification of training is required, personnel will have documentation of such certification with them on site at all times.
- Personnel must be aware that certain instruments are rated for operation within a limited range of conditions such as temperature and humidity. Usage of such instruments in conditions outside these ranges will only proceed with proper approval by a project manager and/or health and safety supervisor as appropriate.
- Instruments that contain radioactive source material, such as x-ray fluorescence analyzers or moisture-density gauges require specific transportation, handling, and usage procedures that are generally associated with a license from the Nuclear Regulatory Commission (NRC) or an NRC-Agreement State. Under no circumstance will operation of such instruments be allowed on site unless by properly authorized and trained personnel, using the proper personal dosimetry badges or monitoring instruments.

Calibration

Calibration of an electronic instrument is critical to insure it is operating properly for its intended use. Such instruments are often sensitive to changes in temperature or humidity, or chemical vapors in the working atmosphere, and as a result their response and ability to monitor conditions and provide data can change significantly.

Calibration of instruments shall be performed and documented in accordance with the manufacturer's recommendations. This includes the following parameters:

- Frequency.
- Use of proper calibration gases or chemical standards.
- Requirements for factory calibration.

Instrument calibration shall be performed in accordance with the following manufacturer recommendations or the suggested "minimum" calibration frequency:

Instrumentation Classification/Group		***Instrumentation***	***Representative Manufacturer Recommended Calibration Frequency***	***Minimum Recommended Calibration Frequency***
Health and Safety	Air Monitoring (Real-Time):	PID, FID, compound-specific or multi-gas meter (typ.), etc.	No Recommendation, Daily or As Needed	Daily
	Air Sampling (non-Real-Time):	Flow meter, personal air sampling device, etc.	Per Manufacturer's Recommendations	Per Manufacturer's Recommendations

Instrumentation Classification/Group		***Instrumentation***	***Representative Manufacturer Recommended Calibration Frequency***	***Minimum Recommended Calibration Frequency***
	Air Monitoring for Confined Space Entry (Real-Time)	Four Gas Meter or Multi-Gas meter with O, LEL, CO, H2S sensors	Daily or before each entry As Needed	Daily
Other Monitoring	Water Sampling:	pH, Cond., Temp., ORP, DO, etc.	Per Manufacturer's Recommendations	Daily, or As Needed
	Physical Parameters:	Velocity/flow meter, pressure transducer, water level meter, oil-water interface probe, etc.	Per Manufacturer's Recommendations	Per Manufacturer's Recommendations
	Other:	Miscellaneous (Troxler nuclear density, etc.)	Per Manufacturer's Recommendations	Per Manufacturer's Recommendations

Notes:

1. Some instrumentation requires factory calibration only.
2. If a significant change in conditions occurs, or in dangerous atmosphere conditions, more frequent calibration should be performed.

Calibration Gas Safety

Several instruments such as photoionization detectors (PIDs), flame ionization detectors (FIDs), oxygen meters, explosimeters, combustible gas indicators, and many others require use of calibration gasses contained in compressed gas cylinders. Many of these gases are combustible or explosive. Care shall be taken to minimize the potential for injury from the use of such compressed gases. Transport, handling, and storage of cylinders, where necessary, shall be performed in accordance with applicable Department of Transportation (DOT) regulations and site requirements.

Calibration will only be performed in areas free of sources of spark, flame, or excessive heat. Smoking will not be allowed in the vicinity of calibration gas usage areas.

Documentation of Calibration

Instrument calibration activities will be documented. Form FMG 8.0-01 - Instrument Calibration Record shall be used to record applicable calibration and maintenance activities. In addition, protocol for documentation outlined in FMG 1.4 - Data Recording - Field Books/Digital Recording shall be followed.

Intrinsically Safe Requirements

Certain work locations may be such that dangerous, ignitable, or explosive conditions exist. In such cases, it may be necessary to utilize only equipment that is rated as "Intrinsically Safe".

Intrinsically safe instrumentation is designed with limited electrical and thermal energy levels to eliminate the potential for ignition of hazardous mixtures.

For site work requiring operation of monitoring instruments in Class I, Division I locations [as defined by the National Fire Protection Agency (NFPA)] only instrumentation rated as Intrinsically Safe will be used. Such equipment (including all accessories and ancillary equipment) must be rated to conform to Underwriters Laboratories (UL) Standard 913, for use in a Class I, Division 1, Groups A, B, C, and D locations. It is also recommended the equipment conform with CSA Standard 22.2, No. 157-92.

Upon completion of the field activities, equipment shall be returned to the possession of the Consultant, Contractor, or Rental Agency accompanied by a written summary of any problems encountered with its use or calibration.

Equipment shall be properly prepared for shipping, including insuring that residual gases (if applicable) are removed from the instrument, and accompanying containers of compressed gases or fluids are properly labeled and sealed.

Equipment Decontamination

Equipment that comes in contact with Site media (water level meters, water quality meters) must be cleaned **before** removal from the site to ensure that chemicals are not transferred to other sites. It is the responsibility of the person who requisitioned the equipment to ensure appropriate cleaning before returning the equipment. Equipment decontamination procedures are typically site specific for unique site compounds.

EQUIPMENT/MATERIALS

- Monitoring equipment specific to work plan tasks.
- Manufacturer's instructions, operation and maintenance information.
- Associated calibration gases, aqueous standards, etc.
- Appropriate shipping containers to facilitate transport without damage to equipment.

REFERENCES

Underwriters Laboratories, Inc. (https://www.ul.com/) Standard UL 913.

National Fire Protection Agency (https://www.nfpa.org/).

Canadian Standards Association (CSA) (https://www.csagroup.org/) Standard 22.2 No. 157.

Form FMG 8.0-01

INSTRUMENT CALIBRATION RECORD

PROJECT ______________________ PROJECT MANAGER ______________________

LOCATION ______________________ FIELD REP. ______________________

DATE ______________________

Instrument	Date Calibrated	By	Standard Used	Decontamination, Maintenance, or Repair Performed	Remarks

Other Remarks: ______________________

FMG MODIFICATIONS MUST BE ACCOMPANIED BY A REVISION REQUEST FORM APPROVED BY THE PROJECT MANAGER

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EQUIPMENT DECONTAMINATION

EQUIPMENT DECONTAMINATION

It is mandatory that all field activities are performed in a manner that is consistent with Occupational Safety and Health (OSHA) regulations and GM's health and safety policy. Prior to completing any field activities, the project-specific Health and Safety Plan (HASP) must be finalized, reviewed, and understood. **In addition, all field activities must comply with federal, state, and local rules and regulations at all times. Any questions that arise should be discussed and resolved with the GM Project Manager.**

INTRODUCTION

This procedure describes decontamination of field equipment potentially exposed to contaminants. Proper decontamination is required to reduce the risk of transfer of contaminants from areas of contamination to other areas and to minimize the potential for cross-contamination that would compromise sample quality. The degree of decontamination required will be dependent on the nature of the activity, equipment used, and on the amount of exposure to contaminants.

PROCEDURES REFERENCED

- FMG 2.0 - Subsurface Investigations
- FMG 5.0 - Aquifer Characterization
- FMG 6.0 - Sample Collection for Laboratory Analysis
- FMG 6.15 – PFAS/POFA Sampling
- FMG 8.0 - Field Instruments – Use/Calibration
- FMG 10.0 - Waste Characterization

PROCEDURAL GUIDELINES

Decontamination activities must be performed in a controlled area outside any exclusion zones established on the site. Care must be taken to minimize the potential for transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve removal of gross material (dirt, grease, oil, etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of washes and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Drill rigs, backhoes, and other exploration equipment must be decontaminated prior to initiating site activities, in between exploration locations to minimize cross-contamination potential, and prior to mobilizing off site after completion of site work. Heavy equipment is generally best deconned with a combination of steam-cleaning equipment and detergent scrubbing. Particular attention should be paid to parts in direct contact with contaminants, e.g., shovels, tires, augers, drilling decks, etc.

Control and containerization of all decontamination fluids is critical. A decontamination pad must be constructed that is appropriate for the size and type of equipment being decontaminated. At a minimum, the decontamination pad will have the following elements:

- An impermeable barrier capable of containing decontamination fluids.
- A low point where fluids will collect and can be pumped into appropriate containers.
- Durability to withstand equipment such as vehicle and foot traffic.
- Appropriate ancillary equipment such as racks to place decontaminated equipment to drain without further exposure to contaminated fluids.
- Labels to alert personnel as to the potential presence of contaminated materials.

<u>Decontamination of Specific Sampling Equipment</u>

<u>*Note there is a preference to use pre-packaged disposable equipment rather than create potential for cross contamination and the time spent on decontamination.*</u>

The following specific decontamination procedure is recommended:

- Brush loose soil off equipment.
- Wash equipment with laboratory grade detergent (i.e., Alconox or equivalent). Make sure it's appropriate for the types of contaminants [i.e., per- and polyfluoroalkyl substances (PFAS)/ perfluorooctanoic acid PFOA)] (see FMG 6.15 – PFAS/POFA Sampling for further details).
- Rinse with tap water (three rinses minimum).
- Rinse equipment with reagent grade methanol for VOC samples (this requirement may not be appropriate for sites where methanol is a contaminant of concern).
- Rinse equipment with nitric acid for metal samples (especially important for sites with potentially high metals concentrations.
- Rinse equipment with distilled water.
- Allow water to evaporate before reusing equipment

Decontamination of Monitoring Equipment

Because monitoring equipment is difficult to decontaminate, care should be exercised to *prevent* contamination. Sensitive monitoring instruments should be protected when they are at risk of exposure to contaminants. This may include enclosing them in plastic bags allowing an opening for the sample intake. Ventilation ports should not be covered.

If contamination does occur, decontamination of the equipment will be required; however, immersion in decontamination fluids is not possible. As such, care much be taken to wipe the instruments down with detergent-wetted wipes or sponges, and then with deionized water-wetted wipes or sponges.

Disposal of Wash Solutions and Contaminated Equipment

All contaminated wash water, rinsates, solids and materials used in the decontamination process that cannot be effectively decontaminated (such as polyethylene sheeting) will be containerized and disposed of in accordance with applicable regulations and GM requirements. All containers will be labeled with an indelible marker as to contents and date of placement in the container, and any appropriate stickers required [such as polychlorinated bipheyls (PCBs)].

Sampling of containerized wastes will be performed immediately upon completion of the investigations to minimize storage time on site. Storage of decontamination wastes on site will not exceed 90 days under any circumstances.

Level C Decontamination Procedures

The general Level C decontamination procedures to be used when leaving the exclusion zone are as follows:

Step 1: Equipment drop.
Step 2: Outer boot cover, outer glove and suit wash with decontamination solution or detergent/potable water.
Step 3: Outer boot cover, outer glove and suit rinse with potable water.
Step 4: Tape removal around outer boots and gloves and deposit in PPE waste receptacle properly labeled for disposal.
Step 5: Boot cover removal.
Step 6: Outer glove removal.
Step 7: Suit removal. If disposable place in PPE waste receptacle.
Step 8: Respirator removal. Clean and disinfect for next use.
Step 9: Inner glove removal and disposal in PPE waste receptacle.
Step 10: Wash hands, face, and neck and shower as soon as possible at the end of the day/shift.

It should be noted that the steps above can vary slightly dependent on the task and what PPE is required (e.g., reusable or disposable). Decontamination of Level C PPE is generally accomplished using detergents (surfactants) in water combined with a physical scrubbing action. This process will remove most forms of surface contamination including dusts, many inorganic chemicals, and some organic chemicals.

EQUIPMENT/MATERIALS

Decontamination equipment and solutions are generally selected based on ease of decontamination and disposability.

- Polyethylene sheeting.
- Metal racks to hold decontaminated equipment.
- Soft-bristle scrub brushes or long-handle brushes for removing gross contamination and scrubbing with wash solutions.
- Large galvanized wash tubs, stock tanks, or wading pools for wash and rinse solutions.
- Plastic buckets or garden sprayers for rinse solutions.
- Large plastic garbage cans or other similar containers lined with plastic bags can be used to store contaminated clothing.
- Contaminated liquids and solids should be segregated and containerized in DOT-approved plastic or metal drums, appropriate for off-site shipping/disposal if necessary.

REFERENCES

ASTM D5088 - Practice for Decontamination of Field Equipment Used at Non-Radioactive Waste Sites.

APPENDIX L – REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR DELPHI AUTOMOTIVE SYSTEMS SITE #828064

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